30 JAN 1968

PEA Jan-68 No.1

TERRITORY OF PAPUA AND NEW GUINEA
GEOLOGICAL AND VULCANOLOGICAL BRANCH
VULCANOLOGICAL SECTION

PRELIMINARY EARTHQUAKE ANALYSIS
RABAUL CENTRAL OBSERVATORY
1968

Rabaul	RAB	From: DEC. 26. 1967 To : JAN. - 2. 1968
Keravat	KRT	From: DEC. 26. 1967 To : JAN. - 2. 1968
Esa'ala	ESA	From: To :
Tabele	TBL	From: DEC. - 6. 1967 To : DEC. 29. 1967
Agenahambo	AGE	From: To :
Waris	WAA	Not operational
Ulamona	ULA	Not operational
Piva	PIV	Not operational
Cape Gloucester		From: DEC. 31. 1967 To : JAN. - 1. 1968

STATION PERSONNEL

RAB Central Observatory, Rabaul.

Vulcanologist-in-Charge	G.W. D'Addario
Vulcalologist	R.F. Heming
Seismologist	Position Vacant
Senior Technical Officer	N.O. Myers
Technical Officer	R.J. Conway
Seismogram Readers	P.M. Leitao; V. Hunt
Vulcanological Assistants	L. Topue; M. Gaiam
	V. Kaita
Technical Assistant	P. Daimbari
Trainee Vulcanological Assistants	B. Talai; M. Salaiau;
	Position Vacant
Secretary	G. Chant

KRT Keravat Outstation
Observer (part-time) — G.E. Chorick

TBL Tabele Observatory
Observer — E. Ravian

ESA Esa'ala Observatory
Observer — F. Dira

AGE Agenahambo Out-station
Observer (part-time) — Br. B. Hughes

The Rabaul Preliminary Earthquake Analysis (PEA) is produced by the staff under the direction of the Vulcanologist-in-Charge from whom additional information and photocopies of seismogram records from all stations may be obtained on request.

Please address all communications to:-

Vulcanologist-in-Charge,
Central Observatory,
P.O. Box 386,
RABAUL, T.P. & N.G.

SEISMOGRAPH STATIONS

Station	Code	South Latitude	East Longitude	Elev. (m)	Foundation
NEW GUINEA					
Rabaul	RAB	04°11'28.6"	152°10'11.4"	183.5	Basalt Flow
Wanliss Street	WAN*	04°11'39.6"	152°10'32.5"	25.0	Basalt Flow
Sulphur Creek	SUL*	04°13'09.8"	152°10'33.3"	8.5	Unconsolidated Volcanic Ash
Rabalanakaia	RAL*	04°13'13.0"	152°12'07.0"	91.0	Unconsolidated Volcanic Ash
Tavurvur	TAV*	04°14'12.0"	152°13'18.0	60.0	Andesite Flow
Taviliu	VUL*	04°16'58.2"	152°08'44.6"	332.3	Unconsolidated Volcanic Ash
Kerawat	KRT	04°20'00"	152°00'00"	20.0	Alluvium
Ulamona	ULA	04°59'24.0"	151°16'30.0"	17.0	Lapilli Tuff
Tabele	TBL	04°06'04.67"	145°00'41.37"	179.5	Basalt Flow
Waris	WAA	04°07'00"	145°06'00"	48.0	Lapilli Tuff
Piva	PIV	06°12'00"	155°03'30"	60.0	Alluvium
PAPUA					
Agenahambo	AGE	08°48'30"	148°06'12"	303.0	Unconsolidated Volcanic Ash
Esa'ala	ESA	09°44'18.2"	150°48'50.7"	46.4	Granite Gneiss

* Rabaul Harbour Network

STATION INSTRUMENTATION

Station & Instruments	Comp.	Ts	Tg	Trace Speed mm/min	Approximate relative Magnification	Approximate damping
NEW GUINEA						
Rabaul Central Observatory						
WORLD-WIDE STANDARD	Z	1.0	0.74	60	12,500	critical
	N,E	1.0	0.74	60	6,250	critical
	Z/N/E/	15.0	100.0	15	750	critical
Benioff VR 14.7Kg	Zh	1.0	0.02	180*	4,000	critical
Omori 15Kg	No	3.6	-	24	12	10.1(air)
Omori 15Kg	Eo	3.8	-	24	10	10.1(air)
Wood-Anderson Torsion	Na,Ea	0.8	-	60	2,800	critical

* Recording is triggered by the onset of any earthquake with pre-determined minimum amplitude. Recorder is stopped automatically by hour break pulse.

Rabaul Harbour Network

Readings from the Harbour Network are entered in the PEA only for large earthquakes.

WAN** Benioff VR 14.7Kg Z	1.0	0.02	60	5,240	critical
SUL** Benioff VR 14.7Kg Z	1.0	0.02	60	2,850	critical
RAL** Benioff VR 14.7Kg Z	1.0	0.02	60	8,075	critical
TAV** Benioff VR 14.7Kg Z	1.0	0.02	60	20,900	critical
VUL***Benioff VR 14.7Kg Z	1.0	0.02	60	5,000	critical

STATION INSTRUMENTATION

Station & Instruments	Comp.	To	Tg	Trace Speed mm/min	Approximate relative Magnification	Approx. damping
Rabaul Harbour Network (Cont'd)						
Keravat Out-Station KRT						
Benioff MC 50Kg	Z	1.2	0.2	15	20% sensitivity	critical
Benioff MC 50Kg	N,E	1.2	0.2	15	10% sensitivity	critical
Ulamona Field Station	ULA					
Willmore portable	Z	0.6	0.25	60	3,000	underdamped
Piva Field Station	PIV					
Willmore portable	Z	0.6	0.25	60	3,000	underdamped
Waris Field Station	WAA					
Willmore portable	Z	0.6	0.25	60	3,000	underdamped
Tabele Observatory	TBL					
Benioff VR 107.5Kg	Z	1.0	0.2	60	1,350	critical
PAPUA						
Esa'ala Observatory	ESA					
Benioff VR 107.5Kg	Z	1.0	0.2	15	36,000	critical
Benioff VR 107.5Kg	N,E	1.0	0.2	15	18,000	critical
Benioff VR 107.5Kg	Z/N/E/	1.0	60.0	30	50% sensitivity	critical
Agenahambo Station	AGE					
Willmore portable	Z	0.6	0.25	60	3,000	underdamped

** Signals from these stations are telemetered by land line to Helicorders (Geotech Mod. 2484) at the Central Observatory.

*** Signals from this station are telemetered via VHF to its Helicorder at the Central Observatory.

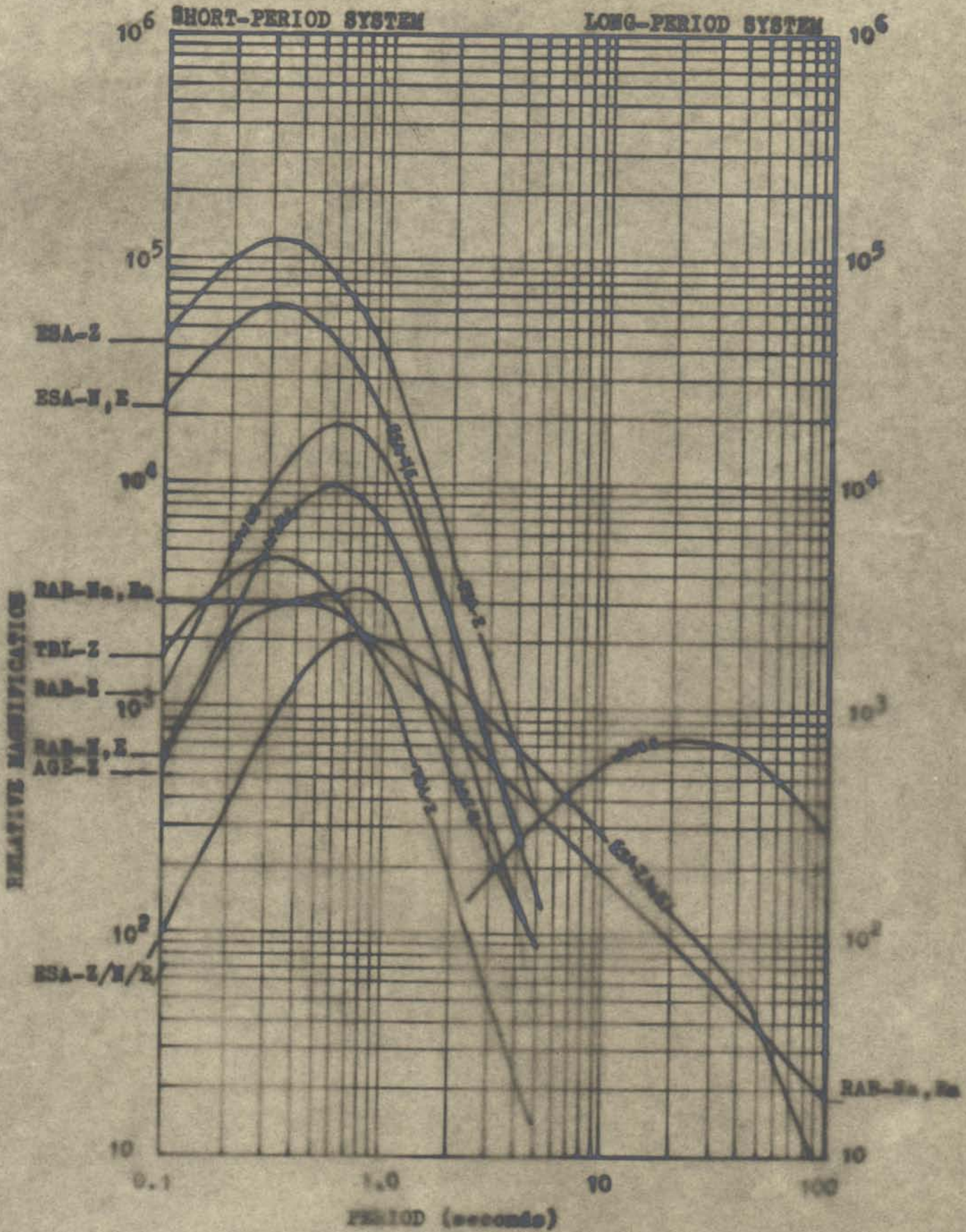
N.B. These field stations consist of a permanent building in which instruments are installed when necessary.

Details of emergency field stations, within the Territory will be listed when in operation.

VRS Variable Reluctance

MCS Moving-coil

Relative magnification curves of seismograph systems installed in stations controlled by the Rabaul Central Observatory have been listed on the following page.



FREQUENCY RESPONSE CURVES OF THE INSTRUMENTS.

PRESENTATION OF DATA

(reviewed in November, 1967)

All times are reduced to Greenwich Mean Time (GMT), which is 10 hours behind Eastern Standard Time.

At RAB and Harbour Network, the time signal is marked every minute on each seismogram record from the Observatory crystal chronometer. Second marks from radio signal VNG (Australia) are recorded on World-Wide Standard System S.P.-N component only according with the W.W.S.S. programme, at six hour intervals. Primary time is provided by W.W.S.S. equipment and secondary time by a Labtronic crystal chronometer with the accuracy of ± 5ms per day compared with VNG (Australia) with the aid of a chronoscope.

At TBL and AGE, the time signal is derived from a spring driven chronometer (Mercer) and marked each minute on records. Time accuracy is determined by comparison with signals from WWVH daily. Linear correction is applied to the daily drift.

On all seismogram records time increases from left to right and time break is upward.

At RAB* and Harbour Network the recording drum of each seismograph is driven by a 110VAC 60Hz synchronous motor. The 110VAC is frequency regulated by a crystal chronometer.

* The Omori recording drum is driven by a nonregulated 50Hz frequency supply.

At ESA and KRT power for recorder motors is frequency regulated by a crystal chronometer at 50Hz.. Power for AGE and TBL and field Stations is supplied by a 50Hz free running oscillator.

Direction of Motion

Upward direction of ground motion corresponds to upward trace motion on vertical seismogram records. Direction of component of ground motion to North or East corresponds to upward trace motion on horizontal seismogram records.

Vertical trace motion from impulsive onset of longitudinal waves of compressional or dilatational ground movement is indicated by "u" or "d" accompanied by N, S, E or W, as per trace motion amplitude on horizontal seismogram records, to represent vectorially the direction of ground motion. "+" or "-" indicates upward or downward motion of the ground respectively, from a wave not known to be of the longitudinal type.

Accuracy of Readings

When readings are given with a decimal figure, they are to 1/10 of a second, other readings have been made to the nearest half second.

Crustal Phases

Px, Sx Crustal phases, other than Pn and Sn for local and near earthquakes.

Felt Intensity

Information on maximum intensities of shocks reported felt is included. Intensities are given in Roman numerals based on the Modified Mercalli Scale, of 1931.

PRESENTATION OF DATA (CONT'D)

Determinations of Epicentres

Where no source is cited, the determination of epicentres, origin time, focal depth and distance in central angle degrees from the pertinent station for local and regional earthquakes, are carried out at the Central Observatory, Rabaul.

Geographical Designation of Epicentres

The regional names which follow the co-ordinates of epicentres located at the Central Observatory are meant only to supplement the co-ordinates and normally follow well-known geographical rather than geological features. Use is made of the full degree blocks according to the method defined by E.A. Flinn and E.R. Engadhl in "A PROPOSED BASIS FOR GEOGRAPHICAL AND SEISMIC REGIONALIZATION", Seismic Data Laboratory Report No. 101, U.I.D. Inc., Alexandria, Virginia, 1964, adopted by the U.S.C.G.S. for computer requirements.

Magnitude Definition and Determination

M_L -Local Magnitude (Richter, 1935) is calculated from the recorded trace amplitude of the Wood-Anderson torsion seismographs of stated physical constants (installed at the Observatory in November, 1967)

Maximum trace amplitude (0 to peak) expressed in millimetres and tenths is measured directly on both components. Magnitude is determined independently and the arithmetic mean taken. M_L values are given to the tenth of a unit.

The station correction factor is assumed to be zero until better known.

M_S -Surface Wave Magnitude (Gutemberg & Richter, 1956) is calculated from the amplitude of surface waves of period near 20 seconds for shallow distant earthquakes.

M_B -Body Wave Magnitude is calculated from the ratio of amplitude over period for body waves on S.P.-Z of World-Wide Seismograph System only when depth is known. The magnification factor for the standard seismograph is taken into account.

m -Unified magnitude (Gutemberg & Richter, 1956) has the following relation to M_L, M_S, and M_B.

$$m = 1.7 + 0.8\ M_L - 0.01\ M^2_L$$

$$m = M_B \text{ (without correction)}$$

$$m = 2.5 + 0.63\ M_S$$

Local Magnitude of earthquakes recorded at RAB with a clear S-P interval is tabulated on a Day-Distance (in Central Angle Degrees) graph which is added to the PEA monthly.

Symbols

i -impulsive and sharply defined beginning of a phase.

e -emergent and poorly defined emergence of phase.

T -Period in seconds

A -Peak-to-Trough trace amplitude in millimetres.

GM -Ground Motion.

Dist -Distance in central angle degrees.
H -Origin Time
h -Focal depth in Kilometres
CBM -Confused by microseisms.

PRESENTATION OF DATA (CONT'D)

Remarks

Local - Typical signature of an earthquake with epicentre within 0.9°

Near - Typical signature of an earthquake with epicentre between 0.9° and 9°

Distant - Typical signature of an earthquake with epicentre between 9° and 45°

Teleseism - Typical signature of an earthquake with epicentre more than 45°

Traces - Any recorded disperse waves or very weak unknown earthquake phases.

Local and Near earthquakes will be classified Regional, and Distant earthquakes will be grouped with Teleseisms if sheer waves and their reflections are unidentifiable.

G.W. D'ADDARIO
Vulcanologist-in-Charge

			T sec	A mm	GM	Dist	H	Remarks
27th Dec.,1967								
KRT	iPZ iSE	002203 30½	0.2	2.0	d	2¼°	002127	
RAB	iPZ	011713.4	0.4	2.1	d			Local
KRT	iPZ iE iSE	011643 1710 20½	0.2	2.2	d	3°	101554	
RAB	iPZ iSE	011856.7 1924.0	0.5	2.7	u	2¼°	011821	M_L=4.7
KRT	iPZ iSE	011902 29	0.2	4.0	d	2¼°	011826	
RAB	iPZ	014441.6	0.4	5.2	u			Regional
KRT	iPZ	014441½	0.4	2.3	u			Regional
RAB	iPZ iSN/	021200.5 26.0	0.5	9.0	d	2¼°	021126	M_L=5.4
WAN	iPZ	021200.4	0.5	3.0	u			
KRT	iPZ iE iSE	021202 10 28			d	2¼°	021128	
RAB	iPZ iZ iSNa	030634.8 41.0 0702.4	0.4	4.0	u	2¼°	030559	M_L=5.1
KRT'	iPZ iSE	030633 57			u	2¼°	030601	
RAB	iPZ iSE	041359.9 1429.0	0.4	7.2	u	2½°	041321	M_L=5.2
KRT	iPZ iSE iE	041400 31 42½	0.2	2.5	d	2½°	041320	
RAB	iPZ i(S)N/	042851.5 2916.0			dESE	2¾°	042808	M_L=5.8
WAN	iPZ	042851.5	0.4	1.5	d			
SUL	ePZ	042852	0.6	1.5	d			
RAL	iPZ	042851.4			d			
KRT	iPZ	042853			d			
RAB	iPZ iSE	052219.0 29.0	0.5	4.0		¾°	052205	M_L=3.6
KRT	iPZ iSE	052158½ 2223			u	2°	052126	
RAB	iPZ iSNa	061907.8 37.0	0.4	6.1	d	2½°	061830	M_L=5.3
KRT	iPZ iZ iSE	061907 13½ 34	0.3	1.2	u	2¼°	061829	
RAB	iPZ iSE	064328.2 51.5	0.4	2.8	d	2°	064258	M_L=4.8
KRT	iPZ iSE	064325 44	0.2	6.0	u	1½°	064300	

			T sec	A mm	GM	Dist	H	Remarks
27th Dec., (cont'd)								
RAB	ePZ	074019	0.5	3.6	u			Regional
KRT	iPZ	074014½	0.2	1.2	d	2¼°	073929	
	iSE	38						
	iE	41½						
RAB	iPZ	091902.9	0.3	33.9	d	¾°	091848	M_L=4.0
	iSNa	14.0						
WAN	iPZ	091902.6	0.3	4.6	d			
RAL	iPZ	091903.0	0.3	8.0	d			
KRT	iP!Z	091906			d	1°	091846	
	iS!E	21						
RAB	iPZ	093657.0	1.5	9.0	d	18°		M_L=6.5
	i(S)N/	4028.0						
KRT	iPZ	093658	0.5	4.7	u	18°		
	e(S)E	4028½						
RAB	iPZ	095006.5	0.4	4.2	d	1½°	094940	M_L=4.7
	iSE	27.0						
KRT	iPZ	095007	0.3	1.2	d	2°	094935	
	iE	25						
	iSE	31						
RAB	iPZ	103041.2	0.6	2.5	u			Distant
KRT	iPZ	103013	0.5	3.0	u	16°		
	e(S)E	3316½						
	iPZ	105022	0.3	21.0	u			
RAB	iPZ	111246.0	0.5	4.2	u	2¼°	111210	M_L=4.9
	iSE	1313.2						
WAN	ePZ	111246	0.3	1.0	u			
KRT	iPZ	111247	0.2	2.0	d	2¼°	111213	
	iSE	1313						
	iE	18½						
RAB	iPZ	115100.5	0.4	2.0	u	2½°	115022	M_L=4.5
	iSE	30.5						
KRT	iPZ	115101	0.3	1.0	u	2¾°	115019	
	iSE	33						
RAB	ePZ	121151	0.7	4.2	d	2½°	121111	M_L=5.0
	iZ	51.8						
	iSE	1219.4						
WAN	iPZ	121151.5	0.4	1.5	u			
RAL	iPZ	121151.0			u			
KRT	iPZ	121152	0.2	3.0	u	2¾°	121110	
	iZ	58						
	iE	1217						
	i(S)E	24½						
RAB	iPZ	131950.0	0.7	5.2	d	2¼°	131913	M_L=5.6
	iZ	52.2						
	iSN/	2018						
WAN	iPZ	131950.2	0.5	2.0	u			
RAL	iPZ	131950.0	0.5	1.0	u			
KRT	iPZ	131951	0.2	9.0	d	(1½°)	1319(26)	
	i(S)E	2010						

			T sec	A mm	GM	Dist	H	Remarks
27th Dec., (cont'd)								
RAB	iPZ iSE	140136.9 0208.5	0.4	4.2	d	2¾°	140056	M_L=5.1
KRT	iPZ iZ iSE iE	140135 41 0204 11½	0.2	1.5	d	2½°	140057	
RAB	iPZ iPPZ/ iLqN/ iSN/ eLiZ/	144143.0 56 .0 4349 .0 58 .0 4442	1.2	2.1	u	15½°		M_L=6.4
KRT	iPZ	144142½	0.5	3.2	u	15½°		
RAB	iPZ iSN/	144745.8 4809.0			d	2°	144716	M_L=5.6 Overlapping traces
WAN	iPZ	144745.5	0.4	1.0	d			
RAL	iPZ	144745.0			d			
KRT	iPZ	144746½	0.2	3.1	d			Regional
RAB	iPZ iSNa	161344.0 1401.5			d	1¼°	161321	M_L=4.8
WAN	iPZ	161344.0	0.3	8.0	d			
SUL	iPZ	161344.0	0.2	3.5	d			
RAL	iPZ	161343.8	0.5	9.0	d			
KRT	iP!Z	161343			d			Near
RAB	iPZ/ ePPZ/ iSN/ iScPZ/ iSSN/	162954.0 3100 3537.0 3601.0 3804.0				38°		M_L=7.8
KRT	iPZ e(S)E	162955½ 3537½	1.0	7.0	d	38°		
RAB	iPZ iSE	173210.0 42.2	0.3	2.5	u	2¾°	173128	M_L=5.0
KRT	iPZ iZ iSE	173208½ 14½ 37½	0.5	0.7	d	2½°	173130	
RAB	e(P)Z iSE	182140 2213.2	0.4	1.1	u	2¾°	182057	M_L=4.6
KRT	i(P)Z iSE	182140½ 2217				(3°)	1820(51)	CBM
RAB	e(P)Z	213408			u			Near shock
KRT	ePZ iSE iE	213406½ 37½ 47	0.6	0.7	d	2½°	213325	
RAB	ePZ iSE	214959 5033.0	0.5	1.8	u	2¾°	214914	M_L=4.6
KRT	ePZ iZ iE iSE	214959½ 5004 28 35½			u	3°	214912	

			T sec	A mm	GM	Dist	H	Remarks
27th Dec.,(cont'd)								
RAB	ePZ iSE	222928 3000.5	0.5	1.1	d	2¾°	222846	M_L=5.0
KRT	iPZ i(S)E	222926½ 55½	0.2	2.1	u	(2½°)	2228(48)	
RAB	iPZ iSE	223849.2 3916.2	0.7	3.8	d	2¼°	223813	M_L=4.8
KRT	iPZ i(S)E	223850½ 3920	0.4	3.5	u	(2½°)	2238(11)	
RAB	ePZ iE eSE	233222.2 46.1 47.2	0.4	2.7	d	2°	233149	M_L=4.5
KRT	ePZ iSE	233220½ 43				2°	233150	CBM
RAB	iPZ iSE	234513.6 32.8	0.6	2.9	u	1½°	234449	M_L=3.6
RAB	eiPZ iSE	235656½ 5726.8	0.6	2.2	u	2½°	235617	M_L=5.3
28th Dec., 1968								
RAB	iPZ iE iSE	002037.0 50.5 55.1	0.6	3.2	u	1½°	002013	M_L=4.3
KRT	iPE iE iS	002039 52 54			d	1¼°	002019	
RAB	ePZ iSE	003859 3926.3				2¼°	003813	M_L=5.0
KRT	iPZ iE i(S)E	003900 23½ 30½			d	(2½°)	0038(20)	
RAB	iPZ iSN	044140.9 4202.9	0.6	3.5	u	2°	044122	M_L=4.9
KRT	iPZ	044141½	0.5	1.2	d			Local
RAB	iPZ iSN	052633.9 2702.2	0.5	3.9	u	2½°	052557	M_L=5.0
KRT	iPZ i(S)E	052634½ 2707	0.2	1.3	u	(2¾°)	0525(52)	
RAB	ePZ eSN	054635.1 4706.2	0.4	3.1	d	2½°	054554	M_L=5.1
KRT	iPZ iZ iSE	054636 36½ 4707	0.3	3.2	d	2½°	054555	
RAB	iPZ iSN	074232.1 4306.0	0.5	2.0	d	3°	074147	M_L=4.7
KRT	iPE iE iSE	074233½ 57½ 4305½				2¾°	074246	
RAB	eiPZ iSE	105410¼ 38.8	0.5	1.9	u	2½°	105332	M_L=5.0
KRT	ePZ iZ i(S)E	105411½ 15½ 43½	0.6	0.3	d	(2¾°)	1053(29)	

			T sec	A mm	GM	Dist	H	Remarks
28th Dec., (cont'd)								
RAB	eiPZ	115612.7	0.6	2.0	u	2½°	115533	M_L=5.0
	iSE	43.3						
KRT	ePZ	115613½	0.5	0.4	u	(3°)	1155(28)	
	iZ	17						
	iZ	22½						
	iE	51						
	i(S)E	47½						
RAB	iPZ	122252.2				2°	122219	M_L=5.3
	iSE/	2317.6						
KRT	iP!Z	122250½			d	1¾°	122222	
	iS!E	2311½						
RAB	iPZ	132954.7	0.7	6.1	d	2½°	132918	M_L=5.2
	iSE	3023.1						
WAN	iPZ	132955.0	0.5	3.8	u			
RAL	iPZ	132954.0	0.5	1.5	d			
KRT	iPZ	132956	0.3	3.3	d	(2½°)	1329(15)	
	iZ	3001						
	i(S)E	27½						
RAB	iPZ	154612.7	0.4	6.0	u	2½°	154546	M_L=5.4
	iSN	41.0						
WAN	iPZ	154612.5	0.3	2.5	u			
KRT	iPZ	154613½	0.3	2.0	d	2¼°	154537	
	iZ	14½						
	iSE	40½						
RAB	ePZ	160409	0.7	3.1	u	2¾°	160326	M_L=4.6
	iSE	43.0						
KRT	i(P)Z	160411½	0.2	2.5	u	(3°)	1603(25)	
	iZ	37½						
	i(S)E	46						
RAB	iPZ	175153.4	0.4	31.0	u	½°	175142	M_L=4.3
	iSE	5201.6						
WAN	iPZ	175153.3	0.3	8.0	u			
SUL	iPZ	175153.0	0.3	3.5	d			
RAL	iPZ	175153.0	0.2	7.5	u			
KRT	iPZ	175155½	0.2	22.8	u	(1°)	1751(39)	
	i(S)!E	5207½						
RAB	iPZ	184409.2	0.5	4.0	u	2¼°	184333	M_L=4.8
	iZ	38.4						
	iSN	39.8						
WAN	iPZ	184409.1	0.4	1.0	u			
RAL	ePZ	184409	0.2	1.0	u			
KRT	eiPZ	184410½	0.5	0.4	u	(3°)	1843(25)	
	iZ	11½						
	iE	35½						
	iSE	44						
RAB	iPZ	184539.0	0.4	47.9	u			In coda of previous shock
WAN	iPZ	184539.0	0.3	17.0	u			
RAL	iPZ	184538.2	0.3	31.0	u			
KRT	i(P)Z	184542½			d			In coda of previous shock

			T sec	A mm	GM	Dist	H	Remarks
28th Dec., (cont'd)								
RAB	iPZ iSE	225224.1 46.5	0.6	10.8	d	1¾°	225155	
WAN	ePZ	225224	0.2	2.0	u			
RAL	iPZ	225223.3	0.5	8.0	u			
KRT	iPZ	225225½	0.3	8.3	u			Near
29th Dec., 1968								
RAB	eZ/	003808			+			Traces
RAB	iPZ iSN	023214.8 37.0	0.4	1.5	d	1¾°	023146	M_L=4.3
KRT	iPZ iSE	023215½ 39½			d	2°	023143	
RAB	iPZ iZ iSN	030029.5 33.0 54.0	0.5	11.0	d	2°	025956	M_L=5.2
WAN	iPZ	030029.5	0.3	5.0	u			
RAL	iPZ	030029.0	0.3	2.5	d			
KRT	iPZ	030030½			d			CBM
RAB	ePZ eSN	034827 49	0.5	2.0	u	1¾°	034758	M_L=4.3
KRT	i(P)Z i(S)E	034823½ 52½				(2½°)	0347(45)	
RAB	iPZ iZ eSE/	041042.6 45.0 1112	0.5	10.0	u	2½°	041004	M_L=5.1
WAN	iPZ	041042.2	0.4	3.0	u			
KRT	iPZ iZ i(S)E	041042½ 48½ 1116½	0.4	2.7	d	(3°)	0409(58)	
RAB	iPZ eSN/	051059.3 1124	0.5	2.0	d	2°	051026	M_L=5.7
WAN	ePZ	051059½	0.2	1.8	u			
RAL	iPZ	051059.0	0.3	3.0	d			
KRT	i(P)Z	051049½	0.2	3.2	d			Local
RAB	iPZ iSN	061216.0 47.5	0.5	3.0	u	2½°	061134	M_L=4.6
KRT	iPZ iZ iZ iSE	061217 19½ 44½ 48½			u	2½°	061135	
RAB	iPZ iSE	061614.0 42.5	0.5	2.0	u	2¼°	061536	M_L=4.5
KRT	i(P)Z iZ iSE	061617 34½ 42½	0.2	1.2	u	(2°)	0616(43)	
RAB	iPZ iSN	083101.2 26.0	0.5	2.5	u	2°	083028	M_L=4.2

			T sec	A mm	GM	Dist	H	Remarks
29th Dec., (cont'd)								
KRT	iPZ i(S)E	083103 28½			u	(2°)	0830(29)	CBM
RAB	iPZ iSN	115121.5 45.0	0.4	2.0	u	2°	115050	M_L=3.9
KRT	iPZ i(S)E	115121½ 47½			u	(2°)	1150(47)	
RAB	iPZ iSE	115816.3 45.9	0.5	1.8	d	2½°	115738	M_L=4.0
KRT	iPZ iSE	115817½ 46½			u	2½°	115739	CBM
RAB	iPZ iSE	131421.5 51.0	0.4	1.0	u	2½°	131342	M_L=4.2
KRT	iPZ iSE	131423 51½			u	2¼°	131445	CBM
RAB	ePZ iSN	134954 5014.5	0.4	1.0	d	1½°	134928	M_L=3.5
KRT	ePZ iSE	134955 5016	0.3	0.4	u	1¾°	134927	
RAB	iPZ	140954.0	0.5	1.0	d			Regional
RAB	iPZ iSE	152345.2 2410.5	0.4	1.0	u	2°	152312	M_L=3.9
KRT	ePZ iSE	152345½ 2413	0.4	0.4	d	2¼°	152307	
RAB	iPZ iSN	160217.5 39.0	0.4	2.0	u	1¾°	160148	M_L=3.8
KRT	iPZ iSE	160216½ 39	0.2	2.0	u	2°		
RAB	ePZ eSE/	203637 4236	0.5	1.0	u	40°		
KRT	ePZ	203637	0.8	0.4	u			Distant
30th Dec., 1967								
RAB	ePZ iZ	001250 51.0	0.5	1.0	d			Regional
KRT	ePZ	001249½	1.0	0.8	d			
RAB	iPZ iSN	005145.0 5217.2	0.4	3.5	d	2½°	005103	M_L=4.7
KRT	eiPZ iZ iZ iSE	005145½ 47 10 5213½			d			
RAB	iPZ eSE/	005524.5 5612	0.5	7.0	u	4°	005421	M_L=5.8
WAN	iPZ	005524.0	0.2	2.5	u			
RAL	iPZ	005524.0						
KRT	iPZ	005521	0.3	7.0	u			Near

			T sec	A mm	GM	Dist	H	Remarks
30th Dec., (cont'd)								
RAB	iPZ	014430.0	0.3	2.0	u	2°	014358	M_L=4.5
	iSN	54.0						
KRT	i(P)Z	014437	0.6	2.4	d	(1°)	0144(13)	
	iS	55.0						
RAB	eZ/	035950			-			Traces
RAB	iPZ	050725.0	0.5	8.0	d	5°	050608	M_L=6.1
	iZ	36.8						
	iZ	49.0						
	eSN/	0824						
WAN	iPZ	050725.0	0.3	2.2	d			
RAL	iPZ	050725.0	0.5	3.5	d			
KRT	iPZ	050725	0.2	5.5	u			Near
RAB	iPZ	065641.3	0.4	2.5	d	2¼°	065606	M_L=4.1
	iSN	5708.0						
RAB	iPZ	101840.0	0.5	2.0	u	2½°	101759	M_L=4.3
	iSE	1911.0						
KRT	iPZ	101841½			-			Near
RAB	iPZ	103903.5	0.5	13.0	d	1½°	103841	M_L=4.4
	iZ	14.0						
	iSN	24.0						
WAN	iPZ	103903.2	0.3	3.0	d			
SUL	ePZ	103903½	0.3	1.8	d			
RAL	iPZ	103903.0	0.4	2.0	d			
KRT	iP!Z	103903½			d	1¼°	103838	
	iS!E	22½						
RAB	iPZ	104528.5	0.4	1.5	u	1¼°	104606	M_L=3.8
	iSN	45.0						
KRT	i(P)Z	104529½	0.3		d	(1½°)	1046(03)	
	iZ	39½						
	iSE	49½						
RAB	iPZ	114329.0	0.4	1.0	d	1¾°	114300	M_L=3.8
	iSN	51.0						
KRT	iPZ	114329½			d	1½°	114301	
	iSE	51						
RAB	ePZ	114549	0.4	1.0	d	2¾°	114505	M_L=4.1
	iSN	4622.5						
KRT	ePZ	114551			d			Near
RAB	iPZ	124929.0	0.5	1.5	u	3½°	124834	M_L=4.9
	eSN	5011						
KRT	ePZ	124928½	0.4	0.3	d			Near
	iZ	36½						
RAB	iPZ	171742.5	0.4	5.0	u	2½°	171704	M_L=4.9
	iZ	45.0						
	iSN	1812.0						
WAN	iPZ	171742.2	0.3	1.0	u			
RAL	iPZ	171743.0	0.2	1.5	d			
KRT	iPZ	171743½	0.4	1.0	d	2¼°	171708	
	iSE	1810½						

			T sec	A mm	GM	Dist	H	Remarks
30th Dec., (cont'd)								
RAB	iPZ	180731.5	0.4	2.7	u	1½°	180703	M_L=4.8
	iSN	53.0						
KRT	eiPZ	180731½			d	2°	180700	
	iZ	32½						
	iSE	35½						
WAN	ePZ	180731½	0.2	1.5	u			
RAL	iPZ	180731.0	0.3	8.5	u			
RAB	iPZ	183722.0	0.5	3.0	u	2½°	183643	M_L=4.7
	iSE	52.0						
KRT	iPZ	183723½	0.3	1.4	u	2¾°	180700	
WAN	ePZ	180731½	0.2	1.5	u			
RAL	iPZ	180731.0	0.3	8.5	u			
RAB	iPZ	183722.0	0.5	3.0	u	2½°	183643	M_L=4.7
	iSE	52.0						
KRT	iPZ	183723½	0.3	1.4	u	2¾°	183640	
	iSE	56½						
RAB	iPZ	211434.5	0.4	2.0	d	4°	211335	M_L=5.5
	eSE/	1520						
KRT	i(P)Z	211426			d			Near
	iZ	35½						
RAB	iPZ	212348.0	0.4	2.0	u	2¼°	212314	M_L=4.1
	iSN	2414.3						
KRT	ePZ	212349½			u			Near
31st Dec., 1967								
RAB	iPZ	001826.0	0.5	2.0	u	2½°	001747	M_L=4.2
	iZ	28.5						
	iSE	55.5						
KRT	ePZ	001826½			u	(3°)	0017(41)	
	iZ	51						
	i(S)E	1900						
RAB	ePZ	014853½	0.5	1.5	u	2¼°	014817	M_L=4.4
	iSN	4920.0						
KRT	ePZ	014853			u	2½°	014815	
	iSE	4922						
RAB	iPZ	023005.0	0.4	2.8	d	1½°	022937	M_L+3.8
	iS!N	26.5						
KRT	i(P)Z	023001½				(1½°)	0229(35)	C.B.M.
	iSE	21½						
RAB	iPZ	023700.2	0.5	2.0	d	¾°	023545	M_L=3.8
	iZ	02.0						
	iSE	11.0						
KRT	iPZ	023700	0.3	2.2	d	1°	023744	
	iSE	12½						
RAB	iPZ	045620.0	0.4	5.0	u	2¼°	045543	M_L=5.1
	i!Z	21.0						
	iSE/	48.0						
WAN	ePZ	045620			u			
SUL	ePZ	045621	0.4	3.8	d			
RAL	iPZ	045621.0	0.5	10.0	d			

			T sec	A mm	GM	Dist	H	Remarks
31st Dec., (cont'd)								
KRT	iP!Z	045618			u			
RAB	iPZ	061752.0	0.4	4.0	d	1½°	061727	M_L=4.8
	iZ	54.0						
	iSE	1811.0						
WAN	ePZ	061751½			(d)			
KRT	iPZ	061749½	0.2	6.0	d			
RAB	iPZ	082609.5	0.4	3.0	u	2¼°	082532	M_L=4.9
	iSN	37.5						
KRT	iPZ	082610	0.3	1.4	u	2½°	082530	
	iSE	40						
RAB	iPZ	140011.8	0.3	1.5	d	5½°	135848	M_L=5.8
	iSE/	0117.0						
KRT	iPZ	140012	0.3	1.2	u			
RAB	ePZ	141433	0.5	1.0	u	5¼°	141315	M_L=5.4
	iSN	1533.0						
KRT	iPZ	141432½	0.3	1.5	u	5¼°	141316	
	iSE	1531						
RAB	iPZ	150634.5	0.5	4.0	u	6°	150507	M_L=6.7
	iZ	44.0						
	iZ	50.2						
	iSE	0742.0						
WAN	iPZ	150634.6	0.6	3.5	d			
SUL	iPZ	150635.6	0.3	1.5	u			
RAL	ePZ	150635	0.5	1.0	u			
KRT	iPZ	150634½	0.6	6.0	u			
	iZ	40½						
RAB	ePZ	153200½	0.5	2.0	d	6¼°	153028	M_L=6.1
	iZ	12.3						
	iSE	3311.5						
KRT	iPZ	153157½	0.5	2.0	d	6¼°	153024	
	iSE	3309½						
RAB	iPZ	155457.5	0.6	2.0	d	6°	155329	M_L=5.7
	e(S)E	5605						
KRT	iPZ	155458	0.6	1.5	d	6½°	155323	
	iSE	5011						
RAB	iPZ	175644.0	0.5	6.0	d	1°	175625	M_L=4.8
	iZ	48.0						
	iZ	51.0						
	iSE	58.5						
KRT	iPZ	175643½	0.5	3.0	d	1¼°	175622	
	iZ	47½						
	iZ	50½						
	iSE	59½						
RAB	i(P)Z	193003.0	0.4	1.3	u			Regional
	iZ	07.0						
KRT	ePZ	193049½			d	1½°	193023	
	eZ	3133						
	i(S)E	3209½						
RAB	iPZ	195358.2	0.5	1.8	u	2¼°	195322	M_L=5.1
	iSN	5425.5						

			T sec	A mm	GM	Dist	H	Remarks
31st Dec., (cont'd)								
KRT	iPZ	195359	0.2	2.0	u	2¼°	195323	
	iZ	5415						
	iSE	26½						
RAB	iPZ	200424.5	0.6	2.0	d	6½°	200248	M_L=5.5
	iSN	0538.0						
WAN	ePZ	200424	0.5	1.5	d			
KRT	ePZ	200423½	0.6	1.0	d	(6¼°)	2002(50)	
	iZ	29½						
	i(S)E	0535½						
RAB	iPZ	205324.5	0.5	3.0	d	1½°	205258	M_L=4.8
	iZ	25.2						
	iSN	44.0						
SUL	iPZ	205325.0	0.4	8.0	u			
RAL	iPZ	205324.4	0.5	9.0	d			
KRT	iPZ	205323½			d	(6½°)	205246	
	i(S)E	39½						
RAB	ePZ	220832	0.5	2.0	d	6°	220704	M_L=5.7
	eSN/	0940						
KRT	iPZ	220832	0.3	2.0	d	6°	220704	
	iSE	0940½						
1st Jan., 1968								
RAB	iPZ	032133.6	0.5	9.0	d	2°	032100	M_L=4.2
	iSN	58.5						
WAN	iPZ	032133.4	0.4	2.0	d			
RAL	iPZ	032133.5	0.5	2.0	d			
KRT	iPZ	032133½	0.2	1.0	d			
	iZ	38½						
	iZ	53½						
RAB	iPZ	102436.0	0.5	1.8	u	2½°	102354	M_L=4.6
	iSN	2508.0						
KRT	iPZ	102435½	0.3	1.5	u	2¾°	102350	-
	iSE	2509½						
RAB	iPZ	103454.0	0.3	4.0	u	½°	103442	M_L=3.5
	iSN	3503.4						
WAN	iPZ	103553.8			u			
RAL	iPZ	103553.5	0.3	3.0	u			
KRT	iPZ	103456½1	0.2	4.0	u	1°	103440	
	iSE	3508½						
RAB	iPZ	144648.5	0.3	2.0	u	2°	144616	M_L=3.9
	iSN	4712.5						
KRT	iPZ	144650				2°	144618	
	iSE	4714½						
RAB	iPZ	145042.6	0.3	2.0	u	2¼°	145008	M_L=4.0
	iSE	5108.6						
KRT	iPZ	145043½	0.3	1.5	d	2°	145013	
	iSE	5107						
RAB	ePZ	152258½	0.3	1.2	u	2¼°	152222	M_L=4.1
	iSN	2326.5						

			T sec	A mm	GM	Dist	H	Remarks
1st Jan., (cont'd)								
KRT	iPZ	152258				2¼°	152221	
	iSE	2326½						
RAB	iPZ	162316.0	0.4	1.5	d	2½°	162237	M_L=4.7
	iZ	43.0						
	iSE	49.0						
RAL	ePZ	162316½			d			
KRT	iPZ	162316½	0.5	1.2	d	3°	162230	
	iZ	20						
	iE	32½						
	iSE	5 53						
RAB	iPZ	190741.5	0.4	4.0	u	¾°	190726	M_L=3.3
	iSN	52.5						
KRT	iPZ	190744½				1°	190728	
	iSE	56½						
RAB	ePZ	213148	0.5	1.5	u	7½°	212958	M_L=6.0
	e(S)E	3313						
KRT	e(P)Z	213152½	0.5	1.5	d	(6¾°)	2130(13)	
	iSE	3309½						
2nd Jan., 1968								
RAB	iP!Z	002138			uNW	(1½°)	0021(18)	M_L=5.6
	e(S)No	59						
WAN	iPZ	002137.5			u			
SUL	iPZ	002137.5	0.3	3.5	u			
RAL	iPZ	002137.0			u			
KRT	iP!Z	002138			u			
RAB	iPZ	021314.8	0.5	4.0	u	2¼°	021238	M_L=5.0
	iSN	42.8						
WAN	iPZ	021314.3	0.5	1.0	u			
RAL	iPZ	021314.8	0.5	1.5	d			
RAB	iPZ	022503.5	0.5	3.5	u	2¼°	022431	M_L=5.2
	iSN	31.0						
WAN	ePZ	022503	0.3	1.0	u			
RAL	ePZ	022502½			u			
KRT	iPZ	022503½			u	2¼°	022427	CBM
	iSN	31						
RAB	iPZ	044406.5	0.5	2.0	d	6½°	044239	M_L=5.5
	e(S)N	4522						
KRT	iPZ	044406	0.4	2.5	d	6½°	044228	
	iSN	4522½						
RAB	iPZ	052848.0	0.5	6.0	d	1½°	082826	M_L=4.6
	iSN	2908.5						
WAN	iPZ	052847.8	0.3	1.0	d			
SUL	iPZ	052848.0	0.3	12.0	u			
RAL	iPZ	052847.5	0.5	16.0	d			
KRT	iP!Z	052846			d	1½°	052822	
	iS!N	2904						

			T sec	A mm	GM	Dist	H	Remarks
2nd Jan., (cont'd)								
RAB	ePZ	065137½	0.4	1.8	d			Regional
KRT	iPZ	065140			d	2¾°	065055	CBM
	iSN	5214						
RAB	iPZ	074807.0	0.5	1.8	d	(6½°)	0746(32)	M_L=5.7
	i(S)N	4820.0						
KRT	iPZ	074806	0.5	2.2	u	6¾°	074625	
	iSN	4924						
RAB	iPZ	080735.6	0.5	3.0	d	1¾°	080704	M_L 4.6
	iSN	58.0						
KRT	iPZ	080735½	0.2	3.0	d	1¾°	080704	
	iS!N	59						
RAB	eZ/	114642			-			Traces
RAB	IPZ	121934.3	0.5	8.0	d	1¼°	121909	ML=4.5
	iZ	37.0						
	iZ	42.0						
	iSN	53.3						
WAN	iPZ	121934.2	0.4	6.0	d			
SUL	iPZ	121934.5	0.3	2.0	u			
RAL	iPZ	121934.5	0.4	3.0	u			
KRT	iP!Z	121932			d	1¼°	121909	
	iSN	49						
RAB	iPZ	122837.8	0.4	1.0	d	3°	122753	M_L=4.3
	iSN	2912.0						
KRT	ePZ	122836	0.5	0.4	d	2¾°	122750	
	iZ	42						
	iSN	2911						
RAB	iPZ	130911.5	0.5	2.0	d	2½°	130829	M_L=5.0
	iSN	43.5						
KRT	eiPZ	130911½			d	2¾°	130828	
	iZ	12½						
	iZ	18						
	iSN	45						
RAB	iPZ	131722.0	0.3	3.5	u	2½°	131643	ML=4.7
	iZ	24.5						
	iSE	52.0						
WAN	ePZ	131722	0.5	1.0	u			
RAL	ePZ	131721½	0.3	1.0	u			
KRT	ePZ	131722			u	2½°	131645	
	iZ	23½						
	iSN	53½						
	iN	58						
RAB	iPZ	135111.5	0.5	1.5	u	2¼°	135038	M_L 4.3
	iZ	13.5						
	iSE	39.0						
KRT	iPZ	135112½				2¼°	135037	
	iZ	15½						
	iSE	39						
RAB	iPZ	183720.6	0.4	11.0	u	2°	183649	M_L=4.1
	iSN	45.0						
KRT	iPZ	183717	0.2	1.0	d	2¼°	183644	
	iN	39½						
	iSN	42						

			T sec	A mm	GM	Dist	H	Remarks
7th Dec., 1967								
TBL	iPZ	230103	0.5	2.8				Regional
	iZ	04						
8th Dec., 1967								
TBL	ePZ	030355	-	-	-			Teleseism
TBL	ePZ	033035	0.2	1.1	d			Regional
TBL	ePZ	080438	0.4	1.0	-			Near
TBL	iPZ	090536	0.4	1.2	u			Near
TBL	ePZ	213954½	0.5	2.3	u			Near
9th Dec., 1967								
TBL	ePZ	033310½	0.1	1.0	-			Near
TBL	ePZ	105521	1.3	2.2	u			Distant
TBL	iPZ	132520	0.4	2.9	u			Near
TBL	iPZ	133931	0.4	8.7	d			Regional
10th Dec., 1967								
TBL	iPZ	173625	0.6	2.4	u			Near
11th Dec., 1967		NIL RECORDED						
12th Dec., 1967								
TBL	iPZ	113902.9	0.4	3.9	u			Near
13th Dec., 1967		NIL RECORDED						
14th Dec., 1967								
TBL	iPZ	183559	0.4	9.8	u			Regional
	iZ	3606½						
15th Dec., 1967		NIL RECORDED						
16th Dec., 1967								
TBL	iPZ	094419	0.5	3.0	u			Near
17th Dec., 1967		NIL RECORDED						
18th Dec., 1967		NIL RECORDED						
19th Dec., 1967								
TBL	iPZ	195343	0.5	2.0	d			Near
	iZ	5402						
20th Dec., 1967								
TBL	iPZ	023130	0.5	2.1	d			Near
TBL	iPZ	061116½	0.4	22.1	d			Regional
21st Dec., 1967		NIL RECORDED						
22nd Dec., 1967		NIL RECORDED						
23rd Dec., 1967								
TBL	iPZ	102923	0.4	11.5	u			Near
	iZ	47½						
TBL	ePZ	132558½	0.7	1.1	d			Regional
24th Dec.,1967								
TBL	ePZ	012539½	0.5	3.0	u			Near
25th Dec., 1967		NIL RECORDED						

			T sec	A mm	GM	Dist	H	Remarks
26th Dec., 1967								
TBL	iPZ	180816½	0.5	4.1	u			Near
	iZ	3.2						
27th Dec., 1967								
TBL	iPZ	014406	-	-	d			Regional
TBL	iPZ	144000½	0.5	3.0	u			Distant
28th Dec., 1967								
TBL	iPZ	161447	0.6	1.8	u			Near
29th Dec., 1967								
TBL	iPZ	094743	0.4	23.9	d			Near

CAPE GLOUCESTER FIELD STATION

04°27"20'S.,148°26"00'E; 24 metres above sea level
Vertical Willmore Seismometer Portable; Magnification 3000
Underdamped Z To 0.6 Tg 0.25; Trace Speed mm/min 60
Time increases from right to left.
Hour mark indicated by a 3 sec break occuring 30 secs. after the hour.

1st Dec., 1967								
	iPZw	181142½	0.5	0.8	d			Regional
	iZw	45½						
	i!Zw	54½						

Central Observatory,
Rabaul

G.W. D'ADDARIO
Vulcanologist-in-Charge

PEA No3

12 FEB 1968

TERRITORY OF PAPUA AND NEW GUINEA
GEOLOGICAL AND BULCANOLOGICAL BRANCH
VULCANOLOGICAL SECTION

PRELIMINARY EARTHQUAKE ANALYSIS
RABAUL CENTRAL OBSERVATORY
1968

Rabaul	RAB	From: JAN. 10. 1968 To : JAN. 16. 1968
Kerevat	KRT	From: JAN. 10. 1968 To : JAN. 16. 1968
Esa'ala	ESA	From: To :
Tabele	TBL	From: To :
Agenahambo	AGE	From: To :
Waris	WAA	Not operational
Ulamona	ULA	Not operational
Piva	PIV	Not operational
C.Gloucester	LAG	From: To :

STATION PERSONNEL

RAB **Central Observatory, Rabaul**

Vulcanologist-in-Charge.	G.W. D'Addario
Vulcanologist	R.F. Heming
Seismologist.	(Position vacant)
Seismogram Readers.	D.J. Cook; H. Carrick
Senior Technical Officer.	N.O. Myers
Technical Officer	R.J. Conway
Vulcanological Assistants	L. Topue; M. Gaiam V. Kaita
Technical Assistant	P. Daimbari
Trainee Vulcanological Assistants. .	B. Talai; M. Salaiau; (one position vacant)
Secretary.	G.J. Chant

KRT **Keravat Outstation**

Observer (part-time).	G.E. Chorick

TBL **Tabele Observatory**

Observer.	E. Ravian

ESA **Esa'ala Observatory**

Observer	F. Dira

AGE **Agenahambo Outstation**

Observer (part-time)	Br B. Hughes

The Rabaul Preliminary Earthquake Analysis (PEA) is produced by the staff under the direction of the Vulcanologist-in-Charge from whom additional information and photocopies of seismogram records from all stations may be obtained on request.

Please address all communications to:-

Vulcanologist-in-Charge,
Central Observatory,
P.O. Box 386,
RABAUL, T.P. & N.G.

SEISMOGRAPH STATIONS

Station (NEW GUINEA)	Code	South Latitude	East Longitude	Elev. (m)	Foundation
Rabaul	RAB	04°11'28.6"	152°10'11.4"	183.5	Basalt Flow
Wanliss Street	WAN*	04°11'39.6"	152°10'32.5"	25.0	Basalt Flow
Sulphur Creek	SUL*	04°13'09.8"	152°10'33.3"	8.5	Unconsolidated volcanic ash
Rabalanakaia	RAL*	04°13'13.0"	152°12'07.0"	91.0	Unconsolidated volcanic ash
Tavurvur	TAV*	04°13'52.2"	152°13'12.9"	27.0	Andesite Flow
Taviliu	VUL*	04°16'58.2"	152°08'44.6"	332.3	Unconsolidated volcanic ash
Keravat	KRT	04°21'10.5"	152°03'06"	20.0	Alluvium
Ulamona	ULA	04°59'24.0"	151°16'30.0"	17.0	Lapilli Tuff
Tabele	TBL	04°06'04.67"	145°00'41.37"	179.5	Basalt Flow
Waris	WAA	04°07'00"	145°06'00"	48.0	Lapilli Tuff
Piva	PIV	06°12'00"	155°03'30"	60.0	Alluvium
Cape Gloucester	LAG	04°27'20"	148°26'00"	24.0	Lapilli Tuff
(PAPUA)					
Agenahambo	ACE	08°48'49"	148°05'56"	303.0	Unconsolidated volcanic ash
Esa'ala	ESA	09°44'18.2"	150°48'50.7"	46.4	Granite Gneiss

* Rabaul Harbour Network

STATION INSTRUMENTATION

Station & Instruments	Comp.	To	Tg	Trace Speed mm/min	Approximate relative Magnification	Approximate damping
(NEW GUINEA)						
Rabaul Central Observatory RAB						
World-Wide Standard	Z	1.0	0.74	60	12,500	critical
	N,E	1.0	0.74	60	6,250	critical
	Z/N/E/	15.0	100.0	15	750	critical
Benioff VR 14.7Kg	Zh	1.0	0.02	180+	4,000	critical
+ Recording is triggered by the onset of any earthquake with pre-determined minimum amplitude. Recorder is stopped automatically by hour break pulse.						
Omori 15Kg	No	3.6	-	24	12	10.1 air
Omori 15Kg	Eo	3.8	-	24	10	10.1 air
Wood-Anderson Torsion	Na,Ea	0.8	-	60	2,800	critical
Rabaul Harbour Network						
Readings from the Harbour Network are entered in the PEA only for large earthquakes.						
WAN° Benioff VR 14.7Kg	Z	1.0	0.02	60	5,240	critical
SUL° Benioff VR 14.7Kg	Z	1.0	0.02	60	2,850	critical
RAL° Benioff VR 14.7Kg	Z	1.0	0.02	60	8,075	critical
TAV° Benioff VR 14.7Kg	Z	1.0	0.02	60	20,900	critical
VUL° Benioff VR 14.7Kg	Z	1.0	0.02	60	5,000	critical

STATION INSTRUMENTATION

Station & Instruments	Comp	To	Tg	Trace Speed mm/min	Approximate relative Magnification	Approximate damping
Rabaul Harbour Network (cont'd)						
KRT Keravat Out-Station						
Benioff MC 50Kg	Z	1.2	0.2	15	20% sensitivity	critical
Benioff MC 50Kg	N,E	1.2	0.2	15	10% sensitivity	critical
ULA Ulamona Field Station						
Willmore portable	Z	0.6	0.25	60	3,000	underdamped
PIV Piva Field Station						
Willmore portable	Z	0.6	0.25	60	3,000	underdamped
WAA Waris Field Station						
Willmore portable	Z	0.6	0.25	60	3,000	underdamped
LAG Cape Gloucester						
Willmore portable	Z	0.6	0.25	60	3,000	underdamped
TBL Tabele Observatory						
Benioff VR 107.5Kg	Z	1.0	0.2	60	1,350	critical
(PAPUA)						
ESA Esa'ala Observatory						
Benioff VR 107.5Kg	Z	1.0	0.2	15	36,000	critical
Benioff VR 107.5Kg	N,E	1.0	0.2	15	18,000	critical
Benioff VR 107.5Kg	Z/N/E	1.0	60.0	30	50% sensitivity	critical
AGE Agenahambo Station						
Willmore portable	Z	0.6	0.25	60	3,000	underdamped

o Signals from these stations are telemetered by land line to Helicorders (Geotech Mod. 2484) at the Central Observatory.

oo Signals from this station are telemetered via VHF to its Helicorder at the Central Observatory.

VR Variable Reluctance

MC Moving-coil

N.B. These field stations consist of a permanent building in which instruments are installed when necessary.

Details of emergency field stations, within the Territory will be listed when in operation.

Relative magnification curves of seismograph systems installed in the stations controlled by the Rabaul Central Observatory are listed once a month on the P.E.A.

PRESENTATION OF DATA

(reviewed in November, 1967)

All times are reduced to Greenwich Mean Time (GMT), which is 10 hours behind Eastern Standard Time.

At RAB and Harbour Network, the time signal is marked every minute on each seismogram record from the Observatory crystal chronometer. Second marks from radio signal VNG (Australia) are recorded on World-Wide Standard System S.P.-N component only according with the W.W.S.S. programme, at six hour intervals. Primary time is provided by W.W.S.S. equipment and secondary time by a Labtronic crystal chronometer with the accuracy of $\pm$ 5ms per day compared with VNG (Australia) with the aid of a chronoscope.

At TBL and AGE, the time signal is derived from a spring driven chronometer (Mercer) and marked each minute on records. Time accuracy is determined by comparison with signals from WWVH daily. Linear correction is applied to the daily drift.

On all seismogram records time increases from left to right and time break is upward.

At RAB* and Harbour Network the recording drum of each seismograph is driven by a 110VAC 60Hz synchronous motor. The 110VAC is frequency regulated by a crystal chronometer.

* The Omori recording drum is driven by a nonregulated 50Hz frequency supply.

At ESA and KRT power for recorder motors is frequency regulated by a crystal chronometer at 50Hz. Power for AGE and TBL and field stations is supplied by a 50Hz free running oscillator.

Direction of Motion

Upward direction of ground motion corresponds to upward trace morion on vertical seismogram records. Direction of component of ground motion to North or East corresponds to upward trace motion on horizontal siesmogram records.

Vertical trace motion from impulsive onset of longitudinal waves of compressional or dilatational ground movement is indicated by "u" or "d" accompanied by N, S, E or W as per trace motion amplitude on horizontal seismogram records, to represent vectorially the direction of ground motion. "+" or "-" indicates upward or downward motion of the ground respectively, from a wave not known to be of the longitudinal type.

Accuracy of Readings

When readings are given with a decimal figure, they are to 1/10 of a second, other readings have been made to the nearest half second.

Crustal Phases

Px, Sx Crustal phases, other than Pn and Sn for local and near earthquakes.

Felt Intensity

Information on maximum intensities of shocks reported felt is included. Intensities are given in Roman numerals based on the Modified Mercalli Scale, of 1931.

PRESENTATION OF DATA (CONT'D)

Determinations of Epicentres

Where no source is cited, the determination of epicentres, origin time, focal depth and distance in central angle degrees from the pertinent station for local and regional earthquakes, are carried out at the Central Observatory, Rabaul.

Geographical Designation of Epicentres

The regional names which follow the co-ordinates of eipcentres located at the Central Observatory are meant only to supplement the co-ordinates and normally follow well-known geographical rather than geological features. Use is made of the full degree blocks according to the method defined by E.A. Flinn and E.R. Engadhl in " A PROPOSED BASIS FOR GEOGRAPHICAL AND SEISMIC REGIONALIZATION", Seismic Data Laboratory Report No. 101, U.I.D. Inc., Alexandria, Virginia, 1964, adopted by the U.S.C.G.S. for computer requirements.

Magnitude Definition and Determination

M_L -Local Magnitude (Richter, 1935) is calculated from the recorded trace amplitude of the Wood-Anderson torsion seismographs of stated physical constants (installed at the Observatory in November, 1967)

Maximum trace amplitude (0 to peak) expressed in millimetres and tenths is measured directly on both components. Magnitude is determined independently and the arithmetic mean taken. M_L values are given to the tenth of a unit.

The station corredtion factor is assumed to be zero until better known.

M_S -Surface Wave Magnitude (Gutemberg & Richter, 1956) is calculated from the amplitude of surface waves of period near 20 seconds for shallow distant earthquakes.

M_B -Body Wave Magnitude is calculated from the ratio of amplitude over period for body waves on S.P.-Z of World-Wide Seismograph System only when depth is known. The magnification factor for the standard seismograph is taken into account.

m -Unified magnitude (Gutemberg& Richter, 1956) has the following relation to M_L, M_S, and M_B.

$$m = 1.7 + 0.8\ M_L - 0.01\ M^2_L$$
$$m = M_B \text{ (without correction)}$$
$$m = 2.5 + 0.63\ M_S$$

Local Magnitude of earthquakes recorded at RAB with a clear S-P interval is tabulated on a Day-Distance (in Central Angle Degrees) graph which is added to the PEA monthly.

Symbols

i -implusive and sharply defined beginning of a phase.

e -emergent and poorly defined beginning of phase.

T -Period in seconds

A -Peak-to-Trough trace amplitude in millimetres.

GM -Ground Motion

Dist -Distance in central degrees

H -Origin Time

h -Focal depth in Kilometres

CBM -Confused by microseisms

PRESENTATION OF DATA (CONT'D)

Remarks

Local	- Typical signature of an earthquake with epicentre within 0.9°
Near	- Typical signature of an earthquake with epicentre between 0.9° and 9°
Distant	- Typical signature of an earthquake with epicentre between 9° and 45°
Teleseism	- Typical signature of an earthquake with epicentre more than 45°
Traces	- Any recorded disperse waves or very weak unknown earthquake phases.

Local and Near earthquakes will be classified Regional, and Distant earthquakes will be grouped with Teleseisms if sheer waves and their reflections are unidentifiable.

G.W. D'ADDARIO
Vulcanologist-in-Charge

10th Dec., 1968			T sec	A mm	GM	Dist	H	Remarks
RAB	iPZ iSN	000550.5 0612.8	0.5	1.2	d	1¾°	000521	M_L=4.0
RAB	i(P)Z	022202.0	1.0	2.1	d			
RAB	iPZ	035945.4	0.4	2.9	d			
RAB	iPZ iZ iSN	060932.5 33.2 50.0	0.4	10.8	u	1½°	060909	M_L=4.6
RAL	iPZ	060932.5	0.4	1.5	d			
KRT	i(P)Z i(S)N	060930½ 47½	0.3	8.0	u	(1¼°)	0609(08)	
RAB	i(P)Z	064326.2	0.4	2.1	u			
RAB	iPZ i(S)N iN	081708.2 33.0 42.1	0.5	2.6	u	(3°)	0816(24)	
KRT	iPZ iSN	081708½ 44½	0.5	1.0	d	3°	081621	
RAB	iPZ iSN iN	093532,5 3620.1 27.0	0.5	2.0	u	4°	093430	M_L=5.2
KRT	e(P)Z iZ iSN	093525½ 34½ 3620	0.4	1.0	d	(4½°)	0934(16)	
RAB	eZ/	094730			-			Traces
RAB	iPZ iSe	095656.6 5714.5	0.4	9.0	u	1½°	095633	M_L=4.5
SUL	iPZ	095655.8	0.3	4.5	u			
RAL	iPZ	095655.6	0.4	3.2	u			
KRT	iPZ iSN	095655½ 5712½	0.2	5.0	d	1¼°	095633	
RAB	iPZ iSN	100054.5 0112.0	0.6	2.1	u	1½°	100031	M_L=3.6
KRT	i(P)Z i(S)N	113745½ 3810½	0.2	1 3	u	(2°)	1137(12)	
RAB	ePZ iSN	113744½ 3812.0	0.5	0.6	u	2¼°	113708	M_L=4.1
RAB	iPZ	124614.9	0.5	1.7	d			
KRT	e(P)Z eZ e(S)N	124611 14½ 4721	0.5	0.5	u	(6°)	1244(46)	
RAB	iPZ iZ	191315.4 23.0	0.6	5.0	u			
KRT	iPZ	191312½	0.4	2 0	u			Regional
RAB	iPZ iSN	191426.2 35.9	0.3	10.9	d	¾°	191412	M_L=3.8
SUL	iPZ	191425.8	0.2	3.0	d			
RAL	iPZ	191425.7	0.2	7.2	d			
KRT	iPZ iSN	191429 40½	0.2	5.0	d	¾°	171413	

			T sec	A mm	GM	Dist	H	Remarks
10th Jan., 1968 contd.								
RAB	e(P)Z iSN	202403½ 30.3	0.5	1.0	d	2¼°	202427	M_L=3.9
11th Jan., 1968								
RAB	ePZ iSN	035125 59.0	0.5	2.0	d	3°	035040	M_L=4.7
KRT	iPZ iN iSN	035124½ 54½ 57½			d	2¾°	035041	CBM
RAB	eZ/	044922			-			Traces
RAB	iPZ	081424.8	0.4	1.5	u			Regional
KRT	iPZ	081411	0.3	2.0	d			
RAB	iPZ iSE	104014.0 52.6	0.5	4.0	d	3¼°	103924	
KRT	iPZ iSN	104011 43½	0.3	2.·	d	2¾°	103928	
RAB	iPZ iS!N	115609.6 17.0	0.5	14.0	u	½°	115600	M_L=3.6
WAN	iPZ	5609.3	0.3	5.2	u			
RAL	iPZ	09.2	0.4	12.0	u			
KRT	iPZ iSE	115612 22	0.2	5.0	u	¾°	115558	
RAB	iPZ iSN	123338.5 56.5	0.4	2.0	d	1½°	123314	
KRT	iPZ iSE	123335½ 54	0.2	1.0	d	1½°	123311	
RAB	iPZ iSN	162026.5 56.0	0.3	3.0	d	2½°	161947	
KRT	iPZ	162023½			d			CBM
RAB	iPZ iSN	162446.6 2507.0	0.4	2.5	u	1½°	162420	
RAB	ez/	162910			+			Traces
RAB	iPZ eSE/	170111.0 0552	0.8	3.0	d	26°		
KRT	ePZ	170111½	1.0	1.0	d			
RAB	ePZ iSN	182427 2503.0	0.3	1.2	u	3°	182340	
RAB	iPZ iS!N	191718.0 42.2	0.5	10.0	d	2°	191646	M_L=4.3
KRT	iPZ iSN	191717 41	0.2	3.0	d	2°	191645	
RAB	iPZ iSN	192223.2 50.2	0.5	2.0	d	2¼°	192147	M_L=4.1
WAN	iPZ	23.1	0.7	2.0	u			
KRT	iPZ iSE	192222½ 45½	0.3	9.0	d	2°	192152	

			T sec	A mm	CM	Dist	H	Remarks
11th Jan.,1968 cont'd								
RAB	iPZ	193012.0	0.3	1.0	u	2½°		
	iZ	13.3					192931	
	iSN	43.3						
KRT	iPZ	193009½	0.2	1.0	d	2¼°		
	iSN	38					192932	
RAB	iPZ	205439.0	0.4	2.0	d	2¼°		
	iSN	5505.0					205405	
KRT	iPZ	205437½	0.3	7.5	d	2°		
	iSE	5501					205406	
RAB	iPZ	215458.0	0.5	2.5	u	2¼°		M_L =4.7
	iSN	5526.0					215421	
KRT	iPZ	215459				2½°		
	iSE	5528½					215422	
RAB	ePZ	224954	0.5	1.0	d	3½°		
	iSN	5037.5					224903	
KRT	iPE	224954				3½°		
	iSN	5037					224858	
12th Jan.,1968								
RAB	iPZ	001320.0	0.4	3.0	u	(3½°)		M_L =5.4
	iZ	32.0					0012(25)	
	i(S)E	1402.0						
RAL	iPZ	20.2	0.8	2.8	u			
KRT	iPE	001323½				3¼°		
	iSN	1401					001234	
RAB	eZ/	031638			-			Traces
RAB	iPZ	041829.6	0.5	3.0	u	4½°		M_L=5.6
	iZ	35.2					041719	
	iSE	1924.0					041719	
KRT	iPE	041832½				4½°		
	iSN	1925½					041723	
RAB	eZ/	084838			+			Traces
RAB	ePZ	120407½	0.3	2.0	d	2¼°		M_L=4.1
	iSN	34.0					120332	
KRT	ePZ	120406½	0.4	0.5	d	2½°		
	iSE	34½					120330	
RAB	ePZ	152247	0.5	3.0	u	2¾°		
	eSN/	2320					152204	
KRT	ePZ	152247½	0.5	1.0	u			
RAB	iPZ	153708.0	0.4	3.0	d	2°		M_L=4.5
	iSN	32.5					153636	
KRT	iPZ	153705½	0.2	1.5	d	2½°		
	iSE	28½					153635	
RAB	ePZ	153804	0.5	4.0	d	2°		M_L=4.2
	iSN	29.0					153731	
RAB	iPZ	212322.5	0.4	5.0	u	2¼°		M_L=5.2
	iSN	50.5					212245	

			T sec	A mm	GM	Dist	H	Remarks
12th Jan.,1968 cont'd.								
RAL	iPZ	212322.1	0.6	2.0	d			
KRT	iPZ	212323½	0.2	3.5	u	2¼°		
	iSN	52					212246	
RAB	iPZ	234142.0	0.5	34.0	u			Regional
WAN	iPZ	41.2		20.0	u			
RAL	iPZ	41.1			u			
KRT	iPZ	234143½			d			
	iN	48½						
RAB	iPZ	234725.6	0.5	7.0	u	2½°		
	iSN	57.5					234643	
KRT	iPZ	234722½	0.2	2.0	u	2¾		
	iSN	56					234639	
13th Jan.,1968 Strong Microseimic activity all day								
RAB	e(P)S	071123½						C.B.M.
KRT	e(P)Z	071125						C.B.M.
PAB	e(P)Z	110333½						C.B.M.
KRT	ePZ	110330½	0.6	1.0	d	3°		
	iSE	0406½					110243	
KRT	ePZ	062501½	1.0	1.0	u			Teleseism
RAB	iPZ	130902.9	0.3	9.5	d	1¼°		M_L=4.3
	iSE	18.5					130842	
WAN	iPZ	03.0	1.4	3.5	u			
RAL	iPZ	02.8		13.0	u			
KRT	iPZ	130904½	0.2	5.0	u	1¼°		
	iSE	21					130843	
RAB	eiPZ	200821½	0.4	21.0	d	1¾°		M_L=4.7
	iSE	43.0					200853	
WAN	eiPZ	21.3	0.3	11.5	d			
RAL	eiPZ	21.2	0.2	5.6	u			
KRT	iPZ	200819	0.2	12.0	d	1½°		
	iSE	38					200854	
RAB	eiPZ	231211½	0.3	3.2	d	2°		M_L=4.3
	iSN	35.8					231139	
	iN	45.2						
KRT	iPZ	231211½	0.3	3.2	u	2°		
	iSE	34½					231141	
14th Jan.,1968								
RAB	(eiPZ	123019)						
WAN	ePZ	18.5	1.0	1.0	u			
SUL	iPZ	19.5	1.0	1.3	u			
RAL	ePZ	19	1.0	2.8	u			
RAB	eiPZ	123019	1.2	9.5	u	20°		M_L=7.2
	iZ	20.1						
	iPPZ/	46.						
	iSN/	3430.						
	iSSE/	4131.						

			T sec	A mm	GM	Dist	H	Remarks
14th Jan.,1968 cont'd.								
KRT	iPZ	123018½	0.6	8.4	u			
	iZ	19½						
RAB	ePZ/	175331			u	66°		
	ePcPZ/	5414						
	ePPZ/	5612						
	iSE/	180224						
	iPSN/	55						
	iPPSN/	0304						
	iScPE/	42						
	iSSE/	0628						
	iLqE/	1044						
	iLrZ/	1354						
RAB	iPZ	201218.8	0.4	21.8	u	1½°		M_L=4.8
	iSN	39.4					201252	
WAN	iPZ	18.2	0.3	3.2	u			
SUL	iPZ	(18.0)			(u)			
RAL	iPZ	18.2	0.3	7.6	d			
KRT	iPZ	201216½			d	2°		
	iSE	40					201146	
RAB	iPZ	214945.2	0.3	4.0	d	2¼°		M_L=4.6
	iSN	5012.5					214909	
KRT	iPZ	214946½	0.4	1.2	d	2°		
	iSE	5010½					214915	
RAB	iPZ	215213.8	0.3	3.5	u	2¼°		M_L=4.5
	iSN	39.6					215139	
WAN	iPZ	13.0	0.2	1.5	u			
RAL	iPZ	11.8	0.3	1.8	u			
KRT	iPZ	215212½			d	2¼°		Incoda of previous shock
	iSE	39					215137	
RAB	ePZ	220257½	0.3	2.8	u	2¼°		M_L=4.0 C.B.M.
	iSE	0323.8					220223	
KRT	iPZ	220257½	0.3	1.2	d	2°		
	iSE	21½					220226	
15th Jan.,1968								
RAB	eZ/	000754			+			Traces
RAB	e(P)Z	020558½	0.5	2.0	u	(22°)		C.B.M.
	e(S)N/	1008						
RAB	eZ/	070556			-			Traces
RAB	iPZ	121901.5	0.4	4.0	d	1¼°		M_L=3.5
	iSN	17.5					121840	
KRT	iPZ	121901	0.2	8.0	d	1°		
	iSE	15½					121843	
RAB	iPZ	170410.2	0.4	2.5	u	4°		M_L=5.1
	iSE	56.0					170310	
KRT	ePZ	170407½	0.6	1.0	d	4½°		
	iZ	12½						
	iSE	59					170301	

			T sec	A mm	CM	Dist	H	Remarks
15th Jan.,1968 cont'd.								
RAB	iPZ	171602.1	0.3	4.0	u			Regional
WAN	iPZ	02			u			
KRT	iPZ	171603½	0.2	4.0	d	1¼°		
	iSE	19½					171542	
RAB	iPZ	185956.0	0.4	2.5	u	1¼°		M_L=3.5
	iSN	190012.2					185935	
KRT	iPZ	185955	0.2	2.5	u	1¼°		
	iSE	190010					185935	
RAB	e(P)Z	223112½	0.5	2.0	d			(Regional)
16th Jan.,1968 Microseimic activity								
RAB	ePZ	050423	0.5	2.5	u			Regional
RAB	iPZ	101514.6	0.5	6.5	u	2½°		M_L=5.1
	iSN	46.0					101433	
WAN	iPZ	15.0	0.4	1.5	d			
SUL	iPZ	15.8	0.3	2.8	d			
RAL	iPZ	15.8	0.4	2.6	d			
KRT	iPZ	101513	0.3	12.0	u			
	iN	38½						
RAB	iPZ	112453.9	0.2	3.1	d	1¾°		M_L=4.1
	iSN	2516.2					112425	
RAL	iPZ	52	0.5	2.8	d			
KRT	iPZ	112451			d	2°	112421	
	iSE	2514						
RAB	iPZ	121902.4	0.6	2.2	d	2½°		M_L=5.1
	iSN	31.8					121824	
WAN	iPZ	03.0			d			
SUL	iPZ	03.4			u			
RAL	iPZ	02.6	0.3	7.2	u			
KRT	iPZ	121903	0.5	3.0	d			
	iZ	04						
	iSN	28						
RAB	iPZ	124128.9	0.2	1.8	u	2½°		M_L=4.1 C.B.M.
	iSN	57.4					124051	
KRT	i(P)Z	124132			d	2½°	124057	C.B.M.
	iSN	59						
RAB	iPZ	135037.5	0.5	4.1	d	1½°		M_L=4.2
	iSN	56.0					135013	
RAL	eiZ	36	0.2	1.6	d			
KRT	iPZ	135038½	0.2	5.0	d			
	iSE	56½						

Central Observatory Rabaul
30th January, 1968.

Dr. G.W.D'Addario
Vulcanologist-in-Charge

PEA Jan-68 No. 2

TERRITORY OF PAPUA AND NEW GUINEA
GEOLOGICAL AND VULCANOLOGICAL BRANCH
VULCANOLOGICAL SECTION

PRELIMINARY EARTHQUAKE ANALYSIS
RABAUL CENTRAL OBSERVATORY
1968

Rabaul	RAB	From: JAN. 2 - 1968 To : JAN. - 9. 1968
Keravat	KRT	From: JAN. 2 - 1968 To : JAN. - 9. 1968
Esa'ala	ESA	From: To :
Tabele	TBL	From: To :
Agenahambo	AGE	From: To :
Waris	WAA	Not operational
Ulamona	ULA	Not operational
Piva	PIV	Not operational
Cape Gloucester		From: To :

STATION PERSONNEL

RAB Central Observatory, Rabaul.

Vulcanologist-in-Charge	G.W. D'Addario
Vulcalologist	R.F. Heming
Seismologist	Position Vacant
Senior Technical Officer	N.O. Myers
Technical Officer	R.J. Conway
Seismogram Readers	P.M. Leitao; V. Hunt
Vulcanological Assistants	L. Topue; M. Gaiam
	V. Kaita
Technical Assistant	P. Daimbari
Trainee Vulcanological Assistants	B. Talai; M. Salaiau;
	Position Vacant
Secretary	G. Chant

KRT Keravat Outstation

Observer (part-time)	G.E. Chorick

TBL Tabele Observatory

Observer	E. Ravian

ESA Esa'ala Observatory

Observer	F. Dira

AGE Agenahambo Out-station

Observer (part-time)	Br. B. Hughes

The Rabaul Preliminary Earthquake Analysis (PEA) is produced by the staff under the direction of the Vulcanologist-in-Charge from whom additional information and photocopies of seismogram records from all stations may be obtained on request.

Please address all communications to:-

Vulcanologist-in-Charge,
Central Observatory,
P.O. Box 386,
RABAUL, T.P. & N.G.

SEISMOGRAPH STATIONS

Station	Code	South Latitude	East Longitude	Elev. (m)	Foundation
NEW GUINEA					
Rabaul	RAB	04°11'28.6"	152°10'11.4"	183.5	Basalt Flow
Wanliss Street	WAN*	04°11'39.6"	152°10'32.5"	25.0	Basalt Flow
Sulphur Creek	SUL*	04°13'09.8"	152°10'33.3"	8.5	Unconsolidated Volcanic Ash
Rabalanakaia	RAL*	04°13'13.0"	152°12'07.0"	91.0	Unconsolidated Volcanic Ash
Tavurvur	TAV*	04°14'12.0"	152°13'18.0	60.0	Andesite Flow
Taviliu	VUL*	04°16'58.2"	152°08'44.6"	332.3	Unconsolidated Volcanic Ash
Keravat	KRT	04°20'00"	152°00'00"	20.0	Alluvium
Ulamona	ULA	04°59'24.0"	151°16'30.0"	17.0	Lapilli Tuff
Tabele	TBL	04°06'04.67"	145°00'41.37"	179.5	Basalt Flow
Waris	WAA	04°07'00"	145°06'00"	48.0	Lapilli Tuff
Piva	PIV	06°12'00"	155°03'30"	60.0	Alluvium
PAPUA					
Agenahambo	AGE	08°48'30"	148°06'12"	303.0	Unconsolidated Volcanic Ash
Esa'ala	ESA	09°44'18.2"	150°48'50.7"	46.4	Granite Gneiss

* Rabaul Harbour Network

STATION INSTRUMENTATION

Station & Instruments	Comp.	Tₛ	Tg	Trace Speed mm/min	Approximate relative Magnification	Approximate damping
NEW GUINEA						
Rabaul Central Observatory						
WORLD-WIDE STANDARD	Z	1.0	0.74	60	12,500	critical
	N,E	1.0	0.74	60	6,250	critical
	Z/N/E/	15.0	100.0	15	750	critical
Benioff VR 14.7Kg	Zh	1.0	0.02	180*	4,000	critical
* Recording is triggered by the onset of any earthquake with pre-determined minimum amplitude. Recorder is stopped automatically by hour break pulse.						
Omori 15Kg	No	3.6	-	24	12	10.1(air)
Omori 15Kg	Eo	3.8	-	24	10	10.1(air)
Wood-Anderson Torsion	Na,Ea	0.8	-	60	2,800	critical
Rabaul Harbour Network						
Readings from the Harbour Network are entered in the PEA only for large earthquakes.						
WAN** Benioff VR 14.7Kg	Z	1.0	0.02	60	5,240	critical
SUL** Benioff VR 14.7Kg	Z	1.0	0.02	60	2,850	critical
RAL** Benioff VR 14.7Kg	Z	1.0	0.02	60	8,075	critical
TAV** Benioff VR 14.7Kg	Z	1.0	0.02	60	20,900	critical
VUL***Benioff VR 14.7Kg	Z	1.0	0.02	60	5,000	critical

PRESENTATION OF DATA

(reviewed in November, 1967)

All times are reduced to Greenwich Mean Time (GMT), which is 10 hours behind Eastern Standard Time.

At RAB and Harbour Network, the time signal is marked every minute on each seismogram record from the Observatory crystal chronometer. Second marks from radio signal VNG (Australia) are recorded on World-Wide Standard System S.P.-N component only according with the W.W.S.S. programme, at six hour intervals. Primary time is provided by W.W.S.S. equipment and secondary time by a Labtronic crystal chronometer with the accuracy of ± 5ms per day compared with VNG (Australia) with the aid of a chronoscope.

At TBL and AGE, the time signal is derived from a spring driven chronometer (Mercer) and marked each minute on records. Time accuracy is determined by comparison with signals from WWVH daily. Linear correction is applied to the daily drift.

On all seismogram records time increases from left to right and time break is upward.

At RAB* and Harbour Network the recording drum of each seismograph is driven by a 110VAC 60Hz synchronous motor. The 110VAC is frequency regulated by a crystal chronometer.

* The Omori recording drum is driven by a nonregulated 50Hz frequency supply.

At ESA and KRT power for recorder motors is frequency regulated by a crystal chronometer at 50Hz.. Power for AGE and TBL and field Stations is supplied by a 50Hz free running oscillator.

Direction of Motion

Upward direction of ground motion corresponds to upward trace motion on vertical seismogram records. Direction of component of ground motion to North or East corresponds to upward trace motion on horizontal seismogram records.

Vertical trace motion from impulsive onset of longitudinal waves of compressional or dilatational ground movement is indicated by "u" or "d" accompanied by N, S, E or W, as per trace motion amplitude on horizontal seismogram records, to represent vectorially the direction of ground motion. "+" or "-" indicates upward or downward motion of the ground respectively, from a wave not known to be of the longitudinal type.

Accuracy of Readings

When readings are given with a decimal figure, they are to 1/10 of a second, other readings have been made to the nearest half second.

Crustal Phases

Px, Sx Crustal phases, other than Pn and Sn for local and near earthquakes.

Felt Intensity

Information on maximum intensities of shocks reported felt is included. Intensities are given in Roman numerals based on the Modified Mercalli Scale, of 1931.

PRESENTATION OF DATA (CONT'D)

Determinations of Epicentres

Where no source is cited, the determination of epicentres, origin time, focal depth and distance in central angle degrees from the pertinent station for local and regional earthquakes, are carried out at the Central Observatory, Rabaul.

Geographical Designation of Epicentres

The regional names which follow the co-ordinates of epicentres located at the Central Observatory are meant only to supplement the co-ordinates and normally follow well-known geographical rather than geological features. Use is made of the full degree blocks according to the method defined by E.A. Flinn and E.R. Engadhl in "A PROPOSED BASIS FOR GEOGRAPHICAL AND SEISMIC REGIONALIZATION", Seismic Data Laboratory Report No. 101, U.I.D. Inc., Alexandria, Virginia, 1964, adopted by the U.S.C.G.S. for computer requirements.

Magnitude Definition and Determination

M_L -Local Magnitude (Richter, 1935) is calculated from the recorded trace amplitude of the Wood-Anderson torsion seismographs of stated physical constants (installed at the Observatory in November, 1967)

Maximum trace amplitude (0 to peak) expressed in millimetres and tenths is measured directly on both components. Magnitude is determined independently and the arithmetic mean taken. M_L values are given to the tenth of a unit.

The station correction factor is assumed to be zero until better known.

M_S -Surface Wave Magnitude (Gutemberg & Richter, 1956) is calculated from the amplitude of surface waves of period near 20 seconds for shallow distant earthquakes.

M_B -Body Wave Magnitude is calculated from the ratio of amplitude over period for body waves on S.P.-Z of World-Wide Seismograph System only when depth is known. The magnification factor for the standard seismograph is taken into account.

m -Unified magnitude (Gutemberg & Richter, 1956) has the following relation to M_L, M_S, and M_B.

$$m = 1.7 + 0.8\ M_L - 0.01\ M^2_L$$

$$m = M_B \text{ (without correction)}$$

$$m = 2.5 + 0.63\ M_S$$

Local Magnitude of earthquakes recorded at RAB with a clear S-P interval is tabulated on a Day-Distance (in Central Angle Degrees) graph which is added to the PEA monthly.

Symbols

i -impulsive and sharply defined beginning of a phase.

e -emergent and poorly defined emergence of phase.

T -Period in seconds

A -Peak-to-Trough trace amplitude in millimetres.

GM -Ground Motion.

Dist -Distance in central angle degrees.
H -Origin Time
h -Focal depth in Kilometres
CBM -Confused by microseisms.

PRESENTATION OF DATA (CONT'D)

Remarks

Local - Typical signature of an earthquake with epicentre within 0.9°

Near - Typical signature of an earthquake with epicentre between 0.9° and 9°

Distant - Typical signature of an earthquake with epicentre between 9° and 45°

Teleseism - Typical signature of an earthquake with epicentre more than 45°

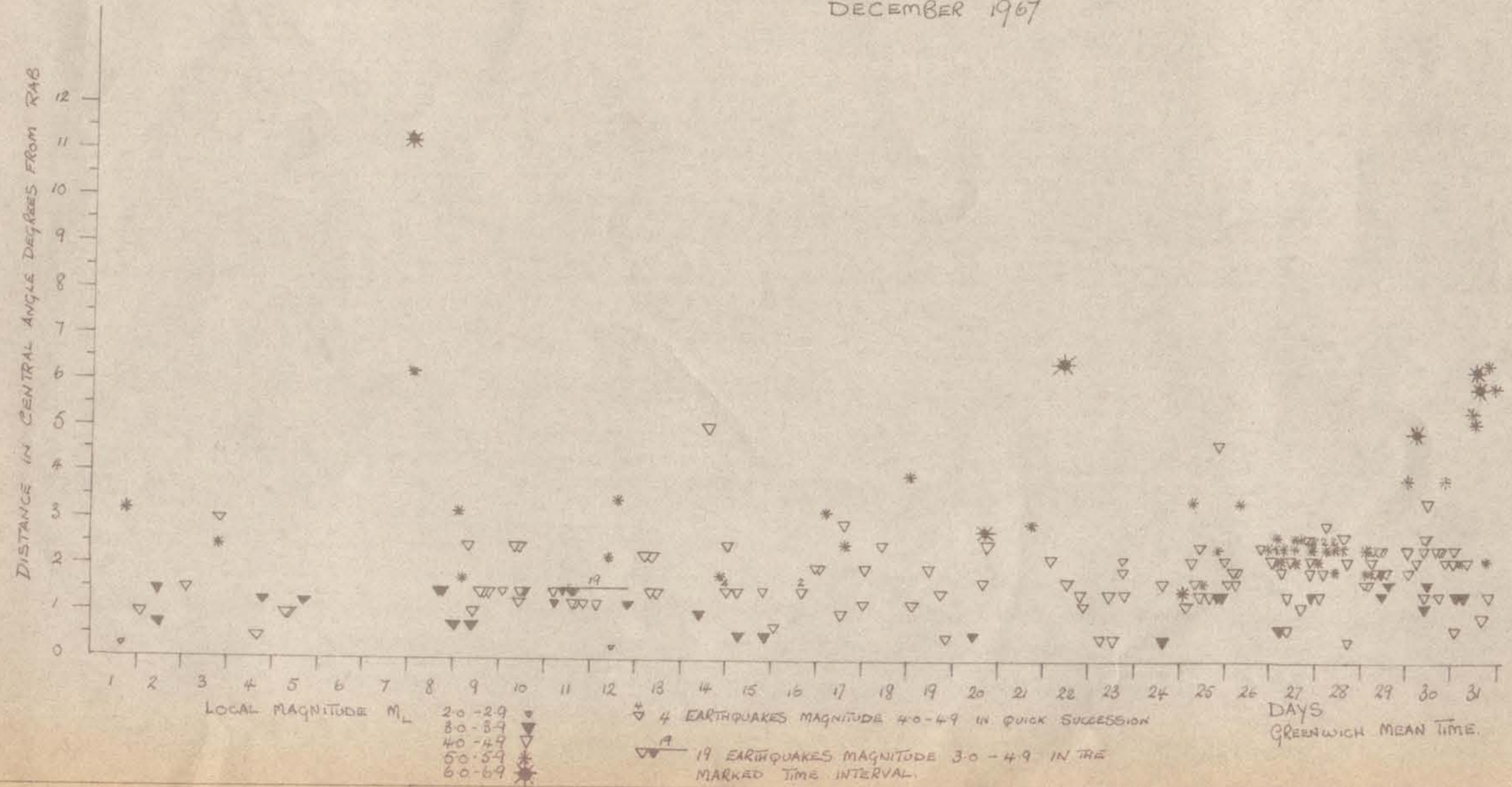
Traces - Any recorded disperse waves or very weak unknown earthquake phases.

Local and Near earthquakes will be classified Regional, and Distant earthquakes will be grouped with Teleseisms if sheer waves and their reflections are unidentifiable.

G.W. D'ADDARIO
Vulcanologist-in-Charge

MAGNITUDE OF EARTHQUAKES WITH A CLEAR S-P INTERVAL RECORDED AT RABAUL

DECEMBER 1967



REH

STATION INSTRUMENTATION

Station & Instruments	Comp.	To	Tg	Trace Speed mm/min	Approximate relative Magnification	Approx. damping
Rabaul Harbour Network (Cont'd)						
** Signals from these stations are telemetered by land line to Helicorders (Geotech Mod. 2484) at the Central Observatory.						
*** Signals from this station are telemetered via VHF to its Helicorder at the Central Observatory.						
Keravat Out-Station KRT						
Benioff MC 50Kg	Z	1.2	0.2	15	20% sensitivity	critical
Benioff MC 50Kg	N,E	1.2	0.2	15	10% sensitivity	critical
Ulamona Field Station	ULA					
Willmore portable	Z	0.6	0.25	60	3,000	underdamped
Piva Field Station	PIV					
Willmore portable	Z	0.6	0.25	60	3,000	underdamped
Waris Field Station	WAA					
Willmore portable	Z	0.6	0.25	60	3,000	underdamped

N.B. These field stations consist of a permanent building in which instruments are installed when necessary.

Details of emergency field stations, within the Territory will be listed when in operation.

Tabele Observatory	TBL					
Benioff VR 107.5Kg	Z	1.0	0.2	60	1,350	critical
PAPUA						
Esa'ala Observatory	ESA					
Benioff VR 107.5Kg	Z	1.0	0.2	15	36,000	critical
Benioff VR 107.5Kg	N,E	1.0	0.2	15	18,000	critical
Benioff VR 107.5Kg	Z/N/E/	1.0	60.0	30	50% sensitivity	critical
Agenahambo Station	AGE					
Willmore portable	Z	0.6	0.25	60	3,000	underdamped

VRS Variable Reluctance

MCS Moving-coil

Relative magnification curves of seismograph systems installed in stations controlled by the Rabaul Central Observatory have been listed on the following page.

			T sec	A mm	GM	Dist	H	REMARKS
3rd Jan., 1968 (cont'd)								
RAB	iPZ eSN	165450.0 5516½	0.3	1.0	d	2¼°	165415	M_L= 4.3
KRT	iPZ	165450½			d	2¼	165414	
RAB	iPZ iSN	173411.3 43.0	0.5	1.0	u	2½°	173329	M_L= 3.8
KRT	ePZ iSN	173412½ 41½			d		173334	
RAB	iPZ iSN	213511.0 40.0	0.4	7.0	d	2½	213433	
WAN	iPZ	213511.0	0.5	2.0	u			
SUL	iPZ	213511.0	0.3	1.0	u			
RAL	iPZ	213510.5	0.4	1.0	u			
KRT	iP iSN	213510 40	0.3	3.0	d	2½	213431	
RAB	iPZ iSN	215427.4 5502.5	0.5	2.0	u	3°	215341	
KRT	iPZ iZ iZ iSN	215429 34½ 58½ 5501½	0.5	1.2	u	2½°	215346	
RAB	iPZ eSN	222141.6 2215	0.4	1.5	d	2¼°	222058	
KRT	iPZ iSN	222143½ 2212½	0.4	1.0	d	2½°	222105	
4th Jan., 1968								
RAB	iPZ iSN	004958.1 5022.0	0.4	45.0	d	2°	004926	M_L= 5.1
WAN	iPZ	004958.1	0.5	15.0	d			
SUL	iPZ	004958.5	0.3	3.0	u			
RAL	iPZ	004958.2	0.5	6.0	d			
KRT	iP!Z iS!N	004955½ 5022			d	2°	004920	
RAB	iPZ iSE/	010816.5 1652.0	0.6	5.0	d	64°		
KRT	ePN	010818½			-			
RAB	iPZ iSN	072206.5 41.0	0.3	2.2	d	3°	072121	M_L = 5.0
RAB	iPZ iSN	073612.5 42.1	0.5	4.0	d	2½°	073534	M_L = 4.5
KRT	iPZ iSE	073610½ 36½	0.3	2.5	d	2°	073536	
RAB	eiPZ iZ iZ iS!N	102913½ 15.5 19.2 3032.0	0.5	2.0	d	6¼°	102732	M_L= 6.2
WAN	iPZ	102915.0	0.5	2.0	d			

			T sec	A mm	GM	Dist.	H	Remarks
4th Jan., 1968 (cont'd)								
SUL	ePZ	102915			d			
RAL	iPZ	102915.5	0.5	3.0	u			
KRT	ePZ	102910½	1.0	0.7	d	6½°	102733	
	iZ	13½						
	iSE	3025½						
RAB	ePZ	120722	0.5	1.8	d			Regional
KRT	iPZ	120720½	0.3	1.0	u	6½°	120546	
	iSE	0833½						
RAB	iPZ	152602.2	0.4	6.0	u	(2½°)	1525(24)	M_L= 4.2
	i(S)N	31.5						
KRT	iPZ	152557½	0.2	2.0	u	2½°	152520	
	iSN	2629½						
RAB	iPZ	172358.0	0.4	2.0	u	2½°	172320	M_L= 4.5
	iZ	2400.5						
	iSN	27.2						
RAL	iPZ	172359.2	0.5	1.5	u			
KRT	iPZ	172358½			u	2¾°	172317	
	iSE	2430½						
RAB	eZ/	174504			+			Traces
KRT	iPZ	225239½			d	2¾°	225155	
	iSE	5313						
5th Jan., 1968								
RAB	ePZ	005235½	0.5	3.0	d	5¾°	005109	C.B.M. M_L = 5.8
	eSN/	5342						
KRT	i(P)Z	005230½			u	(6¼°)		
	iZ	17½						
	iN	5322						
	iSN	41½						
RAB	iPZ	043559.8	0.4	4.0	u	3½°	043507	M_L= 4.6
	iSN	3640.0						
KRT	iPZ	043557	0.2	2.0	d	3¼°	043507	
	iSN	3635						
RAB	iPZ	050109.0	0.5	10.0	u	1½°	050041	M_L= 4.5
	iSN	30.0						
KRT	iPZ	050109½	0.3	6.0	u	1½°	050043	
	iSE	29½						
RAB	iPZ	090155.4	0.4	5.0	u	2¼°	090119	M_L= 5.2
	iZ	57.2						
	iS!N	0222.5						
KRT	iPZ	090153½	0.5	4.0	u	2°	090123	
	iS!N	0216½						
RAB	iPZ	090702.2	0.4	2.5	d	2¼°	090628	M_L= 4.3
	iSN	28.0						
KRT	iPZ	090659½	0.4	4.0	d	2°	090628	
	iSN	0723½						
RAB	iPZ	092554.0	0.4	2.0	d	2¼°	092521	M_L= 4.1
	iSN	2621.5						

			T sec	A mm	GM	Dist.	H	Remarks
5th Jan., 1968 (cont'd)								
KRT	ePZ iSN	092552½ 2622	0.6	0.5	d	2½°	092513	
RAB	iPZ iSN	111003.6 27.0	0.3	1.8	d	2°	110934	M_L= 3.9
KRT	ePZ iZ iSN	111003 10 27½			d	2°	110926	
RAB	iPZ iSN	124758.6 4823.0	0.5	2.4	d	2°	12427	M_L= 3.9
KRT	iPZ iSN	124756 4820	0.3	2.0	u	2°	124724	
RAB	iPZ eSE	145625.5 57	0.5	2.0	d	2½°	145543	M_L= 4.2
KRT	i(P)Z iSN	145624½ 5700			d	(3°)	1455(38)	
RAB	iPZ iSE	192137.0 44.0	0.4	4.5	u	½°	192127	M_L= 3.0
KRT	iPZ iSE	192139½ 45			d			Local
RAB	iPZ iSE	195515.8 39.1	0.5	2.0	d	2°	195440	M_L= 4.2
KRT	ePZ iS iSN	195516 19 40				2°	195444	
6th Jan., 1968								
	Changed to Primary time at 060055 hours.							
RAB	iPZ iSN	^10724.3 0800.5	0.5	1.8	d	(3°)	0106(37)	M_L= 5.2
KRT	iPZ	010725½	0.2	1.8	d			
RAB	iPZ iZ iSN	022257.0 59.0 2321.0	o.6	2.0	u	2°	022225	M_L= 4.5
WAN	ePZ	022257			d			
RAL	iPZ	022257.0	0.5	3.0	d			
KRT	iPZ	022256			d			
RAB	ePZ	044518	0.5	2.0	d			Regional CBM
KRT	iPZ iSN	044521 4645			-	7½°	044332	
RAB	iPZ iSN	065610.5 35.5	0.4	5.0	d	2°	065537	M_L= 4.3
KRT	iPZ iN iSN	065607½ 27½ 34	0.2	4.0	d	2½°	065532	
RAB	ePZ eSN	080648½ 0713	0.7	2.0	d	2°	080616	M_L= 4.4

			T sec	A mm	GM	Dist	H	Remarks
6th Jan., 1968 (cont'd)								
KRT	iPZ iSN	080645 0713	0.4	2.5	d	$2\frac{1}{2}^{o}$	080608	
RAB	iPZ iSN	082645.2 56.5	0.5	31.0	u	$\frac{3}{4}^{o}$	082630	M_L= 4.0
WAN	iPZ	082644.8	0.3	9.0	u			
SUL	iPZ	082645.0	0.5	2.0	d			
RAL	iPZ	082644.8	0.5	1.6	d			
KRT	iPZ iSN	082646 57			u	$\frac{3}{4}^{o}$	082631	
RAB	iPZ iZ iSN	135817.0 19.6 40.0	0.4	2.0	u	2^{o}	135747	M_L- 4.3
RAL	iPZ	135816.0	0.3	1.5	u			
KRT	iPZ iSE	135818 40	0.2	2.0	u	$1\frac{3}{4}^{o}$	135749	
RAB	iPZ iZ iZ iSE	211820.0 22.5 26.6 48.5	0.4	7.0	u	$2\frac{1}{4}^{o}$	211742	M_L= 5.1
WAN	iPZ	211819.5	0.5	2.0	u			
RAL	iPZ	211819.2	0.3	1.0	u			
KRT	iPZ iZ iSN	211820½ 22 52½	0.2	1.5	d	$2\frac{3}{4}^{o}$	211739	
RAB	iPZ eSN	214938.3 54	0.4	19.0	d	$1\frac{1}{4}^{o}$	214917	M_L= 3.8
WAN	iPZ	214938.0	0.2	9.5	d			
SUL	iPZ	214938.0	0.4	3.0	u			
RAL	iPZ	214938.2	0.5	7.0	u			
KRT	iPZ iSN	214938 53			d	$1\frac{1}{4}^{o}$	214918	
RAB	ePZ	234625	0.6	2.0	u			Teleseism
KRT	ePZ	234626			d			CBM
7th Jan. 1968								
	No records for Wood Anderson.							
RAB	iPZ iSNo	095713.2 37.0	0.5	5.0	dSE	2^{o}	095641	
WAN	iPZ	095712.8	0.4	2.0	d			Felt Rabaul Int III-IV 04°11'S,152°10" E
SUL	iPZ	095713.3	0.3	5.0	d			
RAL	ePZ	095712			d			
KRT	iP!Z	095714			d			
RAB	iPZ eSN	110456.6 2018	0.5	1.0	d	$1\frac{1}{2}^{o}$	111929	

			T sec	A mm	GM	Dist	H	Remarks
7th Jan., 1968 (Cont'd)								
RAB	e(P)Z	111957			d			Teleseism
RAB	iPZ iSN	121543.5 1612.0	0.4	1.5	d	$2\frac{1}{4}^{o}$	121506	
KRT	iPZ iSN	121543 $1512\frac{1}{2}$			u	$2\frac{1}{2}^{o}$	121506	
RAB	iPZ iSN	132542.0 2604.5	0.4	1.3	u	$1\frac{1}{4}^{o}$	132512	
KRT	ePZ iSN	132542 2602			d	$1\frac{1}{2}^{o}$	132516	
RAB	ePZ iSN	160650 0724.0	0.3	1.0	u	3^{o}	160605	
KRT	ePZ iSN	160651 0724			u	$2\frac{3}{4}^{o}$	160608	
RAB	iPZ iSN	161314.0 48.0	0.3	1.0	u	3^{o}	161229	
KRT	iPZ iZ iSN	161313 43 $48\frac{1}{2}$				3^{o}	161227	
RAB	iPZ iSN	170645.0 0707.5	0.3	1.8	d	$1\frac{3}{4}^{o}$	170615	
WAN	ePZ	170645	0.2	1.0	d			
RAL	iPZ	170644.8	0.5	6.0	d			
KRT	ePZ iZ iSN	$170645\frac{1}{2}$ 47 0708	0.5	0.4	d	$1\frac{3}{4}^{o}$	170616	
RAB	ePZ iSE	$181020\frac{1}{2}$ 56.0	0.4	1.5	d	4^{o}	181920	
KRT	ePZ iSN	181017 $59\frac{1}{2}$	0.7	0.6	d	$3\frac{1}{2}^{o}$	180922	
RAB	eZ/	193010						Traces
RAB	iPZ iS!N	210446.0 52.2	0.3	1.8	d	$\frac{1}{4}^{o}$	210438	
KRT	iPZ iSN	210446 57	0.4	0.5	u	$\frac{1}{4}^{o}$	210438	
RAB	iPZ iSN	211135.0 41.0	0.3	1.5	d	$\frac{1}{4}^{o}$	211127	
KRT	iPZ iSN	$211136\frac{1}{2}$ 46	0.3	1.0	u	$\frac{3}{4}^{o}$	211123	
RAB	ePZ eZ	211316 21	1.0	2.0	d			Regional deep
KRT	ePZ	211216	1.0	1.0	d			
RAB	iPZ iSN	213701.3 22.0	0.4	2.0	u	$1\frac{1}{2}^{o}$	213633	
KRT	iPZ iSN	213701 23			d	$1\frac{3}{4}^{o}$	213632	

			T sec	A mm	GM	Dist	H	Remarks
8th Jan., 1968								
RAB	iPZ	001210.2	0.5	2.5	d	3°	001124	M_L= 4.5
	iSN	45.2						
KRT	ePE	001209				3¼°	001118	
	iSN	48						
RAB	ePZ	001831	0.4	1.2	u	3¼°	001741	M_L= 4.6
	iSE	1909.0						
KRT	ePE	001830				3¼°	001739	
	iSE	1909						
RAB	iPZ	013455.0	0.5	2.0	u	2°	013422	M_L- 4.3
	iSN	3520.0						
KRT	ePZ	013455	0.5	0.4	d	2½°	013417	
	iSE	3524						
RAB	iPZ	032116.0	0.3	2.0	d			
KRT	eiPZ	032117			d	17½°		
	iZ	18						
	iSE	2434½						
RAB	iPZ	062306.6	0.5	23.0	u	1¼°	062246	M_L= 4.6
	iS!N	22.0						
WAN	ePZ	062306½			d			
RAL	ePZ	062306	0.8	2.0	u			
KRT	iPE	062306				1°	062249	
	iE	07						
	iSN	19						
RAB	iPZ	063012.6	0.5	1.5	u	2°	062941	M_L= 3.9
	iSN	36.5						
KRT	ePE	063013				2¾°	062928	
	iSN	38½						
	iN	47						
RAB	ePZ	065846	0.3	2.0	d	1¼°	065825	M_L= 3.5
	iSN	5902.0						
KRT	iPZ	065846			d			
RAB	iPZ	070317.5	0.3	3.0	u	2¼°	070246	M_L= 4.4
	iSN	45.0						
RAL	iPZ	070317.0	0.5	1.0	u			
KRT	iPZ	070318				2¼°		CBM
	iSN	45						
RAB	eZ/	131504						Traces
RAB	iPZ	135616.5	0.5	3.0	u	2°	135543	M_L= 4.3
	iSN	41.5						
KRT	iPZ	135611	0.5	1.5	u	2½°	135532	
	iSN	42						
RAB	iPZ	160934.5	0.5	1.0	d	2°	160903	M_L= 4.2
	iZ	35.4						
	eSN	58						
WAN	iPZ	160935.0	0.3	2.0	d			

			T sec	A mm	GM	Dist	H	Remarks
8th Jan., 1968 (cont'd)								
RAL	iPZ	160934.8	0.2	1.0	d			
KRT	ePZ	160935½	0.5	0.3	d	2°	160902	
	iZ	37						
	iSN	1001						
RAB	iPZ	172446.0	0.4	9.0	d	3°	172401	M_L= 5.6
	iSE	2520.0						
WAN	iPZ	172446.0	0.5	3.0	u			
SUL	ePZ	172446			d			
RAL	iPZ	172445.4	0.6	2.5	u			
KRT	iPZ	172447	0.4	4.3	d			
RAB	iPZ	183153.0	0.2	1.5	d	2½°	183112	M_L= 4.3
	iSE	3224.0						
KRT	iPZ	183155			d	2½°	183116	
	iSN	3225						
RAB	ePZ	190332	0.3	1.5	d			Teleseism
RAB	iPZ	195947.4	0.3	1.5	d	2½°	195909	M_L= 4.2
	iSN	200016.0						
KRT	iPZ	195947			u	2¼°	195910	CBM
	iSN	200015						
RAB	ePZ	204223	1.0	1.2	d			Teleseism
RAB	ePZ	220107½	0.8	1.0	u	36°		
	iZ	11.5						
	eSN/	0652						
KRT	ePZ	220108			d			
RAB	iPZ	233745.2	0.6	1.8	d	2½°	233707	
	iSN	3814.0						
KRT	iPZ	233745			d	2¼°	233708	CBM
	iZ	48						
	iSN	3813						
RAB	iPZ	234847.0	0.5	2.8	d	2½°	234809	
	iSN	4916.0						
KRT	iPZ	234849			d	2¼	234815	CBM
	iSN	4915						
9th Jan., 1968								
RAB	iPZ	012904.0	0.5	2.3	u	2½°	012826	M_L= 4.6
	iSN	33.0						
KRT	iPZ	012904	0.3	1.0	u	2¼°	012827	
	iSN	32						
RAB	iPZ	065425.2	0.5	1.5	d	2°	065353	M_L= 3.9
	iSN	49.5						
KRT	iPZ	065423½	0.5	0.5	d	2½°	065354	
	iSN	53						
RAB	iPZ	063223.0	0.4	2.5	d	1½°	063158	M_L= 3.7
	iSN	42.2						
RAB	iPZ	081800.5	0.5	3.0	d	2¼°	081724	M_L= 4.1
	iSN	27.5						

			T sec	A mm	GM	Dist	H	Remarks
9th Jan., 1968 (cont'd)								
KRT	iPZ iSN	081801 29	0.2	6.0	u	2¼°	081726	
RAB	ePZ iSE	104039¼ 4114.5	0.5	2.0	d	3°	103953	M_L= 4.4
KRT	ePZ iSN	104038 4112	0.7	0.5	d	2¾°	103953	
RAB	eiPZ iZ iSN	110433 34.2 0505.0	0.5	1.0	u	2½°	110351	M_L= 4.9
KRT	iPZ iSN	110433 0506	0.4	2.0	d	2¾°	110350	
RAB	iPZ iSN	123114.0 49.0	0.5	1.0	u	3°	123028	M_L= 4.4
KRT	ePZ iSN	123114 45½	0.5	0.7	d	2½°	123033	
RAB	iPZ iZ iSN	142600.5 02.0 37.0	0.5	3.0	d	3 ¾°	142512	M_L= 5.1
SUL	iPZ	142601.5	0.5	1.8	d			
RAL	iPZ	142601.0	0.5	3.0	U			
KRT	iPZ iSN	142600½ 2634	0.5	5.0	d	2¼°	142517	
RAB	iPZ iSN	143803.3 37.[illegible]	0.6	2.0	d	3°	143719	M_L= 4.6
SUL	i(P)Z	143805.2	0.6	1.0	d.			
RAL	ePZ	143803½	0.6	1.5	d			
KRT	ePZ iSN	143802½ 35			d	2½°	143720	
RAB	iPZ iSN	144948.0 5023.5	0.5	8.0	u	3°	144901	M_L= 5.0
SUL	iPZ	144947.6	0.4	1.6	u			
RAL	iPZ	144948.0						
KRT	iPZ iSN	144947½ 5020	0.3	4.0	d	2¼	144904	
RAB	iPZ i!Z iZ iSN	170148.0 49.0 58.0 0219.0	0.4	2.0	u	2½°	170107	M_L= 5.0
SUL	iPZ	170148.2	0.5	1.0	u			
RAL	iPZ	170148.5	0.6	5.0	d			
KRT	iPZ	170146	0.2	3.0	u			
RAB	ePZ	202717	0.4	1.0	d			Regional
KRT	iPZ iSN	202717 2827			d	6¼°	202547	

			T sec	A mm	GM	Dist.	H	Remarks
9th Jan., 1968 (cont'd)								
RAB	iPZ iSN	204408.5 44.2	0.3	1.5	d	3°	204321	M_L= 4.6
RAL	iPZ	204408.5	0.5	1.0	u			
KRT	iPZ iSN	204408 40	0.5	1.5	d	$2\frac{3}{4}$°	204326	

Central Observatory
RABAUL

G.W.D'ADDARIO
Vulcanologist-in-Charge

PEA Feb.68 No. 4

TERRITORY OF PAPUA AND NEW GUINEA
GEOLOGICAL AND VOLCANOLOGICAL BRANCH
VOLCANOLOGICAL SECTION

PRELIMINARY EARTHQUAKE ANALYSIS
RABAUL CENTRAL OBSERVATORY
1968

Rabaul	RAB	From: 17th January, 1968 To : 23rd January, 1968
Keravat	KRT	From: 17th January, 1968 To : 23rd January, 1968
Esa'ala	ESA	From: To :
Tabele	TBL	From: To :
Agenahambo	AGE	From: To :
Waris	WAA	Not operational
Ulamona	ULA	Not operational
Piva	PIV	Not operational
C.Gloucester	LAG	From: To:

STATION PERSONNEL

RAB Central Observatory, Rabaul.

Vulcanologist-in-Charge	G.W. D'Addario
Vulcanologist	R.F. Heming
Seismologist	(Position Vacant)
Seismogram Readers	D.J. Cook; H.M.Carrick
Senior Technical Officer	N.O. Myers
Technical Officer	R.J. Conway
Vulcanological Assistants	L. Topue; M. Gaiam V. Kaita
Technical Assistant	P. Daimbari
Trainee Vulcanological Assistants	B. Talai; M. Salaiau; (one Position Vacant)
Secretary	G. Chant

KRT Keravat Outstation

Observer (part-time)	G.E. Chorick

TBL Tabele Observatory

Observer	E. Ravian

ESA Esa'ala Observatory

Observer	F. Dira

AGE Agenahambo Outstation

Observer (part-time)	Br. B. Hughes

The Rabaul Preliminary Earthquake Analysis (PEA) is produced by the staff under the direction of the Vulcanologist-in-Charge from whom additional information and photocopies of seismogram records from all stations may be obtained on request.

Please address all communications to:-

Vulcanologist-in-Charge,
Central Observatory,
P.O. Box 386,
RABAUL, T.P. & N.G.

SEISMOGRAPH STATIONS

Station (NEW GUINEA)	Code	South Latitude	East Longitude	Elev. (m)	Foundation
Rabaul	RAB	04°11'28.6"	152°10'11.4"	183.5	Basalt Flow
Wanliss Street	WAN*	04°11'39.6"	152°10.32.5"	25.0	Basalt Flow
Sulphur Creek	SUL*	04°13'09.8"	152°10'33.3"	8.5	Unconsolidated Volcanic Ash
Rabalanakaia	RAL*	04°13'13.0"	152°12'07.0"	91.0	Unconsolidated Volcanic Ash
Tavurvur	TAV*	04°13'52.2"	152°13'12.9"	27.0	Andesite Flow
Taviliu	VUL*	04°16'58.2"	152°08'44.6"	332.3	Unconsolicated Volcanic Ash
Keravat	KRT	04°21'10.5"	152°03'06"	20.0	Alluvium
Ulamona	ULA	04°59'24.0"	151°16'30.0"	17.0	Lapilli Tuff
Tabele	TBL	04°06'04.67"	145°00'41.37"	179.5	Basalt Flow
Waris	WAA	04°07'00"	145°06'00"	48.0	Lapilli Tuff
Piva	PIV	06°12'00"	155°03'30"	60.0	Alluvium
Cape Gloucester (PAPUA)	LAG	04°27'20"	148°26'00"	24.0	Lapilli Tuff
Agenahambo	AGE	08°48'49"	148°05'56"	303.0	Unconsolidated Volcanic Ash
Esa'ala	ESA	09°44'18.2"	150°48'50.7"	46.4	Granite Gneiss

* Rabaul Harbour Network

STATION INSTRUMENTATION

Station & Instruments (NEW GUINEA)	Comp.	To	Tg	Trace Speed mm/min	Approximate relative Magnification	Approximate damping
Rabaul Central Observatory RAB						
World-Wide Standard	Z	1.0	0.74	60	12,500	Critical
	N,E	1.0	0.74	60	6,250	Critical
	Z/N/E/	15.0	100.0	15	750	Critical
Benioff VR 14.7Kg	Z	1.0	0.02	180 *	4,000	Critical

* Recording is triggered by the onset of any earthquake with pre-determined minimum amplitude. Recorder is stopped automatically by hour break pulse.

Omori 15Kg	No	3.6	-	24	12	10.1(air)
Omori 15Kg	Eo	3.8	-	24	10	10.1(air)
Wood-Anderson Torsion	Na,Ea	0.8	-	60	2,800	Critical
Rabaul Harbour Network						
WAN° Benioff VR 14.7Kg	Z	1.0	0.02	60	5,240	Critical
SUL° Benioff VR 14.7Kg	Z	1.0	0.02	60	2,850	Critical
RAL° Benioff VR 14.7Kg	Z	1.	0.02	60	8,075	Critical
TAV° Benioff VR 14.7Kg	Z	1.0	0.02	60	20,900	Critical
VUL°° Benioff VR 14.7Kg	Z	1.0	0.02	60	5,000	Critical

Readings from the Harbour Network are entered in the PEA only for large earthquakes.

STATION INSTRUMENTATION

Instruments	Comp.	To	Tg	Trace Speed mm/min	Approximate relative Magnification	Approx. damping
Rabaul Harbour Network (Cont'd)						
KRT - Keravat Outstation						
Benioff Mc 50Kg	Z	1.2	0.2	15	20% sensitivity	Critical
Benioff MC 50Kg	N,E	1.2	0.2	15	10% sensitivity	Critical
ULA - Ulamona Field Station						
Willmore portable	Z	0.6	0.25	60	3,000	underdamped
PIV -Piva Field Station						
Willmore portable	Z	0.6	0.25	60	3,000	underdamped
WAA -Waris Field Station						
Willmore portable	Z	0.6	0.25	60	3,000	underdamped
LAG -Cape Gloucester Field Station						
Willmore portable	Z	0.6	0.25	60	3,000	underdamped

o Signals from these stations are telemetered by land line to Helicorders (Geotech Mod.2484) at the Central Observatory.

oo Signals from this station are telemetered via VHF to its Helicorder at the Central Observatory.

N.B. These field stations consist of a permanent building in which instruments are installed when necessary.

Details of emergency field stations, within the Territory will be listed when in operation.

TBL -Tabele Observatory						
Benioff VR 107.5Kg (PAPUA)	Z	1.0	0.2	60	1,350	critical
ESA -Esa'ala Observatory						
Benioff VR 107.5Kg	Z	1.0	0.2	15	36,000	critical
Benioff VR 107.5Kg	N,E	1.0	0.2	15	18,000	critical
Benioff VR 107.5Kg	Z/N/E/	1.0	60.0	30	50% sensitivity	critical
AGE -Agenahambo Station						
Willmore portable	Z	0.6	0.25	60	3,000	underdamped

VR Variable Reluctance
VR Moving-coil

Relative magnification curves of seismograph systems installed in the stations controlled by the Rabaul Central Observatory are listed once a month on the P.E.A.

PRESENTATION OF DATA

(reviewed in November, 1967)

All times are reduced to Greenwich Mean Time (GMT), which is 10 hours behind Eastern Standard Time.

At RAB and Harbour Network, the time signal is marked every minute on each seismogram record from the Observatory crystal chronometer. Second marks from radio signal VNG (Australia) are recorded on World-Wide Standard System S.P.-N component only according with the W.W.S.S. programme, at six hour intervals. Primary time is provided by W.W.S.S. equipment and secondary time by a Labtronic crystal chronometer with the accuracy of ± 5ms per day compared with VNG (Australia) with the aid of a chronoscope.

At TBL and AGE, the time signal is derived from a spring driven chronometer (Mercer) and marked each minute on records. Time accuracy is determined by comparison with signals from WWVH daily. Linear correction is applied to the daily drift.

On all seismogram records time increases from left to right and time break is upward.

At RAB* and Harbour Network the recording drum of each seismograph is driven by a 110VAC 60Hz synchronous motor. The 110VAC is frequency regulated by a crystal chronometer.

* The Omori recording drum is driven by a nonregulated 50Hz frequency supply.

At ESA and KRT power for recorder motors is frequency regulated by a crystal chronometer at 50Hz. Power for AGE and TBL and field stations is supplied by a 50Hz free running oscillator.

Direction of Motion

Upward direction of ground motion corresponds to upward trace motion on vertical seismogram records. Direction of component of ground motion to North or East corresponds to upward trace motion on horizontal seismogram records.

Vertical trace motion from impulsive onset of longitudinal waves of compressional or dilatational ground movement is indicated by "u" or "d" accompanied by N,S,E or W, as per trace motion amplitude on horizontal seismogram records, to represent vectorially the direction of ground motion. "+" or "-" indicates upward or downward motion of the ground respectively, from a wave not known to be of the longitudinal type.

Accuracy of Readings

When readings are given with a decimal figure, they are to 1/10 of a second, other readings have been made to the nearest half second.

Crustal Phases

Px, Sx Crustal phases, other than Pn and Sn for local and near earthquakes.

Felt Intensity

Information on maximum intensities of shocks reported felt is included. Intensities are given in Roman numerals based on the Modified Mercalli Scale, of 1931.

PRESENTATION OF DATA (CONT'D)

Determinations of Epicentres

Where no source is cited, the determination of epicentres, origin time, focal depth and distance in central angle degrees from the pertinent station for local and regional earthquakes, are carried out at the Central Observatory, Rabaul.

Geographical Designation of Epicentres

The regional names which follow the co-ordinates of epicentres located at the Central Observatory are meant only to supplement the co-ordinates and normally follow well-known geographical rather than geological features. Use is made of the full degree blocks according to the method defined by E.A. Flinn and E.R. Engadhl in "A PROPOSED BASIS FOR GEOGRAPHICAL AND SEISMIC REGIONALIZATION". Seismic Data Laboratory Report No. 101, U.I.D. Inc., Alexandria, Virginia, 1964, adopted by the U.S.C.G.S. for computer requirements.

Magnitude Definition and Determination

M_L - Local Magnitude (Richter, 1935) is calculated from the recorded trace amplitude of the Wood-Anderson torsion seismographs of stated physical constants (installed at the Observatory in November, 1967).

Maximum trace amplitude (0 to peak) expressed in millimetres and tenths is measured directly on both components. Magnitude is determined independently and the arithmetic mean taken. M_L values are given to the tenth of a unit.

The station correction factor is assumed to be zero until better known.

M_S -Surface Wave Magnitude (Gutenberg & Richter, 1956) is calculated from the amplitude of surface waves of period near 20 seconds for shallow distant earthquakes.

M_B -Body Wave Magnitude is calculated from the ratio of amplitude over period for body waves on S.P.-Z of World-wide Seismograph System only when depth is known. The magnification factor for the standard seismograph is taken into account.

m -Unified magnitude (Gutenberg & Richter, 1956) has the following relation to M_L, M_S, and M_B.

$$m = 1.7 + 0.8\ M_L - 0.01\ M^2_L$$

$$m = M_B \text{ (without correction)}$$

$$m = 2.5 + 0.63\ M_S$$

Local Magnitude of earthquakes recorded at RAB with a clear S-P interval is tabulated on a Day-Distance (in Central Angle Degrees) graph which is added to the PEA monthly.

Symbols

i - impulsive and sharply defined beginning of a phase.

e - emergent and poorly defined beginning of a phase.

T - Period in seconds

A - Peak-to-Trough trace amplitude in millimetres.

GM - Ground Motion.

Dist -Distance in central angle degrees.

H - Origin Time

h - Focal depth in Kilometres

CBM - Confused by microseisms.

PRESENTATION OF DATA (CONT'D)

Remarks

Local - Typical signature of an earthquake with epicentre within 0.9°.

Near - Typical signature of an earthquake with epicentre between 0.9° and 9°.

Distant - Typical signature of an earthquake with epicentre between 9° and 45°.

Teleseism - Typical signature of an earthquake with epicentre more than 45°.

Traces - Any recorded disperse waves or very weak unknown earthquake phases.

Local and Near earthquakes will be classified Regional, and Distant earthquakes will be grouped with Teleseisms if sheer waves and their reflections are unidentifiable.

G.W. D'ADDARIO
Vulcanologist-in-Charge

			T sec	A mm	GM	Dist	H	Remarks
17th Jan.,1968.								
RAB	iPZ	020111.7	0.4	3.0	d	2°		
	iSN	35.5					020040	M_L=4.9
WAN	iPZ	020112.6	0.2	1.4	d			
RAL	iPZ	020112.5			d			
KRT	iPZ	020113	0.3	7.0	u	2°		
	iN	32						
	iSN	37					020041	
RAB	ePZ	064409	0.4	2.0	d	1¼°		
	iSN/	26.0					064346	M_L=4.3
RAL	iPZ	064411.4	0.2	3.8	u			
KRT	iPZ	064410½	0.3	5.0	u	1°		
	iE	20½						
	iSE	22½					064354	
RAB	ePZ	090507	0.4	2.5	d	6°		
	eSN	0617					090336	M_L=5.4
KRT	iPZ	090511	0.3	4.0	d	5½°		Esa'ala Int.
	iSE	0614					090349	11-111 09°44'S 150°48'E
RAB	eZ/	100628			-			Traces
RAB	iPZ	110731.3	0.3	2.0	u	2°		
	iSN	56.0					110658	M_L=4.8
WAN	iPZ	110731.0	0.2	1.0	u			
SUL	iPZ	110730.6	0.2	1.0	d			
RAL	iPZ	110730.4	0.2	2.0	d			
KRT	iPZ	110731	0.4	2.2	d	2°		
	iSE	56					110658	
RAB	eZ/	135436			-			Traces
RAB	iPZ	181235.0	0.3	1.5	u	1½°		
	iSE	56.0					181207	M_L=3.8
RAL	iPZ	181234.0	0.5	1.0	d			
KRT	iPZ	181235			d	2°		C.B.M.
	iSN	59					181203	
18th Jan.,1968								
RAB	ePZ	071121	0.5	1.2	d	6½°		
	eSN/	1236½					070944	
KRT	e(P)Z	071118½			d	6½°		
	iSN	1233½					070941	
RAB	iPZ	084717.6	0.4	3.0	d	1½°		
	iSN	38.0					084651	M_L=4.4
RAL	iPZ	084717.0	0.5	1.8	d			
KRT	iPZ	084718½	0.2	2.0	u	1½°		
	iSN	38					084653	
RAB	iPZ	094312.5	0.3	3.6	d	1¼°		
	iSN	27.5						M_L=3.8
RAL	ePZ	094312	0.5	1.0	u		094252	
KRT	iPZ	094310½			d	1°		
	iZ	11½						
	iSN	24½					094252	

			T sec	A mm	GM	Dist	H	Remarks
18th Jan., 1968 (cont'd)								
RAB	iPZ	215958.8	C.4	3.0	u	¾°		M_L= 3.7
	iS!N	220010.0					215944	
RAL	iPZ	215959.3			d			
KRT	iPZ	215959			u	½°		
	iS!N	220008½					215947	
19th Jan., 1968.								
RAB	iPZ	000652.3	0.5	4.0	d	2¼°		M_L= 4.3
	eSN	0719					000616	
RAL	iPZ	000651.6	0.6	1.0	u			
KRT	iPN	000650			d	2°		
	iSN	071½					000618	
RAB	iPZ	005148.0	0.3	10.6	u	1½°		M_L=3.3
	iSN	5208.0					005121	
RAL	iPZ	005147.6	0.6	2.0	u			
KRT	iPZ	005146	0.2	4.0	d	1½°		
	iSN	5203½					005123	
RAB	iPZ	041156.0	0.4	2.5	d	1°		M_L= 3.8
	iS!N	1208.0					041140	
KRT	iPZ	041154½			d	¾°		
	iSN	1205½					041140	
RAB	eiPZ	060636½	0.5	5.0	nw	9½°		M_L=6.0
	iPZ	0637.8					060422	Epicenter 10½°S 159½°E
	eSN	0823						
RAL	ePZ	060637	0.8	1.0	d			
KRT	iPZ	060637	0.4	2.5	u			
	iZ	40½						
RAB	ePZ	083923	0.5	1.9	d	(10¼°)		M_L= 6.0
	e(S)E/	4118					0836(55)	
RAB	ePZ	090202½	0.5	1.0	d	11½°		
	eSE/	0410						
KRT	ePZ	090205½	0.7	1.0	d	10°		
	iSE	0356½						
RAB	iPZ	182704.1	0.5	3.0	d	3½°		M_L= 5.1
	iSN	45.0					182610	
RAL	iPZ	182703.8	0.6	2.0	u			
RAB	eZ/	185432			-			Traces
KRT	iPZ	182704½	0.3	1.0	d	3¼		
	iSE	43½					182614	
RAB	iPZ	202458.0	0.4	1.5	u	3°		M_L= 5.4
	iZ	2509.0						
	iSN	33.0					202412	
RAL	ePZ	202458.0	0.7	1.5	d			
KRT	eiPZ	202457	C.6	0.4	d	2¼°		
	iZ	58						
	iE	2525					202420	
	iSE	31						

			T sec	A mm	GM	Dist	H	Remarks
19th Jan.,1968. (cont'd)								
RAB	iPZ	224232.5	0.4	3.5	u	6°		M_L= 5.6
	i!Z	34.0					224104	
	eSE/	4340						
RAL	ePZ	224233½	0.6	1.0	u			
KRT	iPZ	224230	0.2	1.0	u	3¾°	224131	
	iZ	31						
	iSE	4315						
20th Jan.,1968.								
RAB	ePZ	001053	0.5	3.4	d	2¼	001044	M_L= 4.6
	iSE	1119.8						
KRT	iPZ	001050	0.2	2.4	d	1¾°	001022	
	iSN	1111						
RAB	iPZ	025917.5	0.6	3.5		1¾°	045912	C.B.M. M_L= 3.7
	iSN	38.9						
KRT	iPZ	025914	0.2	2.0	d	1½°	025849	
	iSE	33						
RAB	eiPZ	075058½	0.6	12.1	d	1¼°	075053	M_L= 4.3
	iSE	5114.3						
KRT	iPZ	075100	0.2	2.0	u	1½°		
	iSN	19					075035	C.B.M.
RAB	iPZ	110356.2	0.6	6.2	u	3¾°	110342	
	e(S)N	0441½						
RAB	ePZ	111941	0.6	2.9	u	2¾°		M_L= 4.3
	iSE	2012.7					111930	
KRT	iPZ	111943	0.2	2.0	u	3°		
	iSN	2018½					111857	
RAB	iPZ	115948.2	0.5	110.0	d	1¼°		M_L= 5.0
	i(S)N/	120004					115943	
WAN	iPZ	115947.5			d			
SUL	iPZ	115948.0			d			
RAL	iPZ	115948.0			d			
KRT	iP!Z	115949½			d			
RAB	iPZ	121036.1	0.7	6.0	d			
WAN	iPZ	121035.5			u			
RAL	iPZ	121036.0			u			
KRT	iPZ	121038	0.3	6.0	u	1½°		
	iSN	55½					121015	
RAB	ePZ	152638	0.6	2.8	u			
KRT	iPZ	152640	0.2	1.5	u	3¼°	152530	
	iZ	43						
	iN	2711						
	iSN	18						

			T sec	A mm	GM	Dist	H	Remarks
18th Jan.,1968 (cont'd)								
RAB	e(P)Z/ iE/ e(Lq)N/ e(Lr)N/	120118 1502 1704 1946			d			Teleseism
RAB	iPZ	135804.4	1.0	6.0	d			(Regional)
KRT	e(P)Z	135802½	0.5	1.0	d			
RAB	ePZ	204540	0.3	1.0	d	5°		M_L= 5.4
	eSN	4637					2044.26	
KRT	e(P)Z iSN	204540½ 4627			(d)	(4°)	2044(40)	

../cont'd

			T sec	A mm	GM	Dist	H	Remarks
20th Jan.1968 (cont'd)								
RAB	ePZ	164717½	1.8	1.8	d	23°		
	iPPZ/	4816						
	iSE/	5208						
	iSSN/	5256						
	iSSSN/	5311						
	iLRZ/	5354						
	iPcSN/	5418						
	MZ/	57.5						
KRT	ePZ	164715	1.0	0.5	d			
	eZ	19½						
RAB	ePZ	190207½	0.8	2.0	u	2¾°		M_L= 4.4
	iSE	41.9						
KRT	ePZ	190207					190157	
	iZ	13			d			C.B.M.
	iSE	41					190122	
RAB	ePZ	201148	0.5	4.0	u			
WAN	iPZ	201148.3	0.6	2.0	d			
RAL	iPZ	201148.3	0.6	3.0	u			
KRT	ePZ	201149½	1.0	0.6	d			
	iZ	50½						
RAB	ePZ	212891/2	0.9	5.0	d			
WAN	ePZ	212810	0.6	1.5	u			
RAL	ePZ	212809½			u			
KRT	iPZ	212811	0.8	2.3	d			
	i!Z	12						
	i(S)N	3330						
RAB	ePZ	222804.0	0.5	8.0	d	5°		M_L= 6.1
	iSN	2902.3						
WAN	ePZ	222840½	0.6	2.0	u		222747	
RAL	iPZ	222840.0			u			
KRT	eiPZ	222841	0.6	0.5	d	1¾°	222812	
	iZ	43						
	iS!N	2903						
RAB	eiPZ	232706	0.4	14.1	u			
21st Jan.1968.								
RAB	iP!Z	002847.2	1.0		d	2°	002814	M_L= 5.5
	iSN/	2912.0						
WAN	iPZ	002847.0	0.3	4.0	d			
SUL	iPZ	002847.6	0.2	8.0	u			
RAL	iPZ	002846.6	0.5	3.0	d			
KRT	i(P)Z	002858	0.3	4.0	d			
	i!Z	59						
RAB	ePZ	032425	0.5	3.0	d	1¾°	032357	M_L= 4.5
	iSE	45.8						
WAN	iPZ	032424.5	0.2	1.0	u			
RAL	iPZ	032424.0	0.2	3.8	d			

			T sec	A mm	GM	Dist	H	Remarks
21st Jan.,1968 (cont'd)								
KRT	iPZ	032426	0.3	4.0	d	2°		
	iSE	49					032356	
RAB	ePZ	050046	0.5	1.8	u	2¼°		M_L= 4.6
	iSN	0112.1					050012	
KRT	e(P)Z	050045			d	(3¼)	0459(54)	
	iZ	49						
	iN	0113						
	i(S)N	24						
RAB	iPZ	060331.8	0.3	7.0	d	2¼°	060255	M_L= 5.7
	iS!E	59.5						
WAN	iPZ	060332.0	0.5	2.0	u			
RAL	iPZ	060331.3	0.5	2.0	u			
KRT	iPZ	060332½			d	2¼°		
	iZ	33½					060257	
	iZ	35½						
	iS!E	59						
RAB	iPZ	061439.9	0.4	2.6	u	2½°		M_L= 4.1
	iSE	1508.2					061402	
KRT	iPZ	061438½	0.4	1.5	u	2¼°		
	iSN	1505½					061402	
RAB	e(P)Z	064801½	1.0	2.4	u			C.B.M.
RAB	ePZ	101713	0.6	1.2	d	2½°		M_L=4.4
	iSE	43.9					101632	
KRT	iPZ	101712½	0.2	1.5	u	2½°	101636	
	iE	35						
	iSE	41						
RAB	ePZ	114125½	0.4	1.1	u	3¼°		M_L= 5.0
	iSE	4202.6					114037	
KRT	iPZ	114125½	0.5	1.5	u	3¼°		
	iE	52						
	iSE	4204					114034	
RAB	e(P)Z	132014	0.5	1.0	d	(3°)		
	iSE	47.9					1319(29)	
KRT	iPZ	132018½	0.3	1.5	u	(3°)		
	iSE	54					1319(32)	
RAB	e(P)Z	144528	0.7	0.9	d	(3°)		
	i(S)E	4602.8					1444(42)	
KRT	ePZ	144531½	0.5	0.5	u	3½°	144435	
	iSE	4615						
RAB	ePZ	144945.0	0.5	4.5	d	1½°		M_L= 3.8
	iSN	5004					144920	
WAN	iPZ	144944.6	0.5	2.0	d			
RAL	iPZ	144944.5	0.5	2.0	d			
KRT	iPZ	144944½	0.2	3.0	d	1½°		
	iSE	5002					144920	

			T sec	A mm	GM	Dist	H	Remarks
21st Jan.,1968 (cont'd)								
RAB	eiPZ	155206	0.5	3.8	u	1½°		M_L= 4.0
	iSE	25.0					155139	
WAN	ePZ	155206	0.3	1.0	u			
RAL	iPZ	155207.0	0.2	1.2	d			
KRT	iPZ	155204½	0.2	9.0	d	1¼°		
	iSE	21					155142	
RAB	ePZ	170247				94°		
	e(PP)Z	0554						
	iPSE/	1534						
	iSSE/	2014						
	eLRE/	2912						
RAB	ePZ	181703½	0.5	1.5	d	3¼°		M_L= 4.1
	iSE	41.3					181614	
KRT	ePZ	181705½	0.7	0.5	d	3½°		
	iSE	45					181613	
KRT	i(P)Z	225224			d	(2¾°)		C.B.M.
	iSE						2251(39)	
KRT	iP!Z	225709			u			
22/1/68	No records for Wood Anderson from 0418 - 2238 hours							
RAB	ePN	022036	0.3	2.0	u	2½°		M_L= 4.9
	iSE	2105.0					021958	
WAN	ePZ	022035	0.4	1.5	d			
RAL	ePZ	022035	0.2	1.0	d			
KRT	iPZ	022032½	0.2	5.0	u	2°		
	iSN	57½					021959	
RAB	iPZ	050534.0	0.4	7.0	d	1½°		
	iSN	53.0					050509	
WAN	iPZ	050533.5	0.3	2.8	d			
KRT	iPZ	050531½			d	1¼°		C.B.M.
	iSN	47½					050510	
RAB	ePZ	072839	0.8	1.0	d			Regional
RAB	iPZ	085642.3	0.4	8.0	d	2¼°		
	iZ	46.0						
	iSN	5708.0					085608	
WAN	ePZ	085642	0.5	2.0	d			
RAL	iPZ	085642.0	0.5	1.5	d			
KRT	eiPZ	085643	0.6	1.0	d			
	iZ	44½						
RAB	iPZ	104325.3	0.5	1.5	d	2°		
	iZ	27.0						
	iSN	49.6					104253	
RAL	ePZ	104325			d			
KRT	iPZ	104325½			d	1¾°		
	iSE	47½					104246	

			T sec	A mm	GM	Dist	H	Remarks
22nd Jan.,1968 (cont'd)								
RAB	iPZ	112543.5	0.3	8.0	d	2¼°		
	iZ	48.0					112508	
	iSN	2610.0						
WAN	ePZ	112543	0.5	2.0	d			
SUL	iPZ	112543.5	0.3	1.0	u			
RAL	iPZ	112543.1	0.5	2.0	u			
KRT	iPZ	112544½	0.3	6.0	u			
RAB	iPZ	124958.0	0.4	2.0	u	2½°		
	iSE	5030.0					124916	
KRT	iPZ	124959			u	1¾°	124921	
	iSN	5028½						
RAB	iPZ	141723.5	0.5	5.0	d	2½°	141649	
	iZ	33.5						
	iZ	38.0						
	iZ	45.0						
	iSN	49.5						
WAN	iPZ	141723.3	0.4	1.2	u			
RAL	iPZ	141723.0	0.5	2.0	u			
KRT	iPZ	141724½	0.4	1.5	d	2½°		
	iZ	27½					141649	
	iSE	51½						
RAB	iPZ	142737.5	0.5	1.5	d	3°		
	iSE	2811.0					142652	
RAL	ePZ	142737½	0.5	1.0	u			
KRT	ePZ	142737½	0.5	0.7	d	2°		
	iSE	2809½					142655	
RAB	iPZ	153717.0	0.5	15.0	d	2¼°		
	iSN/	43					153643	
KRT	iPZ	153718	0.6	6.0	d			
RAB	eiPZ	181824	0.4	1.0	d	6¼°	181651	
	iZ	25.0						
	iZ	34.0						
	iSE/	1936						
WAN	iPZ	181824.5	0.5	1.0	u			
SUL	ePZ	181824½	0.5	1.0	d			
KRT	iPZ	181823½	0.4	1.0	d	4¾°		
	iZ	25½					181750	
	iSE	1935½						
RAB	iPZ	185954.0	0.5	6.0	u	3°	185908	
	iZ	57.0						
	iS!E	190029.0						
WAN	ePZ	185954	0.6	2.0	u			
RAL	iPZ	185954.0	0.5	2.0	d			
KRT	ePZ	185954½	0.5	0.6	d	2°	185914	
	iZ	55½						
	iSE	190025½						

			T sec	A mm	GM	Dist	H	Remarks
22nd Jan.,1968 (cont'd)								
RAB	iPZ	210925.5	0.3	1.3	u	1¾		
	iSN	47.0					210856	
KRT	iPZ	210924	0.4	0.6	d	1¾°		
	iSN	45½					210856	
23rd Jan.,1968. No.S.P. N/S records								
RAB	iPZ	002112.0	0.4	4.0	d			Near shock
WAN	iPZ	002112.5	0.6	2.0	d			
RAL	iPZ	002112.0	0.5	1.0	d			
KRT	iPZ	002109½	0.4	2.4	d	(4½°)	0020(02)	
	iE	31½						
	i(S)E	2201½						
RAB	ePZ	031508	0.4	1.5	d	2¼°		M_L= 4.1
	eSE	35					031432	
KRT	ePZ	031504½	0.2	1.5	d	2½°	031436	
	iN	26½						
	iSN	33½						
RAB	iPZ	050015.5	0.4	7.0	u	1½°		M_L=4.6
	iSE	34.5					045950	
WAN	iPZ	050014.0			d			
RAL	iPZ	050014.5			d			
KRT	iPZ	050013½	0.4	15.0	d		045951	
	iS!E	30½						
RAB	iPZ	085740.0	0.3	2.0	u	2°		M_L= 4.6
	iSE	5804.0					085708	
WAN	ePZ	085740	0.2	1.0	d			
RAL	iPZ	085739.6	0.6	4.0	u			
KRT	eiPZ	085737½	0.2	5.0		1¾°		
	iE	38½					085710	
	iS!E	58½						
RAB	ePZ	095307	0.3	2.0	d	1½°		M_L= 3.8
	iSE	27.5					095245	
KRT	ePZ	095308½	0.2	1.0	d	1½°		
	iSE	28½					095242	
RAB	iPZ	104826.5	0.4	11.0	d	1°		M_L= 4.0
	iS!E	40.0					104808	
WAN	iPZ	104826.2	0.2	2.0	d			
RAL	iPZ	104826.6	0.2	2.0	d			
KRT	iPZ	104823½	0.4	9.0	d	¾°		
	iSE	32½					104811	
RAB	iPZ	110802.0	0.5	4.0	d	2½°		M_L= 5.2
	iZ	05.0						
	iSE	31.0					110724	
WAN	iPZ	110802.0	0.4	1.0	u			
RAL	ePZ	110801½	0.4	1.0	u			
KRT	iPZ	110803½	0.2	2.5	u	2°		
	iSE	29½					110729	

			T sec	A mm	GM	Dist	H	Remarks
23rd Jan.1968 (cont'd)								
RAB	ePZ	161719	1.0	1.0	d			Teleseism
RAB	iPZ	162343.0	0.4	4.0	u	$1\frac{1}{4}^{o}$		M_L= 3.5
	iSE	59.5					162321	
WAN	iPZ	162343.0	0.3	2.0	u			
RAL	iPZ	162342.3	0.5	6.0				
KRT	iPZ	$1623\,41\frac{1}{2}$	0.3	3.0	d	$1\frac{1}{4}^{o}$		
	iSE	$56\frac{1}{2}$					162321	
RAB	iPZ	202820.5	0.4	3.0	d	$1\frac{1}{3}^{o}$	202755	M_L= 3.7
	iSE	39.5						

Central Observatory
5th February, 1968.

DR. G.W. D'ADDARIO
Vulcanologist-in-Charge

PEA Jan.68 No.5.

TERRITORY OF PAPUA AND NEW GUINEA
GEOLOGICAL AND VOLCANOLOGICAL BRANCH
VOLCANOLOGICAL SECTION

PRELIMINARY EARTHQUAKE ANALYSIS
RABAUL CENTRAL OBSERVATORY
1968

Rabaul	RAB	From: JAN. 23. 1968 To : JAN. 30. 1968
Keravat	KRT	From: JAN. 23. 1968 To : JAN. 30. 1968
Esa'ala	ESA	From: JAN. - 9. 1968 To : JAN. 15. 1968
Tabele	TBL	From: JAN. - 9. 1968 To : JAN. 22. 1968
Agenahambo	AGE	From: To :
Waris	WAA	Not operational
Ulamona	ULA	Not operational
Piva	PIV	Not operational
C.Gloucester	LAG	From: To:

STATION PERSONNEL

RAB Central Observatory, Rabaul.

Vulcanologist-in-Charge	G.W. D'Addario
Vulcanologist	R.F. Heming
Seismologist	(Position Vacant)
Seismogram Readers	D.J. Cook; H.M.Carrick
Senior Technical Officer	N.O. Myers
Technical Officer	R.J. Conway
Vulcanological Assistants	L. Topue; M. Gaiam V. Kaita
Technical Assistant	P. Daimbari
Trainee Vulcanological Assistants	B. Talai; M. Salaiau; (one Position Vacant)
Secretary	G. Chant

KRT Keravat Outstation

Observer (part-time)	G.E. Chorick

TBL Tabele Observatory

Observer	E. Ravian

ESA Esa'ala Observatory

Observer	F. Dira

AGE Agenahambo Outstation

Observer (part-time)	Br. B. Hughes

The Rabaul Preliminary Earthquake Analysis (PEA) is produced by the staff under the direction of the Vulcanologist-in-Charge from whom additional information and photocopies of seismogram records from all stations may be obtained on request.

Please address all communications to:-

Vulcanologist-in-Charge,
Central Observatory,
P.O. Box 386,
RABAUL, T.P. & N.G.

SEISMOGRAPH STATIONS

Station (NEW GUINEA)	Code	South Latitude	East Longitude	Elev. (m)	Foundation
Rabaul	RAB	04°11'28.6"	152°10'11.4"	183.5	Basalt Flow
Wanliss Street	WAN*	04°11'39.6"	152°10.32.5"	25.0	Basalt Flow
Sulphur Creek	SUL*	04°13'09.8"	152°10'33.3"	8.5	Unconsolidated Volcanic Ash
Rabalanakaia	RAL*	04°13'13.0"	152°12'07.0"	91.0	Unconsolidated Volcanic Ash
Tavurvur	TAV*	04°13'52.2"	152°13'12.9"	27.0	Andesite Flow
Taviliu	VUL*	04°16'58.2"	152°08'44.6"	332.3	Unconsolicated Volcanic Ash
Keravat	KRT	04°21'10.5"	152°03'06"	20.0	Alluvium
Ulamona	ULA	04°59'24.0"	151°16'30.0"	17.0	Lapilli Tuff
Tabele	TBL	04°06'04.67"	145°00'41.37"	179.5	Basalt Flow
Waris	WAA	04°07'00"	145°06'00"	48.0	Lapilli Tuff
Piva	PIV	06°12'00"	155°03'30"	60.0	Alluvium
Cape Gloucester	LAG	04°27'20"	148°26'00"	24.0	Lapilli Tuff
(PAPUA)					
Agenahambo	AGE	08°48'49"	148°05'56"	303.0	Unconsolidated Volcanic Ash
Esa'ala	ESA	09°44'18.2"	150°48'50.7"	46.4	Granite Gneiss

* Rabaul Harbour Network

STATION INSTRUMENTATION

Station & Instruments	Comp.	To	Tg	Trace Speed mm/min	Approximate relative Magnification	Approximate damping
(NEW GUINEA)						
Rabaul Central Observatory RAB						
World-Wide Standard	Z	1.0	0.74	60	12,500	Critical
	N,E	1.0	0.74	60	6,250	Critical
	Z/N/E/	15.0	100.0	15	750	Critical
Benioff VR 14.7Kg	Z	1.0	0.02	180 *	4,000	Critical

* Recording is triggered by the onset of any earthquake with pre-determined minimum amplitude. Recorder is stopped automatically by hour break pulse.

Omori 15Kg	No	3.6	-	24	12	10.1(air)
Omori 15Kg	Eo	3.8	-	24	10	10.1(air)
Wood-Anderson Torsion	Na,Ea	0.8	-	60	2,800	Critical
Rabaul Harbour Network						
WAN° Benioff VR 14.7Kg	Z	1.0	0.02	60	5,240	Critical
SUL° Benioff VR 14.7Kg	Z	1.0	0.02	60	2,850	Critical
RAL° Benioff VR 14.7Kg	Z	1.	0.02	60	8,075	Critical
TAV° Benioff VR 14.7Kg	Z	1.0	0.02	60	20,900	Critical
VUL°° Benioff VR 14.7Kg	Z	1.0	0.02	60	5,000	Critical

Readings from the Harbour Network are entered in the PEA only for large earthquakes.

STATION INSTRUMENTATION

Station & Instruments	Comp.	To	Tg	Trace Speed mm/min	Approximate relative Magnification	Approx. damping
Rabaul Harbour Network (Cont'd)						
KRT - Keravat Outstation						
Benioff Mc 50Kg	Z	1.2	0.2	15	20% sensitivity	Critical
Benioff MC 50Kg	N,E	1.2	0.2	15	10% sensitivity	Critical
ULA - Ulamona Field Station						
Willmore portable	Z	0.6	0.25	60	3,000	underdamped
PIV -Piva Field Station						
Willmore portable	Z	0.6	0.25	60	3,000	underdamped
WAA -Waris Field Station						
Willmore portable	Z	0.6	0.25	60	3,000	underdamped
LAG -Cape Gloucester Field Station						
Willmore portable	Z	0.6	0.25	60	3,000	underdamped
TBL -Tabele Observatory						
Benioff VR 107.5Kg (PAPUA)	Z	1.0	0.2	60	1,350	critical
ESA -Esa'ala Observatory						
Benioff VR 107.5Kg	Z	1.0	0.2	15	36,000	critical
Benioff VR 107.5Kg	N,E	1.0	0.2	15	18,000	critical
Benioff VR 107.5Kg	Z/N/E/	1.0	60.0	30	50% sensitivity	critical
AGE -Agenahambo Station						
Willmore portable	Z	0.6	0.25	60	3,000	underdamped

o Signals from these stations are telemetered by land line to Helicorders (Geotech Mod.2484) at the Central Observatory.

oo Signals from this station are telemetered via VHF to its Helicorder at the Central Observatory.

N.B. These field stations consist of a permanent building in which instruments are installed when necessary.

Details of emergency field stations, within the Territory will be listed when in operation.

VR Variable Reluctance

VR Moving-coil

Relative magnification curves of seismograph systems installed in the stations controlled by the Rabaul Central Observatory are listed once a month on the P.E.A.

PRESENTATION OF DATA

(reviewed in November, 1967)

All times are reduced to Greenwich Mean Time (GMT), which is 10 hours behind Eastern Standard Time.

At RAB and Harbour Network, the time signal is marked every minute on each seismogram record from the Observatory crystal chronometer. Second marks from radio signal VNG (Australia) are recorded on World-Wide Standard System S.P.-N component only according with the W.W.S.S. programme, at six hour intervals. Primary time is provided by W.W.S.S. equipment and secondary time by a Labtronic crystal chronometer with the accuracy of ± 5ms per day compared with VNG (Australia) with the aid of a chronoscope.

At TBL and AGE, the time signal is derived from a spring driven chronometer (Mercer) and marked each minute on records. Time accuracy is determined by comparison with signals from WWVH daily. Linear correction is applied to the daily drift.

On all seismogram records time increases from left to right and time break is upward.

At RAB* and Harbour Network the recording drum of each seismograph is driven by a 110VAC 60Hz synchronous motor. The 110VAC is frequency regulated by a crystal chronometer.

* The Omori recording drum is driven by a nonregulated 50Hz frequency supply.

At ESA and KRT power for recorder motors is frequency regulated by a crystal chronometer at 50Hz. Power for AGE and TBL and field stations is supplied by a 50Hz free running oscillator.

Direction of Motion

Upward direction of ground motion corresponds to upward trace motion on vertical seismogram records. Direction of component of ground motion to North or East corresponds to upward trace motion on horizontal seismogram records.

Vertical trace motion from impulsive onset of longitudinal waves of compressional or dilatational ground movement is indicated by "u" or "d" accompanied by N,S,E or W, as per trace motion amplitude on horizontal seismogram records, to represent vectorially the direction of ground motion. "+" or "-" indicates upward or downward motion of the ground respectively, from a wave not known to be of the longitudinal type.

Accuracy of Readings

When readings are given with a decimal figure, they are to 1/10 of a second, other readings have been made to the nearest half second.

Crustal Phases

Px, Sx Crustal phases, other than Pn and Sn for local and near earthquakes.

Felt Intensity

Information on maximum intensities of shocks reported felt is included. Intensities are given in Roman numerals based on the Modified Mercalli Scale, of 1931.

PRESENTATION OF DATA (CONT'D)

Determinations of Epicentres

Where no source is cited, the determination of epicentres, origin time, focal depth and distance in central angle degrees from the pertinent station for local and regional earthquakes, are carried out at the Central Observatory, Rabaul.

Geographical Designation of Epicentres

The regional names which follow the co-ordinates of epicentres located at the Central Observatory are meant only to supplement the co-ordinates and normally follow well-known geographical rather than geological features. Use is made of the full degree blocks according to the method defined by E.A. Flinn and E.R. Engadhl in "A PROPOSED BASIS FOR GEOGRAPHICAL AND SEISMIC REGIONALIZATION", Seismic Data Laboratory Report No. 101, U.I.D. Inc., Alexandria, Virginia, 1964, adopted by the U.S.C.G.S. for computer requirements.

Magnitude Definition and Determination

M_L - Local Magnitude (Richter, 1935) is calculated from the recorded trace amplitude of the Wood-Anderson torsion seismographs of stated physical constants (installed at the Observatory in November, 1967).

Maximum trace amplitude (0 to peak) expressed in millimetres and tenths is measured directly on both components. Magnitude is determined independently and the arithmetic mean taken. M_L values are given to the tenth of a unit.

The station correction factor is assumed to be zero until better known.

M_S -Surface Wave Magnitude (Gutemberg & Richter, 1956) is calculated from the amplitude of surface waves of period near 20 seconds for shallow distant earthquakes.

M_B -Body Wave Magnitude is calculated from the ratio of amplitude over period for body waves on S.P.-Z of World-wide Seismograph System only when depth is known. The magnification factor for the standard seismograph is taken into account.

m -Unified magnitude (Gutemberg & Richter, 1956) has the following relation to M_L, M_S, and M_B.

$$m = 1.7 + 0.8\ M_L - 0.01\ M^2_L$$

$$m = M_B \text{ (without correction)}$$

$$m = 2.5 + 0.63\ M_S$$

Local Magnitude of earthquakes recorded at RAB with a clear S-P interval is tabulated on a Day-Distance (in Central Angle Degrees) graph which is added to the PEA monthly.

Symbols

i - impulsive and sharply defined beginning of a phase.

e - emergent and poorly defined beginning of a phase.

T - Period in seconds

A - Peak-to-Trough trace amplitude in millimetres.

GM - Ground Motion.

Dist -Distance in central angle degrees.
H - Origin Time
h - Focal depth in Kilometres
CBM - Confused by microseisms.

PRESENTATION OF DATA (CONT'D)

Remarks

Local - Typical signature of an earthquake with epicentre within 0.9°.

Near - Typical signature of an earthquake with epicentre between 0.9° and 9°.

Distant - Typical signature of an earthquake with epicentre between 9° and 45°.

Teleseism - Typical signature of an earthquake with epicentre more than 45°.

Traces - Any recorded disperse waves or very weak unknown earthquake phases.

Local and Near earthquakes will be classified Regional, and Distant earthquakes will be grouped with Teleseisms if sheer waves and their reflections are unidentifiable.

G.W. D'ADDARIO
Vulcanologist-in-Charge

			T sec	A mm	GM	Dist	H	Remarks
24th Jan., 1968								
RAB	iPZ	025512.9	0.3	5.9	d	¾°	025458	M_L=3.4
	iSE	23.5						
WAN	iPZ	025512.8	0.3	3.0	u			
RAL	iPZ	025513.0	0.2	3.0	u			
KRT	i(P)Z	025515	0.4	3,8	d	1¼°	025454	CBM
	i(S)E	5531						
RAB	iPZ	060050.0	0.8	1.2	u			CBM
RAL	iPZ	060050.0	0.8	1.0	u			
KRT	ePZ	060050			d			CBM
RAB	ePZ	061125	0.5	2.0	u	2½°	061044	CBM M_L= 4.6
	iSNa	56.0						
RAL	iPZ	061126.8	0.8	1.0	d			
KRT	ePZ	061125½			d	2½°	061046	CBM
	eSN	55½						
RAB	iPZ	071519.9	0.5	68.0	d	1¼°	071458	M_L=4.8
	iSN/	36						
WAN	iPZ	071519.5	0.5	24.0	d			
RAL	iPZ	071519.5	0.9	19.5	d			
KRT	iPZ	071518			d	1¼°	071458	
	iSN	1533½						
RAB	iPZ	093139.5			d	3°	093052	overlapping traces
	iSE/	3216						
WAN	iPZ	093139.1	0.5	12.6	d			
RAL	iPZ	093139.1			d			
KRT	ePZ	093136						
	iPZ	37						
RAB	iPZ	100423.8	0.3	3.2	u	2½°	100344	M_L=4.7
	iSN	54.0						
KRT	ePZ	100424				2½°	100349	
	iSE	51						
RAB	eiPZ	102757½	0.5	2.7	d	1½°	102729	M_L=3.8
	iSE	2819						
KRT	ePZ	102758				1½°	102732	CBM
	iSE	2818						
RAB	iPZ	153505.1	0.3	3.2	d	½°	153454	M_L=2.8
	iSN	13.0						
KRT	e(P)Z	153503						
RAB	ePZ	182302	1.0	1.1	u	1½°	182237	M_L=3.7
	iN	19.5						CBM
	i(S)N	20.8						
KRT	ePZ	182303½				1½°	182239	
	iSN	22						
RAB	iPZ	211205.4	0.4	4.2	u	½°	211156	M_L=3.1
	iSE	12.4						
KRT	e(P)Z	211203						

			T sec	A mm	GM	Dist	H	Remarks
24th Jan., (cont'd)								
RAB	eiPZ iSE	211750 57.0	0.3	3.4	u	½°	211740	M_L=3.1
KRT	e(P)Z	211751½						CBM
RAB	iPZ iSE	213910.6 17.4	0.3	5.1	u	½°	213901	M_L=3.4
KRT	iPZ iSN	213912½ 21½	0.3	3.8	u	½°	213902	
RAB	eiPZ iSE	225856 5908 8	0.4	3.1	u	1°	225838	M_L=3.4
RAB	eiPZ iSE	230743 49.9	0.3	2.6	u	½°	230733	M_L=3.1
25th Jan., 1968 No L.P.E record from 24th Jan - 30th Jan								
RAB	iPZ iSN	021208.3 16	0.5	28.0	u	½°	021157	M_L=4.4
WAN	iPZ	021208.2	0.7	20.0	u			
RAL	iPZ	021208.8	0.8	29.0	u			
KRT	eiPZ iSE	021210 18½			u	½°	021158	
RAB	iPZ iSN	035156.0 5203.0	0.5	26.0	u	½°	035146	M_L=3.7
WAN	iPZ	035156.0	0.3	11.0	u			
KRT	eiPZ iSE	035158 07	0.4		u	¾°	035146	
RAB	ePZ i(S)N	083906½ 42.0	0.5	1.5	d	(3°)	0838(19)	M_L=5.1
KRT	i(P)Z iSE	083905½ 36	0.3	6.8	u	(2½°)	0838(25)	CBM
RAB	iPZ iSN	093042.3 3110.5	0.4	1.0	d	2¼°	093005	M_L=4.9
KRT	e(P)Z iSE	093046½ 3109½			d	(2°)	0930(15)	CBM
RAB	iPZ eSN	111307.3 30	0.4	1.5	d	2°	111237	M_L=3.9
KRT	ePZ eSN	111303 31½			u	2½°	111225	CBM
RAB	iPZ iZ	113940.5 52.4	0.5	1.5	d			Regional
KRT	e(P)Z	113945			u			CBM
RAB	ePZ eSN	133342½ 3408	0.4	1.2	d	2¼°	133308	M_L=3.9
KRT	ePZ i(S)E	133340½ 3403½	0.6	2.2	d	(2°)	1333(10)	
RAB	iPZ iSE	152513.0 22.0	0.3	2.0	d	½°	152501	
KRT	e(P)Z	152516½						CBM

			T sec	A mm	GM	Dist	H	Remarks
25th Jan (cont'd)								
RAB	iPZ iSE	193833.2 58.5	0.4	1.0	d	2°	193800	M_L=3.8
KRT	i(P)Z iSE	193834½ 58				(2°)	1938(04)	
RAB	iPZ iZ iSN	210012.0 15.0 36.2	0.5	13.0	d	2°	205940	M_L=5 1
KRT	iPZ i(S)E	210012½ 39½	0.6	13.4	u	(2¼°)	2100(37)	
RAB	iPZ iSN	224758.5 4812.6	0.8	3.0	u	¾°	224740	
KRT	iPZ iSE	224756½ 4809	0.3	6.4	d	1°	224740	
26th Jan., 1968								
RAB	ePZ iSE/	045215½ 5720	0.5	3 0	d	28°		
KRT	e(P)Z	045214			d			CBM
RAB	iPZ iSN	083217.6 3306.5	0.5	5.0	u	4¼°	083114	M_L=5.2
KRT	iPZ iZ	0832(15½) 47½	0.5	1.8	u			CBM
RAB	iPZ eSE	084600.2 28	0.6	2.0	u	2¼°	084522	M_L=4.2
KRT	ePZ	084602						CBM
RAB	iPZ iSN	103745.6 3804.0	0.3	7.5	u	1½°	103721	M_L=3.9
WAN	iPZ	103745.2	0.4	2.0	u			
SUL	iPZ	103745.4	0.4	1.0	u			
RAL	iPZ	103745.0	0.6	7.5	d			
KRT	iPZ iSE	103746 3807	0.3	5.6	u	1¾°	103718	
RAB	iPZ iSE	124555.0 4615.0	0.5	6.0	u	1½°	124528	M_L=4.1
WAN	iPZ	124555.0	0.5	1.5	d			
KRT	eiPZ iSE	124552½ 4615	0.6	2.0	u	1¾°	124523	
RAB	iPZ	125935.8	0.6	5.0	u			Regional
KRT	eiPZ	125934	0.6	1.2	d			
RAB	iPZ iSN	135405.8 33.0	0.4	2.8	u	2¼°	135330	M_L=5.1
KRT	eiPZ iSE	135406½ 33	0.2	2.5	d	2¼°	135331	
RAB	iPZ iSN	141930.2 2001.5	0.5	2.0	d	3°	141849	M_L=4.7
RAL	e(P)Z	141932.4	0.5	1.0	d			
KRT	iPZ iSE	141931 59½			u	2½°	141853	CBM

			T sec	A mm	GM	Dist	H	Remarks
26th Jan.,1968. (cont'd)								
RAB	ePZ iSE	173705½ 37½			d	2¾°	173623	
KRT	eiPZ iN	173706½ 42½	0.6	1.1	u			
27th Jan.,1968.								
RAB	eiPZ iZ	033810½ 15.5	0.4	2.0	u			Regional C.B.M
KRT	iPZ i(S)E	033809½ 19	0.4	2.8	u	(¾°)	0337(56)	
RAB	iPZ e(S)	140400.4 1012	0.5	4.0	u	(4°)		
KRT	ePZ	140401	0.7	3.0	u			
RAB	iPZ iSN	142356.8 2420.0	0.4	2.6	u	2°	142326	M_L= 4.4
KRT	iPZ iSE	142357½ 2417½			d	1½°	142331	
RAB	ePZ iSE	174214 45.0	0.4	1.5	d	2½°	174133	M_L= 4.3
KRT	ePZ iSE	174215 42	0.6	1.1	d	2¼°	174139	
RAB	iPZ iZ iSN	182022.5 25.5 52.0	0.4	3.0	d	2½°	181943	M_L= 5.1
WAN	ePZ	182022½	0.9	2.5	d			
RAL	ePZ	182022	0.4	3.0	d			
KRT	ePZ iSN	182023½ 50½			u	2¼°	181948	
RAB	ePZ iSE	192047½ 2113.0	0.3	2.0	d	2¼°	192013	M_L= 4.3
RAL	ePZ	192049	0.2	0.9	u			
KRT	ePZ iSE	192047½ 11½	0.4	2.2	d	2°.	192016	
RAB	iPZ iSN	202753.2 2822.5	0.4	1.0	d	2½°	202715	M_L= 4.5
RAL	iPZ	202754.8	1.0	1.0	d			
KRT	ePZ iSN	202754½ 20½	0.3	2.0	d	2¼°	202720	
28th Jan.1968. Strong microseismic activity all day								
RAB	iPZ iSE/	052518.4 43	0.5	6.0	u	2°	052446	C.B.M. M_L=5.5
WAN	iPZ	052516.9	1.0	3.0	d			
RAL	iPZ	052517.5	1.0	4.0	u			
KRT	iPZ	052519	0.2	2.6	d			C.B.M.

			T sec	A mm	GM	Dist	H	Remarks
28th Jan.1968 (cont'd).								
RAB	iPZ	111418.5	0.5	5.6	d	2°	111344	C.B.M.
	iSN	44.0						M_L= 5.0
RAL	iPZ	111417.9	1.0	2.0	d			
KRT	iPZ	111417	0.3	1.4	d	2¼°	111341	
	iSE	44						
RAB	iPZ	134903.0	0.4	4.5	u	2½°	134825	C.B.M.
	iSE	32.0						M_L=5.3
RAL	iPZ	134904.9	0.9	2.0	d			
KRT	eiPZ	134904	-	-	d	2¼°	134828	C.B.M.
	iSE	31						
RAB	iPZ	153439.4	0.5	4.9	u	1¾°	153417	M_L= 4.1
	iSE	56.0						
KRT	iPZ	153436	0.4	2.6	u	1¾°	153415	
	iSE	52						
RAB	iPZ	163122.2	0.3	3.0	d	2¾°	163040	M_L= 4.9
	iSE	54						
KRT	iPZ	163122	-	-	d	2°	163049	
	iSN	47						
RAB	eiPZ	183254	0.5	3.9	u	2°	183222	M_L=4.9
	iSN	3318.2						
	i!N	37.2						
WAN	iPZ	183254.3	0.9	2.0	d			
RAL	iPZ	183253.8	0.9	5.0	d			
KRT	iPZ	183252	0.4	2.2	d	2°	183218	
	iSN	3317½)						
29th Jan.1968. Strong microseismic activity on KRT records until 1000 hours.								
RAB	iPZ	075548.5	0.5	2.0	u	2°	075515	M_L= 4.3
	iSN	5614.0						
RAB	ePZ	092927	0.6	1.2	d			(Near shock)
RAB	iPZ	101352.2	0.6	13.0	u	(7½°)	101318	Overlapping traces
	i(S)	1418						
WAN	iPZ	101352.1	0.8	4.0	d			
RAL	iPZ	101352	0.9	19.5	d			
KRT	iPZ	101352	-	-	u			
RAB	iPZ	102742.2	1.0	4.0	d	(46°)		Overlapping traces
	iZ	5½						
	i(S)N/	3437						
WAN	iPZ	102742.5	1.0	1.0	u			
RAL	iPZ	102742.7	0.8	2.0	u			
KRT	iPZ	102743½	0.4	0.6	d			C.B.M.
RAB	iPZ	114758.5	0.4	2.0	d	2¾°	114714	M_L= 4.7
	i(S)N	4832						
KRT	ePZ	114759	0.3	1.2	u	2¾°	114716	
	iSN	31½						

			T sec	A mm	GM	Dist	H	Remarks
29th Jan.1968 (cont'd).								
RAB	iPZ iSN	115133.4 38.0	0.5	14.0	u	¼°	115127	M_L= 3.0
WAN	iPZ	115133.3			u			
KRT	iPZ i(S)N	115135½ 42.0			d	¼°	115127	
RAB	iPZ iZ	135003.0 06.0	0.5	7.8	u			Regional
KRT	iPZ iSE	135001 17½	0.3		d	1¼°	134939	
RAB	iPZ iSE	140305.3 24.3	0.4	2.0	d	1½°	140240	M_L= 3.7
KRT	ePZ iSE	140305 23½	0.3		d	1½°	140240	C.B.M.
RAB	iPZ iSN	151628.6 55.0	0.5	2.0	d	2¼°	151554	M_L= 4.3
KRT	iPZ	151627½	0.3	3.0	u			
RAB	iPZ eSE	153350.3 3423½	0.5	2.0	d	2¾°	153307	
KRT	ePZ iSE	153350½ 3423			d	2¾°	153308	C.B.M.
RAB	iPZ	155049.5	0.4	4.0	u			Regional
KRT	eiPZ	155049	0.4	3.0	d			
RAB	iPZ iZ iSN/	160938.0 41.0 1004	0.6	7.0	d	2¼°	160904	
WAN	iPZ	160938.0	0.8	3.0	d			
RAL	iPZ	160937.0	0.8	9.0	d			
KRT	iPZ	160938½	0.7	12.6	d			
RAB	iPZ iSN/	165125.3 5812	0.6	2.0	d	49°		
KRT	ePZ	165128			d			
RAB	iPZ iSN/	175806.0 32	0.5	3.5	u	2¼°	175732	M_L= 4.9
SUL	iPZ	175807.9	0.8	0.8	u			
KRT	iPZ iSN	175807 34½	0.7	3.8	u	2¼°	175731	
RAB	ePZ iZ	190340½ 44.6	0.6	1.2	d			Regional
KRT	ePZ	190342½	1.0	1.2	d			
RAB	iPZ iSN	213106.3 30.0	0.4	3.0	u	2°	213035	
KRT	iPZ iSE	213107½ 32½	0.5	3.0	u	2°	213034	C.B.M.
RAB	iPZ iSN	220024.0 48.0	0.4	3.0	d	2°	215952	

			T sec	A mm	GM	Dist	H	Remarks
29th Jan.1968 (cont'd)								
KRT	iPZ iSN	220024½ 49½	0.5	1.4	u	2°	215953	
30th Jan.1968.								
RAB	ePZ	010511½	0.5	1.5	d			Regional
RAB	ePZ	013853	0.5	1.8	d			Regional
RAB	iPZ iSN	014715.0 24.0	0.4	10 0	d	½°	014703	M_L= 3.7
WAN	iPZ	014714.5	0.2	6.0	d			
RAL	iPZ	014714.4	0.2	6.0	d			
KRT	iPZ iSN	014718.1 28.7			u	¾°	014703	C.B.M.
RAB	ePZ e(S)N/	015705½ 0402	0.5	1.5	d	(48°)		
RAB	ePZ iZ	021825½ 32.3	0.5	1.4	d			Regional
RAB	iPZ iZ	022053.0 56.5	0.5	2.8	d			Regional
RAB	iPZ eSN	024942.0 5013	0.4	1.8	d	2½°	024901	M_L= 4.6
KRT	ePZ iSN	024943½ 5014½			d	2½°	024903	C.B.M.
RAB	ePZ	031014	0.5	1.2	d			Teleseism
RAB	iPZ e(S)E/	035100.4 5512	0.5	12.0	u	(24°)		
KRT	iPZ	035103½			u			C.B.M.
RAB	iPZ iSN	072719.2 46.5	0.5	2.0	d	2¼°	072643	M_L=4.4
KRT	i(P)Z i(S)E	072724 48.			u	2°	072652	C.B.M.
RAB	iPZ iZ iSN	100122.5 29.0 49.0	0.5	2.8	u	2¼°	100047	M_L=5.2
WAN	iPZ	100122.5	0.5	1.0	d			
RAL	iPZ	100122.0	0.5	1.0	u			
KRT	iPZ iN iSN	100123½ 27½ 49½	0.3	5.8	u	2¼°	100049	C.B.M.
RAB	eiPZ iZ i(S)N	122328½ 29.3 53.0	0.4	2.0	d	(2°)	1223(56)	M_L= 4.6
RAL	iPZ	122327.5	0.5	1.0	u			
KRT	iPZ iSN	122326½ 47.	0.4	3.6	u	1½°	122259	

			T sec	A mm	GM	Dist	H	Remarks
30th Jan.1968 (cont'd)								
RAB	iPZ	135140.5	0.4	1.8	d	2°	135110	M_L= 3.9
	iSE	5203.5						
KRT	ePZ	135139	0.9	0.6	d	2°	135106	C.B.M.
	iSN	5204½						
RAB	iPZ	171157.0	0.5	8.0	d	1½°	171129	M_L=4.3
	iSN/	1218						
WAN	iPZ	171157.2	0.2	2.0	d			
SUL	iPZ	171157.2	0.2	2.0	d			
RAL	iPZ	171157.0	0.5	2.0	d			
KRT	eiPZ	171155	0.5	8.4	d	1½°	171130	
	iSN	1213½						
RAB	iPZ	171555.8	0.3	2.0	u	2°	171524	M_L=4.5
	iSE	1620.0						
RAL	iPZ	171554.5	0.5	1.0	u			
KRT	iPZ	171552½	0.4	2.6	u	1½°	171524	
	iSN	1614						
RAB	ePZ	220810½	0.4	2.0	u	2¼°	220736	M_L=4.3
	iSN	36.0						
KRT	ePZ	220808½			u	2°	220734	C.B.M.
	iSN	34						

ESA'ALA

9th Jan. 1968.								
ESA	iPZ	103955	0.4	2.0	d	3¾°	103858	
	iSE	4039						
ESA	eiPZ	110347½	0.4	0.4	d	4°	110248	
	iZ	48½						
	iSE	0433½						
ESA	ePZ	1230 27½	0.5	0.5	d	3¾°	122929	
	iSN	3112½						
ESA	eiPZ	142535	0.8	1.0	d	2¼°	142500	
	iZ	36						
	iSE	2602						
ESA	iPZ	143717	0.3	0.8	u	3¾°	143618	
	iSE	3802						
ESA	eiPZ	144902	1.0	0.5	d	4°	144802	
	iZ	03						
	iSE	48						
ESA	iPZ	170105	0.5	1.0	d	3½°	170011	
	iSE	46½						
ESA	iPZ	204321	0.2	1.6	u	3¾°	204222	
	iSE	4406						
10th Jan.1968								
ESA	ePZ	010237½	0.3	0.2	d	1¼°	010209	
	iZ	42½						
	iSE	59½						
ESA	ePZ	012056½	0.3	0.1	d	4½°	012048	
	eZ	2100						
	iSE	49						

			T sec	A mm	GM	Dist	H	Remarks
10th Jan.1968 (cont'd)								
ESA	iPZ iSE	060921 1014	0.4	1.6	u	4½°	060902	
ESA	ePZ	100029	0.4	0.3	d			
ESA	ePZ eSE	124507½ 4600	0.4	0.2	d	4½°	121459	
ESA	iPZ	191235	0.4	3.0	u			
ESA	i(P)Z iSE	191250 1314	0.2	1.4	u	(1¾°)	1912(18)	Shock in coda
11th Jan.1968.								
ESA	iPZ iSE	035038 5122			u	3½°	030941	
ESA	iPZ iSE/	103910 18			u	½°	103859	
ESA	iPZ iZ	170022½ 50½	0.6	1.4	u			Distant Shock
12th Jan.1968.								
ESA	eiPZ iZ iSE	011237½ 38 1335½	0.8	0.3	u	5°	011222	
ESA	iPZ iSE	041738 1836½	0.4	1.4	d	6°	041722	
ESA	iPZ	093809½	0.4	3.6	d			Regional
ESA	ePZ iZ	140515 17	0.6	0.7	d			Regional
13th Jan.1968.								
ESA	iPZ iSE	042212½ 30½	0.4	1.8	u	1¼°	042149	
ESA	ePZ	042445	1.0	1.0	+			Traces
ESA	ePZ	071046	1.0	0.2	u			Teleseism
ESA	iPZ	082555			dSE			Regional
ESA	iPZ iSE	084023½ 40	0.3	2.6	d	1¼°	084003	
ESA	iPZ iZ	162450 52	0.8	0.3	d			Teleseism
14th Jan.1968.								
ESA	eiPZ iZ iZ	080658½ 59½ 0836	0.7	0.4	d			Distant
ESA	iPZ iZ	123002½ 04	0.6	2.0	d			Distant
ESA	iPZ	125157	1.0	2.6	d			(Regional)
ESA	iPZ e(S)E	175420 180333	0.5	1.2	u			Teleseism
15th Jan.1968.								
ESA	ePZ iZ iSN	002223½ 25½ 49½	0.4	0.3	d	2°	022149	

			T sec	A mm	GM	Dist	H	Remarks
15th Jan.1968 (cont'd).								Teleseism.
ESA	iPZ	020547½	0.8	2.2	u			
ESA	ePZ	022036	0.4	0.4	d	2°	022002	
	iZ	38						
	iSN	2102						
ESA	iPZ	060216½	0.3	1.4	d	4°	060114	
	iSN	0303						
ESA	iPZ	113330½	0.4	0.2	d	2¼°	113255	
	iZ	32						
	iSN	57½						
ESA	ePZ	162534½	0.4	0.2	d	2¼°	162458	
	iZ	35½						
	iSN	2602½						

TABELE

9th Jan.1968.

TBL Nil recorded

10th Jan.1968.

TBL Nil recorded

11th Jan.1968.

TBL Nil recorded

12th Jan.1968.

TBL Nil recorded

13th Jan.1968.

TBL	iPZW	160142	0.4	7.9	d	(Regional)
	i	58				

14th Jan.1968.

TBL	ePZW	114649½				
	iPZW	122904½	1.9	4.9	u	(Teleseism)
	i	42				(Teleseism)
	i	3019½				
	i	3215½				

15th Jan.1968. Microseismic activity associated with heavy rain

TBL ZW 1517 - 1559 hours

16th Jan.1968.

TBL	ePZW	134215½			(u)	Local
	ePZW	155805				Regional

17th Jan.1968.

TBL	ePZW	083707½	0.8	2.9	(u)	Regional

18th Jan.1968.

TBL	eiPZW	135703	0.3	6.1	u	Regional
	iPZW	152801½	0.2	1.9	d	Near

19th Jan.1968.

TBL	iPZW	060802½	0.8	1.0	d	Teleseism

20th Jan.1968.

TBL Nil recorded

21st Jan.1968.

TBL	iPZW	044420½	3.0	0.2	u	Local
	iPZW	235704½	0.8	2.0	u	Distant Shock

		T sec	A mm	GM	Dist	H	Remarks.
22nd Jan. 1968.							
TBL	ePZ	18 18 35½	0.9	2.0	u		Distant Shock

13th February, 1968.
Central Observatory.

G.W. D'ADDARIO
Vulcanologist-in-Charge

PEA Feb.68 No.6.

TERRITORY OF PAPUA AND NEW GUINEA
GEOLOGICAL AND VOLCANOLOGICAL BRANCH
VOLCANOLOGICAL SECTION

PRELIMINARY EARTHQUAKE ANALYSIS
RABAUL CENTRAL OBSERVATORY
1968

Rabaul	RAB	From: JAN. 31. 1968 To : FEB. 6. 1968
Keravat	KRT	From: JAN. 31. 1968 To : FEB. 6. 1968
Esa'ala	ESA	From: JAN. 1. 1968 To : JAN. 8. 1968
Tabele	TBL	From: JAN. 24. 1968 To : JAN. 30. 1968
Agenahambo	AGE	From: To :
Waris	WAA	Not operational
Ulamona	ULA	Not operational
Piva	PIV	Not operational
C.Gloucester	LAG	From: To:

STATION PERSONNEL

RAB Central Observatory, Rabaul.

Vulcanologist-in-Charge	G.W. D'Addario
Vulcanologist	R.F. Heming
Seismologist	(Position Vacant)
Seismogram Readers	D.J. Cook; H.M.Carrick
Senior Technical Officer	N.O. Myers
Technical Officer	R.J. Conway
Vulcanological Assistants	L. Topue; M. Gaiam V. Kaita
Technical Assistant	P. Daimbari
Trainee Vulcanological Assistants	B. Talai; M. Salaiau; (one Position Vacant)
Secretary	G. Chant

KRT Keravat Outstation
Observer (part-time) — G.E. Chorick

TBL Tabele Observatory
Observer — E. Ravian

ESA Esa'ala Observatory
Observer — F. Dira

AGE Agenahambo Outstation
Observer (part-time) — Br. B. Hughes

The Rabaul Preliminary Earthquake Analysis (PEA) is produced by the staff under the direction of the Vulcanologist-in-Charge from whom additional information and photocopies of seismogram records from all stations may be obtained on request.

Please address all communications to:-

Vulcanologist-in-Charge,
Central Observatory,
P.O. Box 386,
RABAUL, T.P. & N.G.

SEISMOGRAPH STATIONS

Station (NEW GUINEA)	Code	South Latitude	East Longitude	Elev. (m)	Foundation
Rabaul	RAB	04°11'28.6"	152°10'11.4"	183.5	Basalt Flow
Wanliss Street	WAN*	04°11'39.6"	152°10.32.5"	25.0	Basalt Flow
Sulphur Creek	SUL*	04°13'09.8"	152°10'33.3"	8.5	Unconsolidated Volcanic Ash
Rabalanakaia	RAL*	04°13'13.0"	152°12'07.0"	91.0	Unconsolidated Volcanic Ash
Tavurvur	TAV*	04°13'52.2"	152°13'12.9"	27.0	Andesite Flow
Taviliu	VUL*	04°16'58.2"	152°08'44.6"	332.3	Unconsolicated Volcanic Ash
Keravat	KRT	04°21'10.5"	152°03'06"	20.0	Alluvium
Ulamona	ULA	04°59'24.0"	151°16'30.0"	17.0	Lapilli Tuff
Tabele	TBL	04°06'04.67"	145°00'41.37"	179.5	Basalt Flow
Waris	WAA	04°07'00"	145°06'00"	48.0	Lapilli Tuff
Piva	PIV	06°12'00"	155°03'30"	60.0	Alluvium
Cape Gloucester (PAPUA)	LAG	04°27'20"	148°26'00"	24.0	Lapilli Tuff
Agenahambo	AGE	08°48'49"	148°05'56"	303.0	Unconsolidated Volcanic Ash
Esa'ala	ESA	09°44'18.2"	150°48'50.7"	46.4	Granite Gneiss

* Rabaul Harbour Network

STATION INSTRUMENTATION

Station & Instruments	Comp.	To	Tg	Trace Speed mm/min	Approximate relative Magnification	Approximate damping
(NEW GUINEA)						
Rabaul Central Observatory RAB						
World-Wide Standard	Z	1.0	0.74	60	12,500	Critical
	N,E	1.0	0.74	60	6,250	Critical
	Z/N/E/	15.0	100.0	15	750	Critical
Benioff VR 14.7Kg	Z	1.0	0.02	180 *	4,000	Critical

* Recording is triggered by the onset of any earthquake with pre-determined minimum amplitude. Recorder is stopped automatically by hour break pulse.

Omori 15Kg	No	3.6	-	24	12	10.1(air)
Omori 15Kg	Eo	3.8	-	24	10	10.1(air)
Wood-Anderson Torsion	Na,Ea	0.8	-	60	2,800	Critical
Rabaul Harbour Network						
WAN° Benioff VR 14.7Kg	Z	1.0	0.02	60	5,240	Critical
SUL° Benioff VR 14.7Kg	Z	1.0	0.02	60	2,850	Critical
RAL° Benioff VR 14.7Kg	Z	1.	0.02	60	8,075	Critical
TAV° Benioff VR 14.7Kg	Z	1.0	0.02	60	20,900	Critical
VUL°° Benioff VR 14.7Kg	Z	1.0	0.02	60	5,000	Critical

Readings from the Harbour Network are entered in the PEA only for large earthquakes.

STATION INSTRUMENTATION

Station & Instruments	Comp.	To	Tg	Trace Speed mm/min	Approximate relative Magnification	Approx. damping
Rabaul Harbour Network (Cont'd)						
KRT - Keravat Outstation						
Benioff Mc 50Kg	Z	1.2	0.2	15	20% sensitivity	Critical
Benioff MC 50Kg	N,E	1.2	0.2	15	10% sensitivity	Critical
ULA - Ulamona Field Station						
Willmore portable	Z	0.6	0.25	60	3,000	underdamped
PIV -Piva Field Station						
Willmore portable	Z	0.6	0.25	60	3,000	underdamped
WAA -Waris Field Station						
Willmore portable	Z	0.6	0.25	60	3,000	underdamped
LAG -Cape Gloucester Field Station						
Willmore portable	Z	0.6	0.25	60	3,000	underdamped

o Signals from these stations are telemetered by land line to Helicorders (Geotech Mod.2484) at the Central Observatory.

oo Signals from this station are telemetered via VHF to its Helicorder at the Central Observatory.

N.B. These field stations consist of a permanent building in which instruments are installed when necessary.

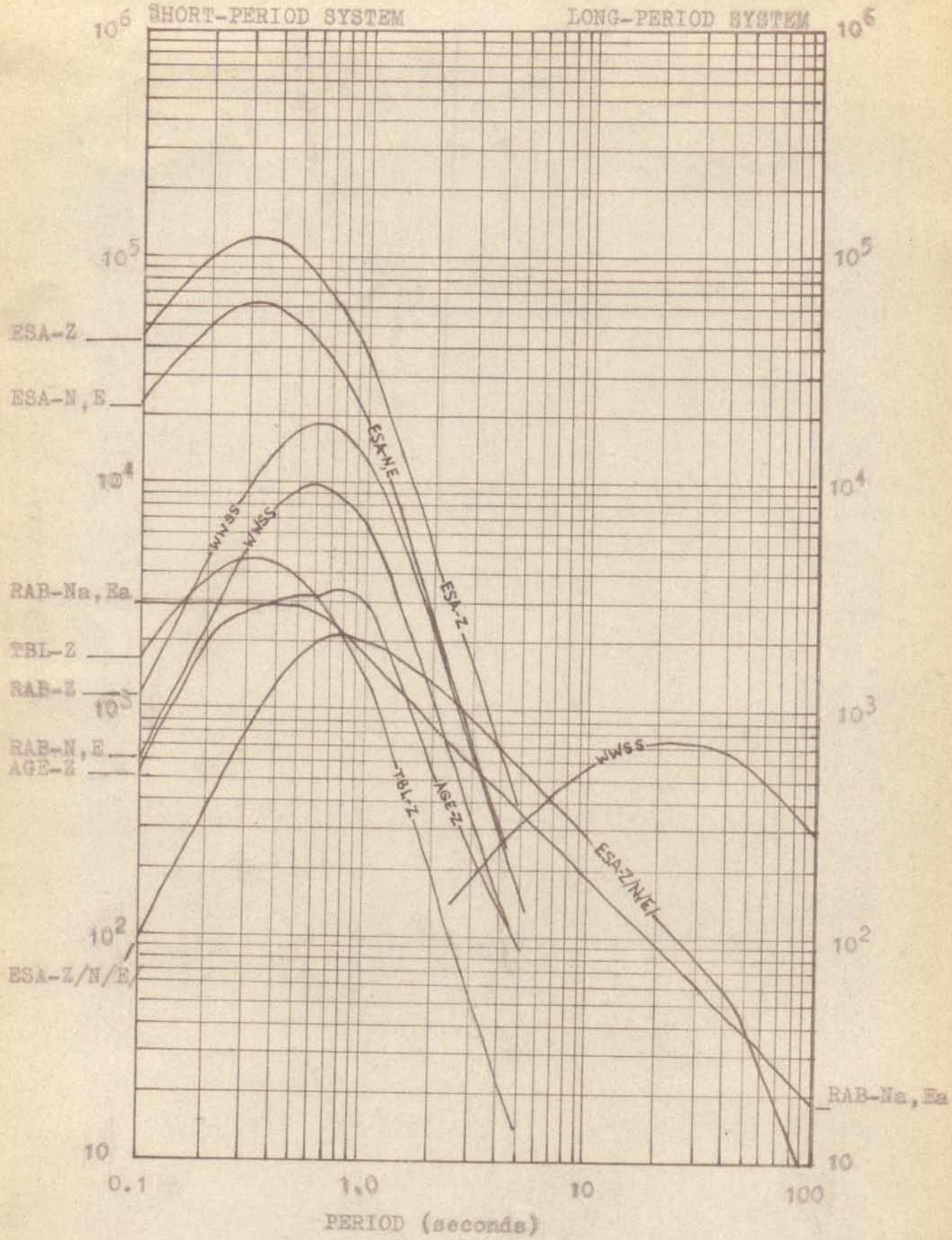
Details of emergency field stations, within the Territory will be listed when in operation.

TBL -Tabele Observatory						
Benioff VR 107.5Kg (PAPUA)	Z	1.0	0.2	60	1,350	critical
ESA -Esa'ala Observatory						
Benioff VR 107.5Kg	Z	1.0	0.2	15	36,000	critical
Benioff VR 107.5Kg	N,E	1.0	0.2	15	18,000	critical
Benioff VR 107.5Kg	Z/N/E/	1.0	60.0	30	50% sensitivity	critical
AGE -Agenahambo Station						
Willmore portable	Z	0.6	0.25	60	3,000	underdamped

VR Variable Reluctance

VR Moving-coil

Relative magnification curves of seismograph systems installed in the stations controlled by the Rabaul Central Observatory are listed once a month on the P.E.A.



FREQUENCY RESPONSE CURVES OF THE INSTRUMENTS

GWDA Nov.67

PRESENTATION OF DATA

(reviewed in November, 1967)

All times are reduced to Greenwich Mean Time (GMT), which is 10 hours behind Eastern Standard Time.

At RAB and Harbour Network, the time signal is marked every minute on each seismogram record from the Observatory crystal chronometer. Second marks from radio signal VNG (Australia) are recorded on World-Wide Standard System S.P.-N component only according with the W.W.S.S. programme, at six hour intervals. Primary time is provided by W.W.S.S. equipment and secondary time by a Lebtronic crystal chronometer with the accuracy of ± 5ms per day compared with VNG (Australia) with the aid of a chronoscope.

At TBL and AGE, the time signal is derived from a spring driven chronometer (Mercer) and marked each minute on records. Time accuracy is determined by comparison with signals from WWVH daily. Linear correction is applied to the daily drift.

On all seismogram records time increases from left to right and time break is upward.

At RAB* and Harbour Network the recording drum of each seismograph is driven by a 110VAC 60Hz synchronous motor. The 110VAC is frequency regulated by a crystal chronometer.

* The Omori recording drum is driven by a nonregulated 50Hz frequency supply.

At ESA and KRT power for recorder motors is frequency regulated by a crystal chronometer at 50Hz. Power for AGE and TBL and field stations is supplied by a 50Hz free running oscillator.

Direction of Motion

Upward direction of ground motion corresponds to upward trace motion on vertical seismogram records. Direction of component of ground motion to North or East corresponds to upward trace motion on horizontal seismogram records.

Vertical trace motion from impulsive onset of longitudinal waves of compressional or dilatational ground movement is indicated by "u" or "d" accompanied by N,S,E or W, as per trace motion amplitude on horizontal seismogram records, to represent vectorially the direction of ground motion. "+" or "-" indicates upward or downward motion of the ground respectively, from a wave not known to be of the longitudinal type.

Accuracy of Readings

When readings are given with a decimal figure, they are to 1/10 of a second, other readings have been made to the nearest half second.

Crustal Phases

Px, Sx Crustal phases, other than Pn and Sn for local and near earthquakes.

Felt Intensity

Information on maximum intensities of shocks reported felt is included. Intensities are given in Roman numerals based on the Modified Mercalli Scale, of 1931.

PRESENTATION OF DATA (CONT'D)

Determinations of Epicentres

Where no source is cited, the determination of epicentres, origin time, focal depth and distance in central angle degrees from the pertinent station for local and regional earthquakes, are carried out at the Central Observatory, Rabaul.

Geographical Designation of Epicentres

The regional names which follow the co-ordinates of epicentres located at the Central Observatory are meant only to supplement the co-ordinates and normally follow well-known geographical rather than geological features. Use is made of the full degree blocks according to the method defined by E.A. Flinn and E.R. Engadhl in "A PROPOSED BASIS FOR GEOGRAPHICAL AND SEISMIC REGIONALIZATION", Seismic Data Laboratory Report No. 101, U.I.D. Inc., Alexandria, Virginia, 1964, adopted by the U.S.C.G.S. for computer requirements.

Magnitude Definition and Determination

M_L - Local Magnitude (Richter, 1935) is calculated from the recorded trace amplitude of the Wood-Anderson torsion seismographs of stated physical constants (installed at the Observatory in November, 1967).

Maximum trace amplitude (0 to peak) expressed in millimetres and tenths is measured directly on both components. Magnitude is determined independently and the arithmetic mean taken. M_L values are given to the tenth of a unit.

The station correction factor is assumed to be zero until better known.

M_S -Surface Wave Magnitude (Gutemberg & Richter, 1956) is calculated from the amplitude of surface waves of period near 20 seconds for shallow distant earthquakes.

M_B -Body Wave Magnitude is calculated from the ratio of amplitude over period for body waves on S.P.-Z of World-wide Seismograph System only when depth is known. The magnification factor for the standard seismograph is taken into account.

m -Unified magnitude (Gutemberg & Richter, 1956) has the following relation to M_L, M_S, and M_B.

$$m = 1.7 + 0.8\ M_L - 0.01\ M^2_L$$

$$m = M_B \text{ (without correction)}$$

$$m = 2.5 + 0.63\ M_S$$

Local Magnitude of earthquakes recorded at RAB with a clear S-P interval is tabulated on a Day-Distance (in Central Angle Degrees) graph which is added to the PEA monthly.

Symbols

i - impulsive and sharply defined beginning of a phase.

e - emergent and poorly defined beginning of a phase.

T - Period in seconds

A - Peak-to-Trough trace amplitude in millimetres.

GM - Ground Motion.

Dist -Distance in central angle degrees.
H - Origin Time
h - Focal depth in Kilometres
CBM - Confused by microseisms.

PRESENTATION OF DATA (CONT'D)

Remarks

Local - Typical signature of an earthquake with epicentre within 0.9°.

Near - Typical signature of an earthquake with epicentre between 0.9° and 9°.

Distant - Typical signature of an earthquake with epicentre between 9° and 45°.

Teleseism - Typical signature of an earthquake with epicentre more than 45°.

Traces - Any recorded disperse waves or very weak unknown earthquake phases.

Local and Near earthquakes will be classified Regional, and Distant earthquakes will be grouped with Teleseisms if sheer waves and their reflections are unidentifiable.

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Vulcanologist-in-Charge

			T sec	A mm	GM	Dist	H	Remarks
31st Jan.,1968		Strong microseismic activity on all KRT records until 1100 hrs						
RAB	ePZ	030321½	0.5	1.0	d	(22°)		CBM
	iZ	43.0						
	e(S)N/	0722						
RAB	ePZ	053204½	0.5	2.5	d			CBM (near shock)
RAB	ePZ	074726½	0.5	2.0	u			CBM Regional
KRT	ePZ	074726	0.3	2.9	u	2¼°	074650	
	i(S)E	53						
RAB	iPZ	104930.5	0.4	2.0	d	2¼°	104855	ML=4.0
	iZ	33.5						
	iSN/	57						
KRT	iPZ	104929			u	2°	104857	
	iSE	53						
RAB	iPZ	111734.3	0.5	15.0	d	(3°)	1116(47)	M_L=5.1
	iZ	37.0						
	i(S)E	1810						
WAN	iPZ	111734.0	0.3	1.5	d			
RAL	iPZ	111733.6	0.2	6.0	d			
KRT	i(P)Z	111736			u	3¼°	111647	CBM
	iSE	1813						
RAB	iPZ	133432.0	1.0	6.0	u			Regional
KRT	ePZ	133430	1.0	2.1	d			
RAB	iPZ	142153.0	0.5	5.0	u	1¼°	142132	M_L=4.3
	iSN	2209.0						
WAN	iPZ	142152.5	0.2	2.0	u			
SUL	iPZ	142152.5	0.2	1.0	u			
RAL	iPZ	142152.2			u			
KRT	ePZ	142154			u			
RAB	iPZ	153742.8	0.8	3.0	d			Regional
KRT	ePZ	153741			d			CBM
RAB	iPZ	180952.4	0.4	16.0	d	1½°	180928	M_L=4.6
	iZ	54.5						
	iSN	1010.0						
WAN	iPZ	180952.0	0.4	5.0	d			
SUL	iPZ	180952.1	0.2	2.5	u			
RAL	iPZ	180952.0	0.5	5.0	d			
KRT	iPZ	180951			d	1°	180933	
	iSN	1004						
1st Feb.,1968		KRT Strong microseisms masking shocks during first and last parts of records						
RAB	iPZ	034903.5	0.5	2.6	u	2¼°	034827	M_L=5.1
	iSN	31.0						
RAL	iPZ	034903.5	0.8	1.5	u			
KRT	iPZ	034904			d	2°	034832	CBM
	iSE	27½						
RAB	e(P)Z	035029½	0.4	5.0	u	3°	054943	in coda of preceeding shock
	iSN	5104.0						

			T sec	A mm	GM	Dist	H	Remarks
1st Feb., (cont'd)								
RAB	iPZ	064209.5	0.4	2.0	d	2¼°	064135	M_L=4.8
	iZ	11.8						
	iSN	36.0						
KRT	iPZ	064211	0.4	4.4	u	2¼°	064134	
	iSE	38½						
RAB	iPZ	101309.0	0.5	2.0	u	2¼°	101235	M_L=5.4
	iZ	12.0						
	iSN	35.0						
KRT	iPZ	101309	0.4	3.8	u	2°	101237	
	iSE	32½						
RAB	ePZ	114517.5	0.5	1.5	d	2½°	114438	M_L=4.5
	i(S)N	47.4						
KRT	e(P)Z	114521.0			d	2½°	114442	
	iSE	4907						
RAB	ePZ	123608	0.5	2.0	u	2°	123535	M_L=4.3
	iSN	33.5						
KRT	ePZ	123605			u	2¼°	123529	
	iSN	7½						
RAB	iPZ	125558.6	0.8	1.5	u	(50°)		
	iZ	5611.0						
	e(S)N	130254						
KRT	e(P)Z	125559			d			
RAB	iPZ	133644.0	0.4	1.3	d	2¼°	133602	M_L=4.5
	i(S)N	3716.0						
KRT	ePZ	133642	0.6	1.2	d	3¼°	133553	
	eSE	3719						
RAB	iPZ	161319.8	0.5	2.0	d	3°	161235	M_L=4.4
	iSE	54.3						
KRT	iPZ	161317½	0.3	1.8	d	3¼°	161229	
	iSE	55						
RAB	iPZ	162314.4	0.4	1.0	d	2¼°	162237	M_L=4.2
	iSN	42.8						
KRT	ePZ	162314½			u			
	iSE	47½						
RAB	iPZ	192637.3	0.4	2.0	d	1¼°	192614	
	i(S)N	54.5						
KRT	iPZ	192637	0.3		d			
	iSE	51½						
RAB	ePZ	200335½	0.4	1.0	d	3°	200251	M_L=4.4
	iSE	0409.0						
KRT	i(P)Z	200339	0.2	4.0	d			CBM
	iS	0410½						
RAB	iPZ	204632.8	0.4	3.0	d	2¼°	204557	
	iSN	59.5						
KRT	iPZ	204633½			d			CBM
	iSE	58½						
RAB	ePZ	221625	0.4	1.5	u	2½°	221544	M_L=4.3
	iSE	56.0						

			T sec	A mm	GM	Dist	H	Remarks
2nd Feb;1968								
RAB	iPZ iSN	034315.4 28.0	0.4	4.0	u	1°	034258	M_L=3.6
RAB	iPZ iSN	040647.0 0712.5	0.4	2.5	d	2°	040613	M_L=4.3
RAB	ePZ eSN	062239 2301½	0.4	2.0	d	1¾°	062209	
KRT	ePZ eSE	062224 2302½		3.0	u	3¼°	062134	
RAB	iPZ iSE	080336.0 0407.6	0.4	1.8	d	2½°	080254	M_L=4.6
KRT	iPZ iSE	080336 0408½	0.6	3.2	d	2¾°	080252	
RAB	ePZ iSN	091923½ 48.0	0.3	1.6	d	2°	091850	M_L=4.4
KRT	ePZ eSN	091924 46½		2.0	d	2½°	091854	
RAB	e(P)Z	094500½	0.5	1.0	d			Teleseism
RAB	iPZ iSN	114302.4 16.0	0.3	3.8	u	1°	114245	M_L=3.4
KRT	iPZ iSE	114303 14½		4.0	d	1°	114247	
RAB	e(P)Z	143115			d			Regional
RAB	ePZ eSN	150506 11	0.5	1.0	u	½°	150459	M_L=2.1
KRT	ePZ eSE	150508½ 16½	1.0	2.0	d	½°	150458	
RAB	iPZ iSN	150533.0 4118.0	0.4	2.0	d	1½°	150505	M_L=4.3 in coda of preceeding shock
KRT	iPZ iSE	164053½ 4118½	0.8	1.0	d	2°	164020	
RAB	iPZ iSN	183447.5 52.2	0.5	12.0	u	½°	183441	M_L=2.6
WAN	iPZ	183447.2	0.2	6.5	u			
SUL	iPZ	183447.0		3.0	u			
RAL	iPZ	183446.9		8.0	u			
KRT	iPZ iSE	183444 53	0.6	1.6	d	½°	183431	
RAB	iPZ	193429.5	0.8	3.0	u			Regional
KRT	ePZ	193429½	1.8	1.4	u			
RAB	iPZ iSN	221908.0 25.5	0.4	4.0	u	1¼°	221845	M_L=3.9
KRT	iPZ iSN	221906½ 26	0.2	6.0	u	1½°	221841	
RAB	iPZ iSE	234226.5 4308.0	0.5	4.0	d	3½°	234132	M_L=5.4
KRT	ePZ	234222½			d			

			T sec	A mm	GM	Dist	H	Remarks
3rd Feb;1968								
RAB	iPZ	001638.0	0.4	5.0	d	2½°	001600	M_L=5.1
	iZ	41.0						
	iSN	1707.5						
RAB	ePZ	010655½	0.3	1.2	u	2°	010623	M_L=4.0
	iSN	0720.0						
KRT	ePZ	010654		3.0	u	2¼°	010620	
	iSN	0720						
RAB	iPZ	090054.6	0.5	1.5	u	2¾°	090011	M_L=4.5
	iSN	0132.1						
KRT	ePZ	090054				3¼°	090004	
	iSE	0132½						
RAB	iPZ	113919.5	1.0	3.5	d			Distant sh
KRT	iPZ	113920½	2.0	1.0	d			
RAB	iPZ	135228.6	0.5	3.0	u	3°	135141	M_L=5.3
	iZ	33.0						
	iSE	5304.5						
KRT	ePZ	135228				3°	135142	
	eSE	5303						
RAB	iPZ	153921.0	0.3	2.0	u	1¾°	153852	M_L=4.8
	iZ	25.3						
	iSE	43.0						
WAN	iPZ	153920.7	0.4	4.0	u			
SUL	iPZ	153921.1	0.5	3.0	d			
KRT	iPZ	153921	0.4	7.0	u	1½°	153854	
	iSE	41						
RAB	ePZ	204726½	0.5	1.0	u	3½°	204629	M_L=4.8
	iSE	4810.0						
4th Feb;1968								
RAB	iPZ	020320.2	0.4	1.0	d	½°	020255	
	eSE	39½						
KRT	e(P)Z	020324½	1.2	1.5	d	¾°	020309	
	iSE	36						
RAB	iPZ	051540.5	0.3	6.0	d	1½°	051515	
	iSE	59.8						
KRT	iPZ	051529	0.2	3.0	u	2¼°	051455	
	iSE	55						
RAB	ePZ	091859	1.0	1.0	d			Near shock
RAB	ePZ	110922½	1.0	3.0	u	49°		
	iSN/	1009						
KRT	ePZ	110924½	1.5	2.0	u			Teleseism
	eSN	1007½						
RAB	iPZ	161911.1	0.4	4.0	u	2°	161841	M_L=4.9
	iZ	14.0						
	eSN/	34						
KRT	ePZ	161912	2.0	1.0	u	2¼°	161837	
	eSE	38½						

			T sec	A mm	GM	Dist	H	Remarks
4th Feb;1968 (cont'd)								
RAB	iPZ	201117.4	0.3	34.0	d	½°	201105	M_L=3.9
	iSN	26.5						
WAN	iPZ	201117.0	0.6	11.0	d			
SUL	iPZ	201116.9	0.5	6.5	d			
RAL	iPZ	201116.5	0.8	25.5	d			
KRT	ePZ	201118	1.0	3.0	d	¾°	201104	
	iSE	28						
5th Feb;1968								
RAB	iPZ	040625.8	0.5	4.0	u	1½°	040600	
	eSN/	46						
KRT	iPZ	040625½			u	1½°	040600	Overlapping traces
	iSE	44½						
RAB	iPZ	100708.1	0.5	3.0	d	2°	100635	M_L=4.8
	iSE	33.5						
KRT	iPZ	100710	0.4	2.0	u	2¼°	100635	
	iSE	36						
RAB	iPZ	190634.5	0.6	4.0	u	2½°	190556	M_L=4.9
	iZ	36.8						
	iSE	0704.0						
KRT	eiPZ	190635½	0.5	2.0	d	2½°	190558	
	iSE	0704						
6th Feb;1968								
RAB	iPZ	044304.2	0.5	3.0	u			Regional
RAB	iPZ	075331.1	0.5	2.0	u	1¼°	075310	
	eSN	47						
KRT	iPZ	075333	0.6	5.0	d	1°	075313	
	iSE	47½						
RAB	eZ/	091224			-			Traces
RAB	eZ/	100248			-			Traces
RAB	iPZ	104840.0	0.5	3.0	d	2°	104806	M_L=4.7
	iZ	42.1						
	iSN	4905.5						
KRT	iPZ	104840	0.3	5.0	d	2°	104810	
	iSE	4903						
RAB	iPZ	113827.6	1.0	2.6	d			Regional
RAB	eZ/	121127.6			-			Traces
RAB	iPZ	130549.4	0.5	8.2	u	1°	130531	
	iSN	0603.2						
WAN	iPZ	130549.0	0.3	2.0	u			
KRT	eiPZ	130552	0.6	3.0	d	1°	130534	
	iZ	52						
	iSE	0605½						
RAB	iPZ	132901.0	0.5	3.0	d	2¼°	132825	M_L=5.0
	iZ	04.1						
	iSN	28 0						

			T sec	A mm	GM	Dist	H	Remarks
6th Feb;1968 (cont'd)								
WAN	iPZ	132901.0	0.5	1.0	u			
KRT	iPZ	132903½	0.3	3.5	d	2°	132832	
	iSN	27						
RAB	eZ/	154034			+			Traces
RAB	iPZ	181331.5	0.4	1.5	d	1½°	181307	M_L=3.8
	iSE	49.5						
KRT	iPZ	181331	0.4	8.0	u	1¼°	181310	
	iSE	46½						

			T sec	A mm	GM	Dist	H	Remarks
1st Jan;1968	L-P N-S records U/S due to faulty galvanometer from 1st - 8th							
ESA	iPZ	124833	0.4	4.8	u	½°	124823	
	iSN	41						
2nd Jan;1968								
ESA	iPZ	002119½	0.5	1.8	u			Regional
ESA	ePZ	032713½	0.3	4.4	d		032657	
	iSE	25½						
ESA	iPZ	074710½			u	1°		traces indistinct
	e(S)E	4801½						
ESA	ePZ/	114742						Telescism
3rd Jan;1968								
ESA	eiP	030638½	0.5	4.8	u	8½°	030435	
	i(S)E	0814½						
ESA	iPZ	213501	0.5	2.0	u	¼°	213455	
	iSE	05½						
4th Jan;1968								
ESA	iPZ	004927	0.4	1.5	d			
ESA	eiPZ	010752½	0.9	5.6	d			
ESA	eiPZ	102708½	0.4	2.3	d			
ESA	ePZ	112023	0.5	1.2	d	3°	111949	
	iSE	48½						
ESA	ePZ	120518				2°	120448	
	iSE/	41						
ESA	eP	203138½	0.5	0.2	d			
5th Jan;1968								
ESA	ePZ	002222½	0.5	1.1	u	2¼°	002147	
	iSE	49½						
ESA	eiPZ	005224	0.4	1.6	u	¼°	005124	
	iSN	5310½						
ESA	iPZ	043448			u	3°	043404	
	iSN	3522½						
ESA	ePZ	091902	0.6	1.2	u	2¼°	091828	
	iSE	28						
ESA	eiPZ	103905	0.5	3.4	d	2¼°	103829	
	iSE	32½						
ESA	iPZ	184157	0.3	3.2	d	2½°	184119	
	i(S)N	4226						
ESA	ePZ	222805½				5½°	222640	
	i(S)E	2911½						
6th Jan;1968	No Z L-P record							
ESA	ePZ	062310	1.0	1.6	d	1¾°	062242	
	i(S)E	32						
ESA	iPZ	133409½	0.6	1.2	u	2¼°	133334	
	iSE	36½						

			T sec	A mm	GN	Dist	H	Remarks
7th Jan;1968								
ESA	eiP!Z i(S)E/	095701 5801½			d	4°	095542	
8th Jan;1968								
ESA	eiPZ	082016	0.6	1.1	d			
ESA	iPZ	173432½ 3533½	0.5	4.6	d	4°	173313	
TABLE 24th Jar - 30th Jan, 1968								
24th Jan;1968								
TBL	eiPZ	093203		6.0	d			
25th Jan;1968			NIL RECORDED					
26th Jan;1968								
TBL	ePZ	045115½	0.5	2.0	u			
27th Jan;1968			NIL RECORDED					
28th Jan;1968			NIL RECORDED					
29th Jan;1968								
TBL	ePZ	102629	1.0	0.5	u			
30th Jan;1968								
TBL	ePZ	022048½	0.6	2.0	d			

G.W. D'ADDARIO
Vulcanologist-in-Charge

Rabaul Central Observatory
20th February, 1968

PEA Feb.68 No.8.

TERRITORY OF PAPUA AND NEW GUINEA
GEOLOGICAL AND VOLCANOLOGICAL BRANCH
VOLCANOLOGICAL SECTION

PRELIMINARY EARTHQUAKE ANALYSIS
RABAUL CENTRAL OBSERVATORY
1968

Rabaul	RAB	From; FEB. 14. 1968 To: FEB. 20. 1968
Keravat	KRT	From: FEB. 14. 1968 To: FEB. 20. 1968
Esa'ala	ESA	From: FEB. -6. 1968 To: FEB. 12. 1968
Tabele	TBL	From: FEB. 13. 1968 To: FEB. 19. 1968
Agenahambo	AGE	From; To:
Waris	WAA	Not operational
Ulamona	ULA	Not operational
Piva	PIV	Not operational
C.Gloucester	LAG	From: To:

STATION PERSONNEL

RAB Central Observatory, Rabaul.

Vulcanologist-in-Charge	G.W. D'Addario
Vulcanologist	R.F. Heming
Seismologist	(Position Vacant)
Seismogram Readers	D.J. Cook; H.M.Carrick
Senior Technical Officer	N.O. Myers
Technical Officer	R.J. Conway
Vulcanological Assistants	L. Topue; M. Gaiam V. Kaita
Technical Assistant	P. Daimbari
Trainee Vulcanological Assistants	B. Talai; M. Salaiau; (one Position Vacant)
Secretary	G. Chart

KRT Keravat Outstation

Observer (part-time)	G.E. Chorick

TBL Tabele Observatory

Observer	E. Ravian

ESA Esa'ala Observatory

Observer	F. Dira

AGE Agenahambo Outstation

Observer (part-time)	Br. B. Hughes

The Rabaul Preliminary Earthquake Analysis (PEA) is produced by the staff under the direction of the Vulcanologist-in-Charge from whom additional information and photocopies of seismogram records from all stations may be obtained on request.

Please address all communications to:-

Vulcanologist-in-Charge,
Central Observatory,
P.O. Box 386,
RABAUL, T.P. & N.G.

SEISMOGRAPH STATIONS

Station (NEW GUINEA)	Code	South Latitude	East Longitude	Elev. (m)	Foundation
Rabaul	RAB	04°11'28.6"	152°10'11.4"	183.5	Basalt Flow
Wanliss Street	WAN*	04°11'39.6"	152°10.32.5"	25.0	Basalt Flow
Sulphur Creek	SUL*	04°13'09.8"	152°10'33.3"	8.5	Unconsolidated Volcanic Ash
Rabalanakaia	RAL*	04°13'13.0"	152°12'07.0"	91.0	Unconsolidated Volcanic Ash
Tavurvur	TAV*	04°13'52.2"	152°13'12.9"	27.0	Andesite Flow
Taviliu	VUL*	04°16'58.2"	152°08'44.6"	332.3	Unconsolicated Volcanic Ash
Keravat	KRT	04°21'10.5"	152°03'06"	20.0	Alluvium
Ulamona	ULA	04°59'24.0"	151°16'30.0"	17.0	Lapilli Tuff
Tabele	TBL	04°06'04.67"	145°00'41.37"	179.5	Basalt Flow
Waris	WAA	04°07'00"	145°06'00"	48.0	Lapilli Tuff
Piva	PIV	06°12'00"	155°03'30"	60.0	Alluvium
Cape Gloucester	LAG	04°27'20"	148°26'00"	24.0	Lapilli Tuff
(PAPUA)					
Agenahambo	AGE	08°48'49"	148°05'56"	303.0	Unconsolidated Volcanic Ash
Esa'ala	ESA	09°44'18.2"	150°48'50.7"	46.4	Granite Gneiss

* Rabaul Harbour Network

STATION INSTRUMENTATION

Station & Instruments	Comp.	To	Tg	Trace Speed mm/min	Approximate relative Magnification	Approximate damping
(NEW GUINEA)						
Rabaul Central Observatory RAB						
World-Wide Standard	Z	1.0	0.74	60	12,500	Critical
	N,E	1.0	0.74	60	6,250	Critical
	Z/N/E/	15.0	100.0	15	750	Critical
Benioff VR 14.7Kg	Z	1.0	0.02	180 *	4,000	Critical

* Recording is triggered by the onset of any earthquake with pre-determined minimum amplitude. Recorder is stopped automatically by hour break pulse.

Omori 15Kg	No	3.6	-	24	12	10.1(air)
Omori 15Kg	Eo	3.8	-	24	10	10.1(air)
Wood-Anderson Torsion	Na,Ea	0.8	-	60	2,800	Critical
Rabaul Harbour Network						
WAN° Benioff VR 14.7Kg	Z	1.0	0.02	60	5,240	Critical
SUL° Benioff VR 14.7Kg	Z	1.0	0.02	60	2,850	Critical
RAL° Benioff VR 14.7Kg	Z	1.0	0.02	60	8,075	Critical
TAV° Benioff VR 14.7Kg	Z	1.0	0.02	60	20,900	Critical
VUL°° Benioff VR 14.7Kg	Z	1.0	0.02	60	5,000	Critical

Readings from the Harbour Network are entered in the PEA only for large earthquakes.

STATION INSTRUMENTATION

Station & Instruments	Comp.	To	Tg	Trace Speed mm/min	Approximate relative Magnification	Approx. damping
Rabaul Harbour Network (Cont'd)						
KRT - Keravat Outstation						
Benioff Mc 50Kg	Z	1.2	0.2	15	20% sensitivity	Critical
Benioff MC 50Kg	N,E	1.2	0.2	15	10% sensitivity	Critical
ULA - Ulamona Field Station						
Willmore portable	Z	0.6	0.25	60	3,000	underdamped
PIV -Piva Field Station						
Willmore portable	Z	0.6	0.25	60	3,000	underdamped
WAA -Waris Field Station						
Willmore portable	Z	0.6	0.25	60	3,000	underdamped
LAG -Cape Gloucester Field Station						
Willmore portable	Z	0.6	0.25	60	3,000	underdamped

o Signals from these stations are telemetered by land line to Helicorders (Geotech Mod.2484) at the Central Observatory.

oo Signals from this station are telemetered via VHF to its Helicorder at the Central Observatory.

N.B. These field stations consist of a permanent building in which instruments are installed when necessary.

Details of emergency field stations, within the Territory will be listed when in operation.

TBL -Tabele Observatory						
Benioff VR 107.5Kg (PAPUA)	Z	1.0	0.2	60	1,350	critical
ESA -Esa'ala Observatory						
Benioff VR 107.5Kg	Z	1.0	0.2	15	36,000	critical
Benioff VR 107.5Kg	N,E	1.0	0.2	15	18,000	critical
Benioff VR 107.5Kg	Z/N/E/	1.0	60.0	30	50% sensitivity	critical
AGE -Agenahambo Station						
Willmore portable	Z	0.6	0.25	60	3,000	underdamped

VR Variable Reluctance

VR Moving-coil

Relative magnification curves of seismograph systems installed in the stations controlled by the Rabaul Central Observatory are listed once a month on the P.E.A.

PRESENTATION OF DATA

(reviewed in November, 1967)

All times are reduced to Greenwich Mean Time (GMT), which is 10 hours behind Eastern Standard Time.

At RAB and Harbour Network, the time signal is marked every minute on each seismogram record from the Observatory crystal chronometer. Second marks from radio signal VNG (Australia) are recorded on World-Wide Standard System S.P.-N component only according with the W.W.S.S. programme, at six hour intervals. Primary time is provided by W.W.S.S. equipment and secondary time by a Labtronic crystal chronometer with the accuracy of ± 5ms per day compared with VNG (Australia) with the aid of a chronoscope.

At TBL and AGE, the time signal is derived from a spring driven chronometer (Mercer) and marked each minute on records. Time accuracy is determined by comparison with signals from WWVH daily. Linear correction is applied to the daily drift.

On all seismogram records time increases from left to right and time break is upward.

At RAB* and Harbour Network the recording drum of each seismograph is driven by a 110VAC 60Hz synchronous motor. The 110VAC is frequency regulated by a crystal chronometer.

* The Omori recording drum is driven by a nonregulated 50Hz frequency supply.

At ESA and KRT power for recorder motors is frequency regulated by a crystal chronometer at 50Hz. Power for AGE and TBL and field stations is supplied by a 50Hz free running oscillator.

Direction of Motion

Upward direction of ground motion corresponds to upward trace motion on vertical seismogram records. Direction of component of ground motion to North or East corresponds to upward trace motion on horizontal seismogram records.

Vertical trace motion from impulsive onset of longitudinal waves of compressional or dilatational ground movement is indicated by "u" or "d" accompanied by N,S,E or W, as per trace motion amplitude on horizontal seismogram records, to represent vectorially the direction of ground motion. "+" or "-" indicates upward or downward motion of the ground respectively, from a wave not known to be of the longitudinal type.

Accuracy of Readings

When readings are given with a decimal figure, they are to 1/10 of a second, other readings have been made to the nearest half second.

Crustal Phases

Px, Sx Crustal phases, other than Pn and Sn for local and near earthquakes.

Felt Intensity

Information on maximum intensities of shocks reported felt is included. Intensities are given in Roman numerals based on the Modified Mercalli Scale, of 1931.

PRESENTATION OF DATA (CONT'D)

Determinations of Epicentres

Where no source is cited, the determination of epicentres, origin time, focal depth and distance in central angle degrees from the pertinent station for local and regional earthquakes, are carried out at the Central Observatory, Rabaul.

Geographical Designation of Epicentres

The regional names which follow the co-ordinates of epicentres located at the Central Observatory are meant only to supplement the co-ordinates and normally follow well-known geographical rather than geological features. Use is made of the full degree blocks according to the method defined by E.A. Flinn and E.R. Engadhl in "A PROPOSED BASIS FOR GEOGRAPHICAL AND SEISMIC REGIONALIZATION", Seismic Data Laboratory Report No. 101, U.I.D. Inc., Alexandria, Virginia, 1964, adopted by the U.S.C.G.S. for computer requirements.

Magnitude Definition and Determination

M_L - Local Magnitude (Richter, 1935) is calculated from the recorded trace amplitude of the Wood-Anderson torsion seismographs of stated physical constants (installed at the Observatory in November, 1967).

Maximum trace amplitude (0 to peak) expressed in millimetres and tenths is measured directly on both components. Magnitude is determined independently and the arithmetic mean taken. M_L values are given to the tenth of a unit.

The station correction factor is assumed to be zero until better known.

M_S -Surface Wave Magnitude (Gutemberg & Richter, 1956) is calculated from the amplitude of surface waves of period near 20 seconds for shallow distant earthquakes.

M_B -Body Wave Magnitude is calculated from the ratio of amplitude over period for body waves on S.P.-Z of World-wide Seismograph System only when depth is known. The magnification factor for the standard seismograph is taken into account.

m -Unified magnitude (Gutemberg & Richter, 1956) has the following relation to M_L, M_S, and M_B.

$$m = 1.7 + 0.8\ M_L - 0.01\ M^2_L$$

$$m = M_B \text{ (without correction)}$$

$$m = 2.5 + 0.63\ M_S$$

Local Magnitude of earthquakes recorded at RAB with a clear S-P interval is tabulated on a Day-Distance (in Central Angle Degrees) graph which is added to the PEA monthly.

Symbols

i - impulsive and sharply defined beginning of a phase.

e - emergent and poorly defined beginning of a phase.

T - Period in seconds

A - Peak-to-Trough trace amplitude in millimetres.

GM - Ground Motion.

Dist -Distance in central angle degrees.
H - Origin Time
h - Focal depth in Kilometres
CBM - Confused by microseisms.

PRESENTATION OF DATA (CONT'D)

Remarks

Local - Typical signature of an earthquake with epicentre within 0.9°.

Near - Typical signature of an earthquake with epicentre between 0.9° and 9°.

Distant - Typical signature of an earthquake with epicentre between 9° and 45°.

Teleseism - Typical signature of an earthquake with epicentre more than 45°.

Traces - Any recorded disperse waves or very weak unknown earthquake phases.

Local and Near earthquakes will be classified Regional, and Distant earthquakes will be grouped with Teleseisms if sheer waves and their reflections are unidentifiable.

G.W. D'ADDARIO
Vulcanologist-in-Charge

			T sec	A mm	GM	Dist	H	Remarks
14th Feb.,1968.								
RAB	eZ/	041814			+			Traces
RAB	ePZ	060625	0.5	2.0	d			Regional
RAB	iPZ eSN/	074810.2 30	0.3	2.0	d	1½°	074746	
WAN	iPZ	074810.2	0.2	2.0	u			
RAL	iPZ	074809.5	0.5	2.0	d			
KRT	iPZ	074810			d			Overlapping traces
RAB	ePZ eSN/	080418½ 47	0.6	2.0	d	2½°	080340	
KRT	i(P)Z i(S)N	080418 30½			d	1°	0804(01)	C.B.M.
RAB	ePZ eSE/	081912 29	0.4	2.0	d	1¼°	081852	
RAB	ePZ eSE/	104238.0 4308	0.2	2.0	u	2½°	104149	M_L= 4.9
RAB	eiPZ iZ iSN	115503½ 09.0 28.5	0.5	2.5	d	2°	115430	M_L= 4.8
KRT	iPZ eSN	115504 26	1.0	2.0	d	1¼°	115435	
RAB	iPZ iSN	134855.5 4916.0	0.3	8.0	u	1½°	134738	M_L= 4.3
WAN	iPZ	134855.5	0.3	1.5	u			
SUL	iPZ	134855.4	0.4	2.0	d			
RAL	iPZ	134855.3	0.5	2.0	u			
KRT	iPZ i(S)E	134853 4910	0.5	8.0	d	1¼°	1348(30)	
RAB	iPZ iSN	140720.0 44.0	0.5	4.0	u	2°	140648	M_L= 4.2
KRT	iPZ iSN	140717 37	0.4	2.0	u	1¼°	140650	
RAB	iPZ iSN	161444.8 1509.0	0.6	3.5	u	2°	161413	M_L= 4.3
KRT	iPZ eSN	161442 1508½	0.6	3.0	d	2¼°	161407	
RAB	iPZ iSE	190224.0 43.6	0.5	2.8	u	1½°	190158	M_L= 3.7
WAN	iPZ	190224.5	0.5	1.0	d			
KRT	ePZ iSN	190220 42		3.0	d	1¼°	190151	
15th Feb.,1968.								
RAB	eZ/	024012			+			Traces
RAB	iPZ iSN	044355.2 59.0	0.5	5.6	d			Local

			T sec	A mm	GM	Dist	H	Remarks
15th Feb.,1968 (cont'd).								
RAB	eZ/	045212			+			Traces
RAB	ePZ	060059	0.7	1.0	u			Near
RAB	ePZ i(S)N	072138 2206.0	0.3	1.3	d	(2¼°)	0721(01)	M_L= 4.2
RAB	ePZ iSE	075847 5918.0	0.4	1.8	d	2½°	075806	M_L= 4.4
RAB	iPZ iSN	083920.0 44.0	0.5	3.5	d	2°	083848	M_L= 4.0
RAB	iPZ	094252.5	0.2	3.0	d			Regional
KRT	iPZ iSE	094252 4315½			u	1¾°	094221	
RAB	iPZ eSN/	095507.2 38	0.5	7.0	u	2½°	095426	M_L= 4.8
WAN	iPZ	095507.2	0.5	1.0	d			
KRT	eiPZ iSE	095507½ 32			u	2°	095435	
RAB	iPZ eSE/	100313.5 44	0.4	2.5	d	2½°	100233	M_L= 5.0
KRT	iPZ iSE	100313½ 35	0.4	3.0	u	1½°	100245	
RAB	iPZ iZ iSN/	105457.1 59.2 5529	0.5	2.5	u	2½°	105415	M_L= 5.1
KRT	eiPZ	105456½			u			
RAB	iPZ iSN	125817.4 45.5	0.5	3.6	u	2¼°	125740	M_L= 4.7
KRT	ePZ iSN	125814½ 48	0.2	1.2	d	2¾°	125740	
RAB	iPZ iSN	153316.3 48	0.4	1.8	d	2½°	153234	M_L= 5.2
KRT	eiPZ iZ iSE	153317½ 18 41½	0.4	2.8	u	2°	153246	
RAB	ePZ i(S)	170710½ 29.0	0.5	1.5	d	(1½°)	1706(45)	M_L= 3.7
KRT	eiPZ i(S)N	170710 41	0.3	3.0	u	2½°	1706(29)	
RAB	iPZ iSN	182507.5 43.5	0.5	4.0	d	3°	182420	M_L= 5.0
WAN	iPZ	182507.4	0.5	1.5	u			
KRT	iPZ	182507.0	0.6	4.8	d	3°	182420	
RAB	iPZ iSN/	185412.2 5509	0.4	8.0	d	5°	185258	M_L= 5.8 Deep Shock
WAN	iPZ	185412	0.3	2.0	d			
KRT	iPZ iSN	185413½ 5512½			d	5¼°	185257	Overlapping traces

			T sec	A mm	GM	Dist	H	Remarks
15th Feb.,1968.(cont'd)								
RAB	iPZ iSE	200514.2 42.5	0.5	2.2	u	2¼°	200437	M_L= 4.4
RAB	iPZ iSN	214636.0 51.5	0.5	5.2	u	1¼°	214615	M_L= 4.0
WAN	iPZ	214635.4	0.2	1.0	u			
16th Feb., 1968.								
RAB	iPZ iSN	000613.2 25.0	0.3	9.5	u	1°	000557	M_L= 3.7
RAB	iPZ iSN	011039.2 1103.0	0.5	4.0	u	2°	011007	M_L= 4.2
RAB	iPZ iSN	052428 48.2	0.5	4.0	u	1½°	052401	M_L= 3.7
RAB	ePZ	070208	0.4	1.0	d			Regional
RAB	e(P)Z iZ eSN/	084842 47.4 4916	0.5	1.0	u	3°	084757	M_L= 4.7
KRT	e(P)Z iSN	084841½ 4915½			d	3°	084757	
RAB	iPZ iZ iSN	112033.0 36.3 53.0	0.3	1.0	d	1½°	112006	M_L= 5.1
WAN	iPZ	112033.0	0.2	3.0	d			
KRT	iPZ iSE	112030½ 48½			d	1½°	112007	
RAB	ePZ iSE	122256½ 2320.0	0.4	1.2	u	2°	122225	M_L= 4.0
KRT	eiPZ i(S)N	122255 2333			u	3¼°	1222(05)	
RAB	iPZ	143212.5	0.5	11.0	u			Regional
WAN	iPZ	143212.2	0.8	3.6	u			
KRT	eiPZ	143213½	0.5	3.8	u			
RAB	iPZ iZ iSN	143906.4 09.0 37.0	0.4	1.0	u	2½°	143825	M_L= 5.1
KRT	iPZ iSN	143906 36½	0.3	1.0	u	2½°	143826	
RAB	iPZ iSN	173714.0 28.0	0.4	6.0	d	1°	173655	M_L= 3.8
WAN	iPZ	173713.5	0.2	1.0	d			
KRT	iPZ iSN	173716½ 3732½			d	1¼°	173655	
RAB	iPZ iSN	185752.0 5813.0	0.3	4.5	u	1½°	185724	M_L= 4.7
WAN	iPZ	185752.0	0.2	1.0	u			

			T sec	A mm	GM	Dist	H	Remarks
16th Feb., 1968 (cont'd).								
KRT	eiPZ iSE	185749 5808½		2.8	d	1½°	185723	
RAB	iPZ iSN	190211.5 32.0	0.3	2.0	d	1½°	190143	M_L= 4.2
KRT	iPZ iSE	190209 27½			d	1½°	190145	
RAB	iPZ iZ iSN	194927.0 28.0 47.6	0.4	2.6	u	1½°	194859	
KRT	eiPZ i(S)N	194925 42			d	3¼°	1949(02)	
RAB	ePZ iSN	224421 49.0	0.5	1.5	u	2¼°	224344	
17th Feb., 1968.								
RAB	iPZ e(S)E/	003234.3 3319	0.4	2.6	u	(3¾°)	0030(35)	M_L= 5.2
RAB	iPZ eSE!	065605.0 21	0.5	8.0	u	1¼°	065544	M_L= 3.7
WAN	iPZ	065605.0	0.2	3.0	d			
KRT	iPZ iSE	0656(04.5) 21			u	1¼°	065543	
RAB	iPZ iSN	083500.2 21.0	0.5	5.0	u	1½°	083432	M_L= 4.3
RAB	iPZ eSN	120742 0808	0.6	2.0	d	2¼°	120708	
KRT	iPZ iSN	120743 120809			u	2¼°	120709	
RAB	ePZ eSN	130109 24½	0.4	2.0	u	1¼°	130049	M_L= 3.5
KRT	ePZ	130101	0.6	1.0	d			
RAB	ePZ	141813	0.4	2.0	u			Regional
RAB	iPZ iSN	142739.5 2809.5	0.5	2.0	u	2½°	142700	M_L= 4.8
KRT	iPZ	142738½	0.8	3.6	u			
RAB	ePZ	172523½	0.5	2.0	u			Regional
RAB	eiPZ iZ eSE/	174303 08.2 32	0.5	1.0	u	2½°	174225	M_L= 4.5
KRT	eiPZ	174302	0 4	2.0	u			
RAB	iPZ iSN	174548.7 4608.4	0.5	2.0	d	1½°	174522	M_L= 4.0
WAN	iPZ	174548.6	0.2	1.0	d			
KRT	iPZ	174645½			d			

			T sec	A mm	GM	Dist	H	Remarks
17th Feb., 1968 (cont'd).								
RAB	ePZ eSN	194731½ 58½	0.4	1.0	d	2¼°	194656	M_L= 4.1
KRT	iPZ	194730	0.7	1.2	d			
RAB	iPZ iSN/	200521.7 33	0.5	36.0	d	¾°	200507	
WAN	iPZ	200521.4	0.5	12.0	d			
KRT	eiPZ	200521½			d			
RAB	iPZ iSN	201059.7 1115.8	0.5	1.8	d	1¼°	201038	M_L= 3.6
KRT	eiPZ	201059½	0.4	1.8	d			
RAB	iPZ iSN	205307.0 22.0	0.5	4.0	u	1¼°	205247	
WAN	iPZ	205306.8	0.3	2.0	u			
KRT	iPZ	205306½	0.4	4.0	d			
18th Feb.,1968 (cont'd).								
RAB	eiPZ eSN/	001616.0 42	0.8	5.5	u	2¼°	001542	
KRT	iPZ e(S)N	001616 43½	1.0	7.0	d	2¼°	0015(39)	
RAB	iPZ iSE	001850.2 1915.5	0.5	3.0	d	2°	001817	
RAB	iPZ iSN/	040612.2 58.0	0.5	5.5	d	4°	040512	M_L= 5.6
RAB	iPZ iZ eSN/	043043.2 47.4 3106.0	0.4	3.8	d	2°	043013	M_L= 4.5
RAB	iPZ iSN/	101209.6 34.0	0.6	3.0	u	2°	101137	M_L= 5.2
RAB	iPZ iZ iSN/	105753.5 57.7 5822	0.8	1.8	u	2¼°	105716	M_L= 4.5
KRT	ePZ e(S)N	105752½ 5820	0.4	3.0	u	2¼°	1057(16)	
RAB	eiPZ eSN/	120443½ 0500.3	0.5	2.2	d	1¼°	120421	
KRT	iPZ e(S)N	120442 53½	0.4		d	1°	1204(26)	
RAB	iPZ eSE/	201732.0 1806	0.8	8.2	d	2¾°	201647	M_L= 5.1
WAN	iPZ	201732.0	0.6	2.0	d			
KRT	iPZ eSE	201732 1806	1.0	8.5	d	2¾°	201647	C.B.M.
19th Feb.,1968.								
RAB	iPZ iSE/	022025.0 48	0.8	20.5	d	1¾°	021955	M_L= 5.4

			T sec	A mm	GM	Dist	H	Remarks
19th Feb.,1968 (cont'd).								
RAB	iPZ eSE/	031337.4 1404	0.5	9.0	d	2¼°	031302	M_L= 4.9
RAB	iPZ iSE/	032912.8 54.0			d	3½°	032819	Overlapping traces
RAB	iPZ eSE/	033135.3 3205			d	2½°	033058	In coda of preceeding shock M_L= 4.7
RAB	iPZ eSN/	043725.8 56			u	2½°	043646	M_L= 4.8
RAB	iPZ iSN	103209.8 34.5	0.4	2.8	u	2½°	103137	M_L= 4.6
RAB	iPZ eSE/	111137.7 56	0.5	8.2	d	1½°	111114	M_L= 4.6
WAN	iPZ	111137.2	0.3	5.0	d			
KRT	ePZ	111136			d			Regional
RAB	iPZ i(S)E/	135539.0 58	0.4	42.0	u	1½°	135514	M_L= 5.2
RAL	iPZ	135538.0	0.4	3.0	d			
KRT	iPZ	135538½			d			Regional
RAB	iPZ i(S)N	140445.8 0508.0	0.8	22.0	d	(1¾°)	1404(17)	M_L= 4.7
RAB	iPZ iSE	143143.0 3216	0.8	7.2	u	2¾°	143100	M_L= 5.6
SUL	iPZ	143143.2	0.4	1.0	d			
KRT	iPZ	143143			d			
RAB	iPZ	151702.9	0.5	3.0	d			
RAB	iPZ eSN/	152652.2 2724	0.5	3.0	u	2¾°	152610	
KRT	iPZ e(S)E	152650½ 2723½		2.0	u	2¾°	152606	
RAB	iPZ iSE	162207.2 25.6	0.5	4.0	u	1¼°	162143	M_L= 4.2
KRT	iPZ iSE	162207 26	0.3	3.0	d	1½°	162142	
20th Feb.,1968.								
RAB	ePZ iSE	002227 54.3	0.2	1.5	d	2¼°	002151	M_L= 5.6
KRT	ePZ eSE	002227½ 53½	0.6	2.5	d	2¼°	002153	
RAB	ePZ cSN	005747½ 5817			u	2½°	005709	M_L= 4.9
RAB	iPZ	025619.7	0.3	2.8	u			Near

			T sec	A mm	GM	Dist	H	Remarks
20th Feb.,1968 (cont'd).								
RAB	ePZ iSN	030511 22.2	0.2	2.1	d	¾°	030456	
RAB	ePZ iSN	070143½ 0203.0	0.3	2.3	u	1½°	070118	M_L= 2.9
RAB	ePZ iSN	120328 0400.2	0.3	3.2	d	2¾°	120246	Near
KRT	ePZ iSN	120327½ 0400½	0.4	3.5	d	2¾°	120244	C.B.M.
RAB	iPZ i(S)E	175620.0 28.3	0.5	2.0	u	1¾°	175556	
KRT	iPZ iSE	175618 39	0.4	1.0	u	1¾°	175550	
RAB	eiPZ eSN	191756½ 1812.6	0.3	11.0	u	1¾°	191735	M_L= 4.5
WAN	iPZ	191756.5	0.3	5.6	d			
SUL	iPZ	191756.4	0.3	2.0	d			
RAL	iPZ	191756.3	0.5	16.5	d			
KRT	i(P)Z iSE	191759½ 1817½	0.4	-	u	1½°	191736	
RAB	ePZ	205953	0.5	2.0	d			Near

6th Feb.,1968.

ESA	ePZ e(S)N	132944 3026	0.6	0.6	d	(3½°)	1328(49)	

7th Feb.,1968. Nil recorded

8th Feb.,1968.

ESA	ePZ	180439½	0.6	0.4	d			

E-W)
N-S) components - no time breaks on film.

9th February, 1968.

ESA	eP	135110	0.4	0.5	u			

E-W)
N-S) components - no time breaks on film.

ESA	iPZ	152642	0.4	1.0	u			

E-W)
N-S) no time breaks.

10th Feb.,1968.

ESA	iPZ	092347	0.6	1.0	u			

E-W)
N-S) no time breaks.

	ePZ	100719½	0.6	0.4	u			

			T sec	A mm	GM	Dist	H	Remarks
10th Feb., 1968 (cont'd).								
ESA	iPZ	120310½	0.4	0.6	u			
ESA	iPZ	161909						
11th Feb., 1968.								
ESA	iPZ	010223.8	0.4	1.2	u			
ESA	iPZ	080721.6	0.6	0.8	u			
ESA	ePZ	122305½	1.0	1.0	d			
ESA	iPZ	160235.4	0.6	2.0	u			
ESA	iPZ	210356.6	0.4	1.5	d			
	E-W) N-S)	no time breaks						
12th Feb., 1968.								
ESA	iPZ	05(41)(55.4)			d			
ESA	iPZ	09(19)(51.2)	0.4	0.8	d			
ESA	iPZ	14(31)(03.8)	0.4	1.5	d			
13th Feb., 1968.								
TBL	iPZ	003925½	0.2	6.0	d			Local
TBL	ePZ	021547½	0.5	2.0	d			
14th Feb.,1968.		Nil recorded						
15th Feb.,1968.								
TBL	iPZ	100103	0.3	6.0	u			Local
16th Feb.,1968.		Nil recorded						
17th Feb.,1968.								
TBL	ePZ	082321½	0.2	7.1	u			
TBL	ePZ	122934	0.2	2.9	u			Local
18th Feb.,1968.								
TBL	iPZ	040606	0.5	3.0				Regional
19th Feb.,1968.								
TBL	ePZ	174642		2.9	d			Local

Central Observatory
6th March, 1968.

G. W. D'ADDARIO
Vulcanologist-in-Charge

PEA Feb.68 No. 7

TERRITORY OF PAPUA AND NEW GUINEA
GEOLOGICAL AND VOLCANOLOGICAL BRANCH
VOLCANOLOGICAL SECTION

PRELIMINARY EARTHQUAKE ANALYSIS
RABAUL CENTRAL OBSERVATORY
1968

Rabaul	RAB	From: FEB. 7. 1968 To: FEB. 13. 1968
Keravat	KRT	From: FEB. 7. 1968 To: FEB. 13. 1968
Esa'ala	ESA	From: JAN. 16. 1968 To: JAN. 22. 1968
Tabele	TBL	From: JAN. 31. 1968 To: FEB. 12. 1968
Agenahambo	AGE	From: To:
Waris	WAA	Not operational
Ulamona	ULA	Not operational
Piva	PIV	Not operational
C.Gloucester	LAG	From: To:

STATION PERSONNEL

RAB Central Observatory, Rabaul.

Vulcanologist-in-Charge	G.W. D'Addario
Vulcanologist	R.F. Heming
Seismologist	(Position Vacant)
Seismogram Readers	D.J. Cook; H.M.Carrick
Senior Technical Officer	N.O. Myers
Technical Officer	R.J. Conway
Vulcanological Assistants	L. Topue; M. Gaiam V. Kaita
Technical Assistant	P. Daimbari
Trainee Vulcanological Assistants	B. Talai; M. Salaiau; (one Position Vacant)
Secretary	G. Chant

KRT Keravat Outstation

Observer (part-time)	G.E. Chorick

TBL Tabele Observatory

Observer	E. Ravian

ESA Esa'ala Observatory

Observer	F. Dira

AGE Agenahambo Outstation

Observer (part-time)	Br. B. Hughes

The Rabaul Preliminary Earthquake Analysis (PEA) is produced by the staff under the direction of the Vulcanologist-in-Charge from whom additional information and photocopies of seismogram records from all stations may be obtained on request.

Please address all communications to:-

Vulcanologist-in-Charge,
Central Observatory,
P.O. Box 386,
RABAUL, T.P. & N.G.

SEISMOGRAPH STATIONS

Station (NEW GUINEA)	Code	South Latitude	East Longitude	Elev (m)	Foundation
Rabaul	RAB	04°11'28.6"	152°10'11.4"	183.5	Basalt Flow
Wanliss Street	WAN*	04°11'39.6"	152°10'32.5"	25.0	Basalt Flow
Sulphur Creek	SUL*	04°13'09.8"	152°10'33.3"	8.5	Unconsolidated volcanic ash
Rabalanakaia	RAL*	04°13'13.0"	152°12'07.0"	91.0	Unconsolidated volcanic ash
Tavurvur	TAV*	04°13'52.2"	152°13'12.9"	27.0	Andesite Flow
Taviliu	VUL*	04°16'58.2"	152°08'44.6"	332.3	Unconsolidated volcanic ash
Keravat	KRT	04°21'10.5"	152°03'06"	20.0	Alluvium
Ulamona	ULA	04°59'24.0"	151°16'30.0"	17.0	Lapilli Tuff
Tabele	TBL	04°06'04.67"	145°00'41.37"	179.5	Basalt Flow
Waris	WAA	04°07'00"	145°06'00"	48.0	Lapilli Tuff
Piva	PIV	06°12'00"	155°03'30"	60.0	Alluvium
Cape Gloucester	LAG	04°27'20"	148°26'00"	24.0	Lapilli Tuff
(PAPUA)					
Agenahambo	ACE	08°48'49"	148°05'56"	303.0	Unconsolidated volcanic ash
Esa'ala	ESA	09°44'18.2"	150°48'50.7"	46.4	Granite Gneiss

* Rabaul Harbour Network

STATION INSTRUMENTATION

Station & Instruments (NEW GUINEA)	Comp.	To	Tg	Trace Speed mm/min	Approximate relative Magnification	Approximate damping
Rabaul Central Observatory RAB						
World-Wide Standard	Z	1.0	0.74	60	12,500	critical
	N,E	1.0	0.74	60	6,250	critical
	Z/N/E/	15.0	100.0	15	750	critical
Benioff VR 14.7Kg	Zh	1.0	0.02	180+	4,000	critical
+ Recording is triggered by the onset of any earthquake with pre-determined minimum amplitude. Recorder is stopped automatically by hour break pulse.						
Omori 15Kg	No	3.6	-	24	12	10.1 air
Omori 15Kg	Eo	3.8	-	24	10	10.1 air
Wood-Anderson Torsion	Na,Ea	0.8	-	60	2,800	critical
Rabaul Harbour Network						
Readings from the Harbour Network are entered in the PEA only for large earthquakes.						
WAN° Benioff VR 14.7Kg	Z	1.0	0.02	60	5,240	critical
SUL° Benioff VR 14.7Kg	Z	1.0	0.02	60	2,850	critical
RAL° Benioff VR 14.7Kg	Z	1.0	0.02	60	8,075	critical
TAV° Benioff VR 14.7Kg	Z	1.0	0.02	60	20,900	critical
VUL° Benioff VR 14.7Kg	Z	1.0	0.02	60	5,000	critical

STATION INSTRUMENTATION

Station & Instruments	Comp	To	Tg	Trace Speed mm/min	Approximate relative Magnification	Approximate damping
Rabaul Harbour Network (cont'd)						
o						
Signals from these stations are telemetered by land line to Helicorders (Geotech Mod. 2484) at the Central Observatory.						
oo Signals from this station are telemetered via VHF to its Helicorder at the Central Observatory.						
KRT Keravat Out-Station						
Benioff MC 50Kg	Z	1.2	0.2	15	20% sensitivity	critical
Benioff MC 50Kg	N,E	1.2	0.2	15	10% sensitivity	critical
ULA Ulamona Field Station						
Willmore portable	Z	0.6	0.25	60	3,000	underdamped
PIV Piva Field Station						
Willmore portable	Z	0.6	0.25	60	3,000	underdamped
WAA Waris Field Station						
Willmore portable	Z	0.6	0.25	60	3,000	underdamped
LAG Cape Gloucester						
Willmore portable	Z	0.6	0.25	60	3,000	underdamped
N.B. These field stations consist of a permanent building in which instruments are installed when necessary.						
Details of emergency field stations, within the Territory will be listed when in operation.						
TBL Tabele Observatory						
Benioff VR 107.5Kg	Z	1.0	0.2	60	1,350	critical
(PAPUA)						
ESA Esa'ala Observatory						
Benioff VR 107.5Kg	Z	1.0	0.2	15	36,000	critical
Benioff VR 107.5Kg	N,E	1.0	0.2	15	18,000	critical
Benioff VR 107.5Kg	Z/N/E/	1.0	60.0	30	50% sensitivity	critical
AGE Agenahambo Station						
Willmore portable	Z	0.6	0.25	60	3,000	underdamped

VR Variable Reluctance

MC Moving-coil

Relative magnification curves of seismograph systems installed in the stations controlled by the Rabaul Central Observatory are listed once a month on the P.E.A.

PRESENTATION OF DATA

(reviewed in November, 1967)

All times are reduced to Greenwich Mean Time (GMT), which is 10 hours behind Eastern Standard Time.

At RAB and Harbour Network, the time signal is marked every minute on each seismogram record from the Observatory crystal chronometer. Second marks from radio signal VNG (Australia) are recorded on World-Wide Standard System S.P.-N component only according with the W.W.S.S. programme, at six hour intervals. Primary time is provided by W.W.S.S. equipment and secondary time by a Labtronic crystal chronometer with the accuracy of ± 5ms per day compared with VNG (Australia) with the aid of a chronoscope.

At TBL and AGE, the time signal is derived from a spring driven chronometer (Mercer) and marked each minute on records. Time accuracy is determined by comparison with signals from WWVH daily. Linear correction is applied to the daily drift.

On all seismogram records time increases from left to right and time break is upward.

At RAB* and Harbour Network the recording drum of each seismograph is driven by a 110VAC 60Hz synchronous motor. The 110VAC is frequency regulated by a crystal chronometer.

* The Omori recording drum is driven by a nonregulated 50Hz frequency supply.

At ESA and KRT power for recorder motors is frequency regulated by a crystal chronometer at 50Hz. Power for AGE and TBL and field stations is supplied by a 50Hz free running oscillator.

Direction of Motion

Upward direction of ground motion corresponds to upward trace motion on vertical seismogram records. Direction of component of ground motion to North or East corresponds to upward trace motion on horizontal seismogram records.

Vertical trace motion from impulsive onset of longitudinal waves of compressional or dilatational ground movement is indicated by "u" or "d" accompanied by N,S,E or W, as per trace motion amplitude on horizontal seismogram records, to represent vectorially the direction of ground motion. "+" or "-" indicates upward or downward motion of the ground respectively, from a wave not known to be of the longitudinal type.

Accuracy of Readings

When readings are given with a decimal figure, they are to 1/10 of a second, other readings have been made to the nearest half second.

Crustal Phases

Px, Sx Crustal phases, other than Pn and Sn for local and near earthquakes.

Felt Intensity

Information on maximum intensities of shocks reported felt is included. Intensities are given in Roman numerals based on the Modified Mercalli Scale, of 1931.

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(reviewed in November, 1967)

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Felt Intensity

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PRESENTATION OF DATA (CONT'D)

Remarks

Local - Typical signature of an earthquake with epicentre within 0.9°.

Near - Typical signature of an earthquake with epicentre between 0.9° and 9°.

Distant - Typical signature of an earthquake with epicentre between 9° and 45°.

Teleseism - Typical signature of an earthquake with epicentre more than 45°.

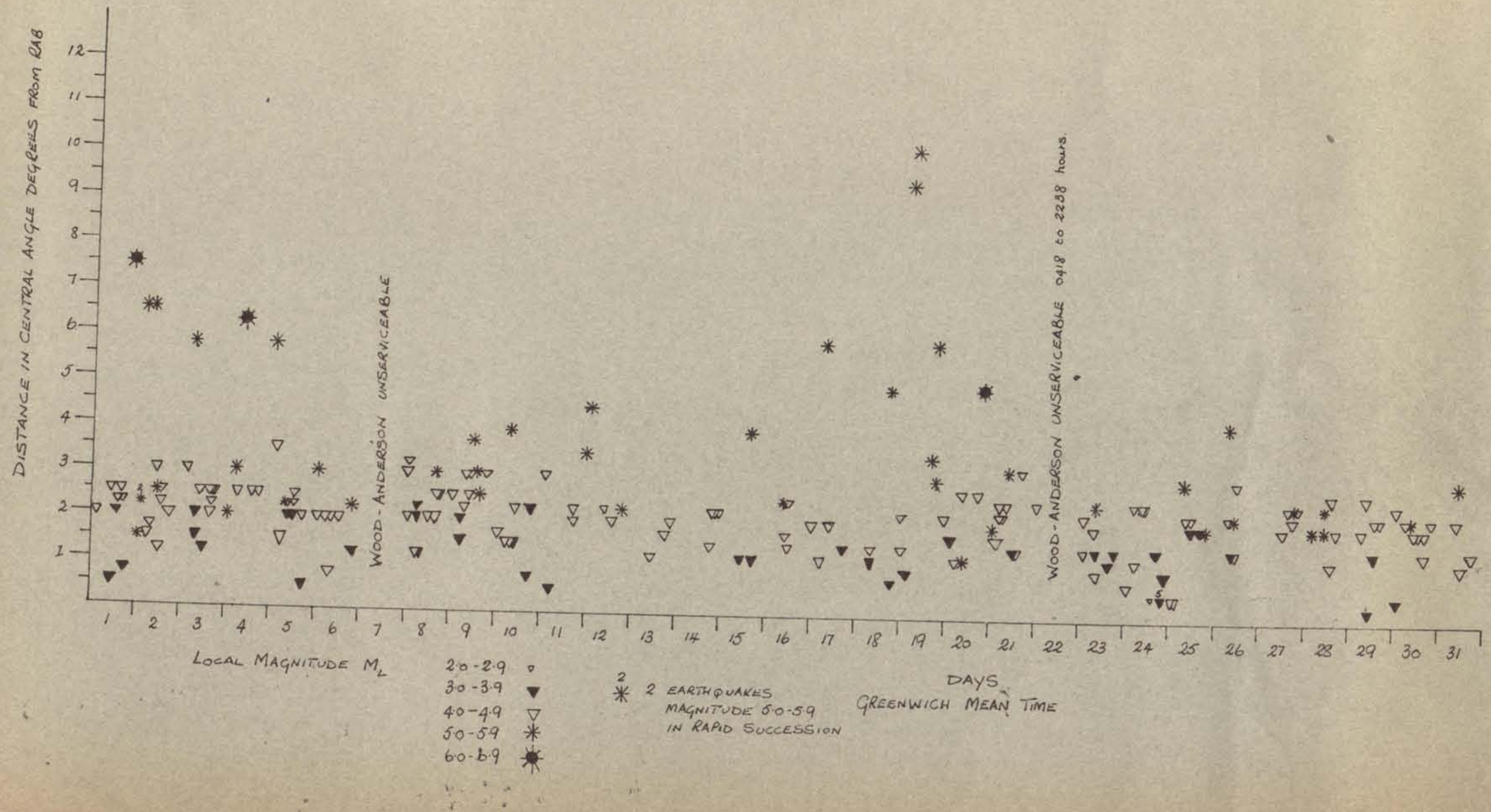
Traces - Any recorded disperse waves or very weak unknown earthquake phases.

Local and Near earthquakes will be classified Regional, and Distant earthquakes will be grouped with Teleseisms if sheer waves and their reflections are unidentifiable.

G.W. D'ADDARIO
Vulcanologist-in-Charge

MAGNITUDE OF EARTHQUAKES WITH A CLEAR S-P INTERVAL

JANUARY 1968



			T sec	A mm	GM	Dist	H	Remarks
7th Feb, 1968								
RAB	iPz	002148.5	0.3	1.6	u	1¼°		M_L=3.7
	iSN	2205.0					002127	
KRT	iPz	002148½	0.2	5.5	d	1¼°	002129	
	iSN	2203						
RAB	ePZ	002745	0.5	2.0	d			Distant
RAB	eZ/	091424	/	/	+			Traces
RAB	uPZ	094513.0	0.4	2.0	u	2½°		M_L=4.6
	iSN	45.5					094430	
KRT	ePZ	094513½	0.3	1.5	d	2½°	094433	
	e(S)N	44½						
RAB	iPZ	121935.2	0.3	2.5	d	1°		
	iSN	47.8					121919	
KRT	iPZ	121937	0.3	2.0	d	1°	121918	
		51						
RAB	iPz	133528.7	0.5	1.0	u	2°		M_L=4.0
	iSN	52.3					133457	
SUL	iPz	133528.5	0.6	3.0	d			
RAL	iPz	133528.0	/	/	u			
KRT	iPz	133527½	0.6	10.0	u			
	iSN	47½				1½°	133501	
RAB	iPz	172156.3	0.3	1.2	d	2½°		
	eSN	2228½					172114	
KRT	iPZ	172154	0.2	1.4	d	2½°		
	iSE	2225					172113	
RAB	iPz	225338.0	0.6	21.0	d	1°		
	iSN	51.1					225320	
WAN	iPz	225337.5	0.3	9.0	d			
SUL	iPz	225337.6	0.2	6.0	d			
RAL	iPz	225337.3	0.4	20.0	d			
KRT	iPz	225340	0.6	10.0	d	1¼°		
	iSN	57					225317	
RAB	iPZ	231905.0	0.6	2.0	u	3°		
	iSN	39.0					231820	
RAL	iPz	231904.0	0.8	1.8	u			
KRT	iPZ	231906	-	3.0	d	2¾°		
	iSN	39					231823	
8th Feb, 1968								
RAB	iPz	073851.0	0.3	1.5	d	2½°		M_L=4.6
	iSN	3920.5						
RAB	iPz	103205.0	0.3	2.0	u	1°		M_L=3.6
	iSN	19.4					103146	
RAB	ePz	121244½	0.8	1.0	d			Distant

			T sec	A mm	GM	Dist	H	Remarks
8th Feb.,1968.								
RAB	iPZ	145356.6	0.3	1.0	u	2½°	145316	
	iSN	5427.5						
KRT	iPZ	145355½	0.3	1.0	d			
RAB	iPZ	170005.4	0.3	20.0	d	1¼°	165943	M_L= 4.4
	iZ	06.5						
	iSN	22.4						
WAN	iPZ	170005.0	0.2	5.5	d			
SUL	iPZ	170005.0	0.3	9.5	d			
RAL	iPZ	170005.0	0.2	5.0	d			
KRT	iPZ	170003½			d	1¼°	165941	
	eSN	20½						
RAB	ePZ	181826	0.4	1.0	u	(12½°)		
	e(S)N/	2046						
KRT	ePZ	181824½	0.6	0.3	d			
RAB	iPZ	185913.0	0.5	2.0	d			Regional
KRT	iPZ	185913½	1.0	1.5	d			
RAB	iPZ	222234.0	0.5	2.0	d	1½°	222207	
9th Feb.,1968.								
RAB	iPZ	055838.0	0.5	7.0	u	1½°	055814	M_L= 3.9
	iSE	55.8						
KRT	e(P)Z	055836½				1¼°	055815	C.B.M.
	iSE	52½						
RAB	iPZ	132253.7	0.4	3.0	u	1¼°	132231	
	iSN	2311.0						
KRT	eiPZ	132252½			u	1¼°	132231	
	iZ	53						
	iSE	2309						
RAB	iPZ	151154.0	0.2	9.0	u	2½°	151116	
	iSN	1223.0						
KRT	iPZ	151150	0.4	1.5	d	2½°	151112	
	iSE	1219						
RAB	iPZ	162917.0	0.5	2.2	d	2¾°	162835	M_L= 4.6
	iZ	19.0						
	eSE	49						
KRT	iPZ	162915	0.3	1.0	d	2½°	162840	
	iSE	45						
RAB	iPZ	184941.8	0.4	9.0	u	1¾°	184913	
	iSN	5004.5						
KRT	iPZ	184938½	0.3	1.5	d	2°	184906	
	iSE	5003						
RAB	ePZ	210132	0.4	2.0	d	2°	210100	M_L= 4.6
	iSE	56.2						
KRT	ePZ	210130½	0.6	1.5	d	2°	210057	
	eSN	55½						

			T sec	A mm	GM	Dist	H	Remarks
10th Feb.,1968.								
RAB	ePZ	092544½	0.5	2.0	u			Distant
RAB	ePZ	100852½	0.6	4.0	d			Distant
RAB	iPZ	112043.4	0.3	4.0	d	2°	112011	M_L= 4.6
	iZ	53.0						
	iSN	2107.0						
RAL	iPZ	112042.4	0.4	4.0	u			
KRT	ePZ	112043½	0.2	3.0	u	1½°	112017	
	iSN	2104						
RAB	eZ/	161114			-			Traces
RAB	eZ/	162732			+			Traces
RAB	eZ/	201318			-			Traces
RAB	iPZ	202552.5	0.4	1.5	d	2¼°	202518	M_L= 4.0
	iZ	55.0						
	iSN	2618.0						
KRT	e(P)Z	202553			u	1½°	202526	C.B.M.
	iSE	2613						
11th Feb.,1968.								
RAB	iPZ	211037.0	0.3	1.8	d			Regional
	iZ	37.6						
RAB	iPZ	234207.8	0.4	29.5	d	1¾°	234139	
	iSN	29.5						
RAB	iPZ	030550.6	0.3	32.0	u	½°	030538	
	iZ	56.3						
	iSN	59.5						
WAN	iPZ	030550.4			u			
RAL	iPZ	030550.3						
RAB	ePZ	045308	0.5	1.0	u	1½°	045240	
	eSN	29						
RAB	iPZ	080654.3	0.4	11.0	u	2°	080624	M_L= 5.0
	iSN	0717						
WAN	iPZ	080653.9	0.6	15.0	u			
RAL	iPZ	080654.0	1.5	15.0	u			
RAB	iPZ	082517.5	0.4	4.0	d	1½°	082449	M_L= 4.3
	iZ	21.0						
	iSE	39.0						
KRT	i(P)Z	082516½			d	1½°	082453	C.B.M.
	iSE	35						
RAB	eiPZ	115405½	0.3	1.0	d	1½°	115537	
	iZ	07.0						
	i(S)N	27.0						
KRT	ePZ	115405	0.2	1.5	d	1½°	115340	
	iSE	24						
RAB	iPZ	122012.2	0.8	2.4	d			Regional

			T sec	A mm	GM	Dist	H	Remarks
11th Feb., 1968.								
RAB	iPZ	122958.5	0.5	3.0	d	2°	122927	M_L= 4.3
	iZ	3008.6						
	iSN	22.5						
RAL	iPZ	122958.0	0.5	3.0	d			
KRT	i(P)Z	123000	-	-	u	1¾°	122931	
	iSE	21½						
RAB	iPZ	151736.5	0.3	2.0	u	1½°	151710	M_L= 4.6
	iZ	37.0						
	iZ	40.0						
	eSN/	56						
KRT	ePZ	151734½		23.0	d	1¾°	151707	
	iZ	35						
	eSN	53½						
RAB	iPZ	160552.4	0.4	3.0	d	2°	160505	
	iZ	55.3						
	iSN	0628.0						
KRT	i(P)Z	160553	0.5	2.0	d			Overlapping traces
RAB	iPZ	170314.1	0.4	3.0	d	1½°	170248	
	iSN/	34						
KRT	iPZ	170313		9.0	d	1¾°	170242	
	eSN	29						
RAB	iPZ	171901.6			u	1¾°	171833	M_L= 4.7
	eSE/	24						
KRT	ePZ	171900						Overlapping traces
RAB	iPZ	185025.2	0.4	2.0	d			Regional
KRT	eiPZ	185024½	0.8	3.0	d			
	iZ	25½						
12th Feb.,1968.								
RAB	iPZ	054516.4			d	ESE 1½°	054451	ML 5½ - 5¾
	eSEo	36						MB = 6.2

Felt:
Sohano Int. VII-VIII
05° 27'S, 154° 40E
Rugen Harbour Int. VI-VII
Mambung Int. VI -VII
Malga Int. VII
Rongamatane Int. VII
04° 31'S, 152° 10'E
Rabaul Int. VI
04° 11'S, 152° 10'E
Waramung Int. VI
04° 04'S 153° 34'E
Muliama Int. VI
04° 05'S, 153° 00'E
Ulamona Int VI
05° 00'S, 151° 15'E
Boku Int. IV
06° 35'S, 155° 20'E
Cape Hoskin Int. III
05° 27'S, 150° 32'E
Losuia Int. I
08° 30'S, 151° 05'E
Kobuan Int II

			T sec	A mm	GM	Dist	H	Remarks
12th Feb., 1963 (cont'd)								
RAB	iPZ iSN	064928.8 5000.2	0.5	6.0	d	2½°	064848	
RAB	iPZ iSE	065930.0 070046.9	0.2	26.0	u	6¼°	065850	
WAN	iPZ	065929.9			u			
RAB	iPZ	090324.2	0.4	9.0	d			Regional
KRT	iPZ iSE	090322½ 35			d	1°	090304	C.B.M.
RAB	iPZ iZ iSE/	092009.0 11.4 38	0.4	2.3	d	2½°	091931	
KRT	ePZ eSN	092009 36½	0.4	2.0	d	2¼°	091933	
RAB	iPZ iZ iSN	093217.2 20.3 44.0	0.4	7.0	d	2¼°	093142	
KRT	iPZ iSE	093217 44			d	2¼°	093141	C.B.M.
RAB	ePZ iZ eSN/	134914 16.0 38	0.4	2.0	d	2°	134842	
KRT	iPZ iSN	134913 38	0.6	2.0	d	2°	134840	
RAB	iPZ iSE/	143354.1 3422	0.4	18.0	d	2¼°	143317	
WAN	iPZ	143354.3	0.2	6.0	d			
RAL	iPZ	143354.2	0.6	6.0	d			
KRT	iPZ	143352½	0.6		d			
RAB	iPZ iSN	145755.6 5814.0	0.4	12.4	d	1½°	145732	M_L= 3.8
WAN	iPZ	145755.6	0.1	3.0	d			
RAL	iPZ	145755.4	0.3	9.0	d			
KRT	iPZ iSE	145757 5816½	0.3	6.0	d	1½°	145731	
RAB	iPZ eSN/	151913.0 32	0.4	4.0	u	1½°	151848	
WAN	iPZ	151912.5	0.5	2.0	u			
KRT	iPZ iSN	151913½ 29	0.4	3.5	d	1¼°	151853	
RAB	iPZ iSN	154602.5 23	0.5	6.0	u	1½°	154535	M_L= 3.6
RAL	iPZ	154602.0	0.4	4.0	u			
KRT	iPZ iSE	154602½ 22½	0.3	3.0	u	1½°	154535	
RAB	iPZ iSN/	155331.3 58	0.5	3.0	u	2¼°	155256	M_L= 4.2
WAN	iPZ	155330.2	0.6	0.3	u			

			T sec	A mm	GM	Dist	H	Remarks
12th Feb.,1968 (cont'd)								
KRT	iPZ iSE	155330 56	0.4	12.0	d	2¼°	155256	
RAB	iPZ iSE	155526.0 46	0.4	8.0	d	1½°	155500	In coda of preceeding shock
RAB	iPZ iZ iSN	160713.0 15.3 38.4	0.5	2.3	d	2°	160640	
KRT	iPZ iSE	160711½ 36	0.4	2.0	d	2°	160639	
RAB	iPZ iSN	165623.5 45	0.4	5.0	u	1¾°	165555	M_L= 3.9
KRT	iPZ iSE	165621 40½	0.4	4.0	d	1½°	165558	
RAB	ePZ eSE	182610 33½	0.4	4.0	u	2°	182539	
KRT	iPZ iSE	182609½ 31	0.3	2.0	u	1¾°	182541	
RAB	iPZ iZ iSE/	210520.4 23.7 48	0.5	2.0	u	2¼°	210443	
KRT	iPZ eSE	210519 46½	0.5		u	2¼°	210443	
RAB	iPZ iSE	221228.3 54.0	0.4	4.0	d	2¼°	221154	
RAB	iPZ iSE	225550.1 5618	0.6	3.7	d	2¼°	225513	
KRT	iPZ eSN	225548 5612½	0.6	2.0	d	2°	225516	

~~No Wood Anderson records due to lamp failure~~

13th Feb.,1968. No Wood Anderson records due to lamp failure.

RAB	iPZ e(S)N/	021712.5 2102	0.4	11.0	u	(20½°)		
RAB	iPZ iZ iSN/	024449.0 51.3 4516	0.5	17.0	u	2½°	024413	
WAN	iPZ	024448.6	0.4	7.0	d			
RAB	ePZ	041338½	0.6	1.5	d			Regional C.B.M.
RAB	iPZ iSE	045854.0 5924.5	0.4	2.0	d	2½°	045814	
RAB	eiPZ iZ iSN/	052833½ 34.5 2906	0.5	1.5	d	2½°	052752	
WAN	iPZ	052834.0	0.4	2.0	d			
KRT	e(P)Z	052837			d			Overlapping traces

			T sec	A mm	GM	Dist	H	Remarks
13th Feb., 1968 (cont'd)								
RAB	iPZ	071927.5	0.4	3.0	d			Regional
RAB	iPZ eSN	074948.2 5009	0.5	2.0	d	1½°	074900	
RAB	iPZ iZ eSN/	084703.2 08.1 31	0.5	2.2	d	2¼°	084626	
RAB	iPZ iZ	091435.3 40.5	0.4	1.8	d			Regional
KRT	iPZ iSN	091435 55	0.4	1.0	d	1½°	091408	
RAB	iPZ iZ iSN/	112146.1 47.5 2208	0.5	8.0	u	1¾°	112117	
WAN	iPZ	112146.0	0.6	8.0	u			
KRT	iPZ iSE	112145 2206	0.6	6.0	u	1¾°	112117	
RAB	iPZ iSN	114210.0 37.0	0.5	4.0	d	2¼°	114134	
RAB	iPZ eSN/	120510.5 36	0.5	2.4	d	2°	120437	
KRT	iPZ iSN	120509.5 37	0.6	2.0	d	2¼°	120433	
RAB	iPZ iSN	125019.4 37.6	0.5	3.0	d	1½°	124955	
KRT	e(P)Z eSN	125013½ 37	0.3	3.0	d	1¾°	124942	
RAB	iPZ iSE	133002.4 26.2	0.5	2.6	u	2°	133030	
KRT	ePZ iSN	133000½ 23				1¾°	132931	
RAB	iPZ eSNo	140647 0716	0.4	2.0	d	2½°	140609	
WAN	iPZ	140646.9	0.2	5.0	d			
KRT	iPZ	140646			d			C.B.M.
RAB	eiPZ iZ	141330 31.2	0.3	2.0	d			Regional
WAN	iPZ	141331	0.9	3.5	d			
SUL	iPZ	141330.8	0.7	1.8	d			
RAB	iPZ iZ iSE	141941.2 45.0 2003.5	0.3	4.0	u	1¾°	141912	
SUL	iPZ	141941.6	0.6	1.0	d			
KRT	iPZ	141941	0.6	4.5	u			
RAB	iPZ iSE	143110.3 34	0.5	1.5	d	2°	143038	

			T sec	A mm	GM	Dist	H	Remarks
13th Feb.,1968. (cont'd)								
KRT	iPZ iSN	143110 32	0.2	2.0	d	1¾°	143041	
PAB	iPZ iZ iSN/	151809.4 11.4 36	0.5	4.0	u	2¼°	151734	
WAN	iPZ	151809.1	0.8	1.0	d			
RAL	iPZ	151809.2	0.6	3.0	d			
KRT	iPZ eSN	151808.5 34½	0.3	4.5	u	2¼°	151734	
RAB	ePZ eSN/	165247 5307	0.5	7.0	d	1½°	165221	
KRT	ePZ	165241½	0.4		d			
RAB	iPZ iZ iSE	171558 02.1 1621.6	0.4	2.0	d	2°	171526	
RAB	iPZ iSE	172803.7 27	0.5	4.0	d	2°	172734	
SUL	iPZ	172803.0	0.6	1.0	u			
KRT	iPZ e(S)E	172802 22½	0.2	2.0	d	1½°	172740	
RAB	iPZ iZ eSN/	190152.6 55.8 0214	0.5	4.0	u	1½	190125	
WAN	iPZ	190152.7	0.7	2.0	u			
KRT	ePZ	190152			u			
RAB	ePZ iSE	194242 4303.0	0.6	1.0	d	1½°	194214	
KRT	iPZ iSN	194239 4301	0.4	1.0	d	1¾°	194210	
RAB	ePZ iSE	202652 2725.0	0.4	1.5	d	2¾°	202609	
RAB	eiPZ iZ eSE	224014 18.4 41	0.4	1.5	d	2¼°	223938	
RAB	eiPZ iZ iSE	231001 05.0 24.5	0.5	2.0	d	2°	230930	
KRT	iPZ iSE	231001 22	0.3	4.5	d	1¾°	230933	
RAB	eiPZ iZ iSE	235731½ 35.4 53.2	0.5	3.0	u	1¾°	235702	
KRT	ePZ iSE	235731½ 52	0.4	6.0	u	1¾°	235704	

			T sec	A mm	GM	Dist	H	Remarks
16th Jan.1968.								
ESA	iPZ	031718½	0.4	1.0	d	2°	031646	
	eSN	44						
ESA	ePZ	075511	0.8	1.0	d			Regional
ESA	iPZ	095332½	0.5	1.0	d			Regional
	iZ	40½						
17th Jan.,1968.								
ESA	iPZ	090349			u			Near
ESA	iPZ	154702			d			Regional
18th Jan.,1968.								
ESA	iPZ	061732½	0.4	2.0	d	2¼°	061655	
	iSN/	1800						
ESA	ePZ	070210½	0.5	1.0	d	2¼°	070133	
	iSE	38						
ESA	iPZ	071016	0.3	3.0	u	2¼°	070939	
	iSN/	44						
ESA	ePZ	071848½	0.5	1.0	u	2¼°	071811	
	iSN/	1916½						
ESA	e(P)Z	115641½	0.8	1.0	u			Teleseism
ESA	e(P)Z/	120954			u			Teleseism
ESA	iPZ	135804	0.3	0.5	d	6°	135633	
	iSN/	5914						
ESA	ePZ	204552½	0.4	0.6	u	5°	204438	
	iSE	4649						
ESA	ePZ	212722	0.5	0.6	u	2¼°	212646	
	iSE	49						
19th Jan.,1968. S.P Z, N-S E-W records fogged.								
ESA	iPZ/	060630½			u	(8¼°)	0604(22)	
	e(S)N/	0757						
20th Jan.,1968. No. L.P. N-S record								
ESA	ePZ	120045	0.4	1.0	d	5°	115930	
	eSE/	0143						
ESA	ePZ	164713	1.0	1.0	u			Teleseism
ESA	ePZ	212748	0.6	1.0	d	30°		
	iZ	52						
	iSE/	3247						
21st Jan., 1968.								
ESA	iPZ	002930			d			Regional
ESA	ePZ	012713½	0.8	1.8	d			Near
ESA	ePZ	050105½	0.8	4.0	d			Regional
ESA	ePZ	060414½	0.5	1.5	d	5½°	060254	
	eSE	0516						

			T sec	A mm	GM	Dist	H	Remarks
21st Jan.,1968 (cont'd).								
ESA	iPZ	061507	0.5	2.0	u			Regional
ESA	iPZ iSE	114156 4237	0.4	1.0	u	3½°	114102	
ESA	ePZ	170236			u			Teleseism
ESA	iPZ iSE	225235½ 5320½	0.2	0.6	d	3¾°	225136	
ESA	iPZ eSE	225645 5738			d	4½°	225536	
22nd Jan., 1968.								
ESA	iPZ iSN	085726½ 5828	0.4	2.0	u	5½°	085606	
ESA	iPZ iSN	112627 2729	0.6	3.6	u	5½°	112507	
ESA	iPZ	115956½	0.4	3.0	u			Regional
ESA	iPZ iSN	141806½ 1908½	0.5	1.6	u	5½°	141646	
ESA	iPZ iSN	142748½ 2833½	0.4	2.0	d	3¾°	142649	
ESA	iPZ iSN	153801 3903	0.5	2.4	d	5½°	153641	
ESA	iPZ	181718½			d			Regional
ESA	iPZ eSN/	190007 52	0.5	9.8	d	3¾°	185908	

TABELE

31st Jan.,1968.

TBL ePZ 053251

1st Feb., 1968. Nil recorded

2nd Feb., 1968. Nil recorded

3rd Feb., 1968. Nil recorded

4th Feb., 1968. Nil recorded

5th Feb., 1968. Nil recorded

6th Feb., 1968. Record partly exposed

7th Feb., 1968. Nil recorded

8th Feb., 1968.

TBL 1915 - 1937 hours. Microseismic activity associated with heavy rainfall.

9th Feb., 1968. Nil recorded

10th Feb., 1968.

TBL 1006 - 1009 hours. Microseismic activity.

11th Feb., 1968. Nil recorded

		T sec	A mm	GM	Dist	H	Remarks
12th Feb., 1968.							
TBL	i(P)Z 054651.1	0.8	7.0	d			

Rabaul Central Observatory
4th March, 1968.

G.W. D'ADDARIO
Vulcanologist-in-Charge

PEA Feb.68 No. 9.

TERRITORY OF PAPUA AND NEW GUINEA
GEOLOGICAL AND VOLCANOLOGICAL BRANCH
VOLCANOLOGICAL SECTION

PRELIMINARY EARTHQUAKE ANALYSIS
RABAUL CENTRAL OBSERVATORY
1968

Rabaul	RAB	From; FEB. 21. 1968 To: FEB. 27. 1968
Keravat	KRT	From: FEB. 21. 1968 To: FEB. 27. 1968
Esa'ala	ESA	From: DEC. 11. 1967 To: FEB. - 5. 1968
Tabele	TBL	From: FEB. 20. 1968 To: FEB. 26. 1968
Agenahambo	AGE	From; To:
Waris	WAA	Not operational
Ulamona	ULA	Not operational
Piva	PIV	Not operational
C.Gloucester	LAG	From: To:

STATION PERSONNEL

RAB Central Observatory, Rabaul.

Vulcanologist-in-Charge	G.W. D'Addario
Vulcanologist	R.F. Heming
Seismologist	(Position Vacant)
Seismogram Readers	D.J. Cook; H.M.Carrick
Senior Technical Officer	N.O. Myers
Technical Officer	R.J. Conway
Vulcanological Assistants	L. Topue; M. Gaiam V. Kaita
Technical Assistant	P. Daimbari
Trainee Vulcanological Assistants	B. Talai; M. Salaiau; (one Position Vacant)
Secretary	G. Chart

KRT Keravat Outstation

Observer (part-time)	G.E. Chorick

TBL Tabele Observatory

Observer	E. Ravian

ESA Esa'ala Observatory

Observer	F. Dira

AGE Agenahambo Outstation

Observer (part-time)	Br. B. Hughes

The Rabaul Preliminary Earthquake Analysis (PEA) is produced by the staff under the direction of the Vulcanologist-in-Charge from whom additional information and photocopies of seismogram records from all stations may be obtained on request.

Please address all communications to:-

Vulcanologist-in-Charge,
Central Observatory,
P.O. Box 386,
RABAUL, T.P. & N.G.

SEISMOGRAPH STATIONS

Station (NEW GUINEA)	Code	South Latitude	East Longitude	Elev. (m)	Foundation
Rabaul	RAB	04°11'28.6"	152°10'11.4"	183.5	Basalt Flow
Wanliss Street	WAN*	04°11'39.6"	152°10.32.5"	25.0	Basalt Flow
Sulphur Creek	SUL*	04°13'09.8"	152°10'33.3"	8.5	Unconsolidated Volcanic Ash
Rabalanakaia	RAL*	04°13'13.0"	152°12'07.0"	91.0	Unconsolidated Volcanic Ash
Tavurvur	TAV*	04°13'52.2"	152°13'12.9"	27.0	Andesite Flow
Taviliu	VUL*	04°16'58.2"	152°08'44.6"	332.3	Unconsolicated Volcanic Ash
Keravat	KRT	04°21'10.5"	152°03'06"	20.0	Alluvium
Ulamona	ULA	04°59'24.0"	151°16'30.0"	17.0	Lapilli Tuff
Tabele	TBL	04°06'04.67"	145°00'41.37"	179.5	Basalt Flow
Waris	WAA	04°07'00"	145°06'00"	48.0	Lapilli Tuff
Piva	PIV	06°12:00"	155°03'30"	60.0	Alluvium
Cape Gloucester (PAPUA)	LAG	04°27'20"	148°26'00"	24.0	Lapilli Tuff
Agenahambo	AGE	08°48'49"	148°05'56"	303.0	Unconsolidated Volcanic Ash
Esa'ala	ESA	09°44'18.2"	150°48'50.7"	46.4	Granite Gneiss

* Rabaul Harbour Network

STATION INSTRUMENTATION

Station & Instruments	Comp.	To	Tg	Trace Speed mm/min	Approximate relative Magnification	Approximate damping
(NEW GUINEA)						
Rabaul Central Observatory RAB						
World-Wide Standard	Z	1.0	0.74	60	12,500	Critical
	N,E	1.0	0.74	60	6,250	Critical
	Z/N/E/	15.0	100.0	15	750	Critical
Benioff VR 14.7Kg	Z	1.0	0.02	180 *	4,000	Critical
Omori 15Kg	No	3.6	-	24	12	10.1(air)
Omori 15Kg	Eo	3.8	-	24	10	10.1(air)
Wood-Anderson Torsion	Na,Ea	0.8	-	60	2,800	Critical

* Recording is triggered by the onset of any earthquake with pre-determined minimum amplitude. Recorder is stopped automatically by hour break pulse.

Rabaul Harbour Network

Readings from the Harbour Network are entered in the PEA only for large earthquakes.

WAN° Benioff VR 14.7Kg	Z	1.0	0.02	60	5,240	Critical
SUL° Benioff VR 14.7Kg	Z	1.0	0.02	60	2,850	Critical
RAL° Benioff VR 14.7Kg	Z	1.	0.02	60	8,075	Critical
TAV° Benioff VR 14.7Kg	Z	1.0	0.02	60	20,900	Critical
VUL°° Benioff VR 14.7Kg	Z	1.0	0.02	60	5,000	Critical

STATION INSTRUMENTATION

Station & Instruments	Comp.	To	Tg	Trace Speed mm/min	Approximate relative Magnification	Approx. damping
Rabaul Harbour Network (Cont'd)						
KRT - Keravat Outstation						
Benioff Mc 50Kg	Z	1.2	0.2	15	20% sensitivity	Critical
Benioff MC 50Kg	N,E	1.2	0.2	15	10% sensitivity	Critical
ULA - Ulamona Field Station						
Willmore portable	Z	0.6	0.25	60	3,000	underdamped
PIV -Piva Field Station						
Willmore portable	Z	0.6	0.25	60	3,000	underdamped
WAA -Waris Field Station						
Willmore portable	Z	0.6	0.25	60	3,000	underdamped
LAG -Cape Gloucester Field Station						
Willmore portable	Z	0.6	0.25	60	3,000	underdamped
TBL -Tabele Observatory						
Benioff VR 107.5Kg (PAPUA)	Z	1.0	0.2	60	1,350	critical
ESA -Esa'ala Observatory						
Benioff VR 107.5Kg	Z	1.0	0.2	15	36,000	critical
Benioff VR 107.5Kg	N,E	1.0	0.2	15	18,000	critical
Benioff VR 107.5Kg	Z/N/E/	1.0	60.0	30	50% sensitivity	critical
AGE -Agenahambo Station						
Willmore portable	Z	0.6	0.25	60	3,000	underdamped

o Signals from these stations are telemetered by land line to Helicorders (Geotech Mod.2484) at the Central Observatory.

oo Signals from this station are telemetered via VHF to its Helicorder at the Central Observatory.

N.B. These field stations consist of a permanent building in which instruments are installed when necessary.

Details of emergency field stations, within the Territory will be listed when in operation.

VR Variable Reluctance

VR Moving-coil

Relative magnification curves of seismograph systems installed in the stations controlled by the Rabaul Central Observatory are listed once a month on the P.E.A.

PRESENTATION OF DATA

(reviewed in November, 1967)

All times are reduced to Greenwich Mean Time (GMT), which is 10 hours behind Eastern Standard Time.

At RAB and Harbour Network, the time signal is marked every minute on each seismogram record from the Observatory crystal chronometer. Second marks from radio signal VNG (Australia) are recorded on World-Wide Standard System S.P.-N component only according with the W.W.S.S. programme, at six hour intervals. Primary time is provided by W.W.S.S. equipment and secondary time by a Labtronic crystal chronometer with the accuracy of ± 5ms per day compared with VNG (Australia) with the aid of a chronoscope.

At TBL and AGE, the time signal is derived from a spring driven chronometer (Mercer) and marked each minute on records. Time accuracy is determined by comparison with signals from WWVH daily. Linear correction is applied to the daily drift.

On all seismogram records time increases from left to right and time break is upward.

At RAB* and Harbour Network the recording drum of each seismograph is driven by a 110VAC 60Hz synchronous motor. The 110VAC is frequency regulated by a crystal chronometer.

* The Omori recording drum is driven by a nonregulated 50Hz frequency supply.

At ESA and KRT power for recorder motors is frequency regulated by a crystal chronometer at 50Hz. Power for AGE and TBL and field stations is supplied by a 50Hz free running oscillator.

Direction of Motion

Upward direction of ground motion corresponds to upward trace motion on vertical seismogram records. Direction of component of ground motion to North or East corresponds to upward trace motion on horizontal seismogram records.

Vertical trace motion from impulsive onset of longitudinal waves of compressional or dilatational ground movement is indicated by "u" or "d" accompanied by N,S,E or W, as per trace motion amplitude on horizontal seismogram records, to represent vectorially the direction of ground motion. "+" or "-" indicates upward or downward motion of the ground respectively, from a wave not known to be of the longitudinal type.

Accuracy of Readings

When readings are given with a decimal figure, they are to 1/10 of a second, other readings have been made to the nearest half second.

Crustal Phases

Px, Sx Crustal phases, other than Pn and Sn for local and near earthquakes.

Felt Intensity

Information on maximum intensities of shocks reported felt is included. Intensities are given in Roman numerals based on the Modified Mercalli Scale, of 1931.

PRESENTATION OF DATA (CONT'D)

Determinations of Epicentres

Where no source is cited, the determination of epicentres, origin time, focal depth and distance in central angle degrees from the pertinent station for local and regional earthquakes, are carried out at the Central Observatory, Rabaul.

Geographical Designation of Epicentres

The regional names which follow the co-ordinates of epicentres located at the Central Observatory are meant only to supplement the co-ordinates and normally follow well-known geographical rather than geological features. Use is made of the full degree blocks according to the method defined by E.A. Flinn and E.R. Engadhl in "A PROPOSED BASIS FOR GEOGRAPHICAL AND SEISMIC REGIONALIZATION", Seismic Data Laboratory Report No. 101, U.I.D. Inc., Alexandria, Virginia, 1964, adopted by the U.S.C.G.S. for computer requirements.

Magnitude Definition and Determination

M_L - Local Magnitude (Richter, 1935) is calculated from the recorded trace amplitude of the Wood-Anderson torsion seismographs of stated physical constants (installed at the Observatory in November, 1967).

Maximum trace amplitude (0 to peak) expressed in millimetres and tenths is measured directly on both components. Magnitude is determined independently and the arithmetic mean taken. M_L values are given to the tenth of a unit.

The station correction factor is assumed to be zero until better known.

M_S -Surface Wave Magnitude (Gutemberg & Richter, 1956) is calculated from the amplitude of surface waves of period near 20 seconds for shallow distant earthquakes.

M_B -Body Wave Magnitude is calculated from the ratio of amplitude over period for body waves on S.P.-Z of World-wide Seismograph System only when depth is known. The magnification factor for the standard seismograph is taken into account.

m -Unified magnitude (Gutemberg & Richter, 1956) has the following relation to M_L, M_S, and M_B.

$$m = 1.7 + 0.8\ M_L - 0.01\ M^2_L$$

$$m = M_B \text{ (without correction)}$$

$$m = 2.5 + 0.63\ M_S$$

Local Magnitude of earthquakes recorded at RAB with a clear S-P interval is tabulated on a Day-Distance (in Central Angle Degrees) graph which is added to the PEA monthly.

Symbols

i - impulsive and sharply defined beginning of a phase.

e - emergent and poorly defined beginning of a phase.

T - Period in seconds

A - Peak-to-Trough trace amplitude in millimetres.

GM - Ground Motion.

Dist -Distance in central angle degrees.
H - Origin Time
h - Focal depth in Kilometres
CBM - Confused by microseisms.

PRESENTATION OF DATA (CONT'D)

Remarks

Local - Typical signature of an earthquake with epicentre within 0.9°.

Near - Typical signature of an earthquake with epicentre between 0.9° and 9°.

Distant - Typical signature of an earthquake with epicentre between 9° and 45°.

Teleseism - Typical signature of an earthquake with epicentre more than 45°.

Traces - Any recorded disperse waves or very weak unknown earthquake phases.

Local and Near earthquakes will be classified Regional, and Distant earthquakes will be grouped with Teleseisms if sheer waves and their reflections are unidentifiable.

G.W. D'ADDARIO
Vulcanologist-in-Charge

			T sec	A mm	GM	Dist	H	Remarks
RABAUL								
21st Feb.,1968. S.P. records confused by microseism								
PAB	e(P)Z/	000500						C.B.M.(Telesism)
RAB	e(P)Z eSN/	015239 5834	0.5	2.0	u	(38°)		
RAB	iPZ iSN	041925.0 54.0	0.4	8.0	u	2½°	041847	
WAN	iPZ	041924.0		2.0	d			
RAL	iPZ	041924.3	0.6	5.0	u			
RAB	ePZ e(S)N/	090259½ 0712	0.5	6.0	u	(24°)		
KRT	iPZ	090301	1.0	3.0	u			
RAB	e(P)Z/ eSE/	124030 4510			-	28°		
KRT	ePZ	124026	1.0	1.2	u			
RAB	ePZ eSN	141234 1304	0.4	3.0	u	2½°	141155	
WAN	iPZ	141233.8	0.5	0.8	u			
KRT	iPZ eSE	141235 1305½	1.0	3.0	u	2½°	141155	
RAB	eZ/	173828						C.B.M. Traces
RAB	iPZ eSN	190412.0 38½	0.5	3.0	d	2¼°	190337	
RAL	iPZ	190411.2	1.0	9.0	d			
RAB	iPZ iSN	203542.5 3604.0	0.5	3.0	u	1¾°	203613	
RAB	iPZ iSN	223037.0 56.5	0.5	5.0	u	1½°	223011	
22nd Feb.,1968.								
RAB	ePZ eSN/	020939 1602	0.8	2.0	u	44°		
RAB	e(P)Z/	103322			+			C.B.M. Distant
RAB	iPZ iSN	115041.5 5109	0.5	3.0	u	2¼°	115005	M_L= 3.7
WAN	iPZ	115041.4	0.5	1.2	u			
KRT	ePZ iSE	115042 5109	0.8	3.0	u	2¼°	115006	
RAB	iPZ iSN	175645 5713.0	0.5	3.0	u	2¼°	175608	M_L= 5.2
WAN	iPZ	175645.1	0.5	2.5	u			
SUL	iPZ	175645.0						
KRT	ePZ iSE	175643½ 5710	0.6	1.5	u	2¼°	175608	

			T sec	A mm	GM	Dist	H	Remarks
22nd Feb., 1968 (cont'd).								
RAB	eP[illegible]Z	181752	0.5	1.5	u	2¼°	181716	M_L= 4.4
	iSN	1819.3						
KRT	ePZ	181752			d	2¼°	181716	C.B.M.
RA[illegible]								
B	iPZ	184750.6	0.4	8.0	d	1¼°	184728	M_L= 3.9
	iSN	4808.0						
WAN	iPZ	184750.6	0.6	8.0	d			
KRT	iPZ	184749		2.0	d	1¼°	184726	
	eSE	4806½						
RAB	iPZ	194715.0	0.5	3.0	d	2¼°	194639	M_L= 4.0
	iSN	42.5						
RAL	iPZ	194714.4	0.8	1.0	u			
KRT	iPZ	194716	0.4	2.0	d	2¼°	194642	
	eSE	42						
RAB	iPZ	195309.8	0.3	3.0	u	1¾°	195242	M_L= 4.0
	iSN	30.5						
RAL	iPZ	195309.8	0.2	1.0	d			
KRT	e(P)Z	195311				1¾°	195242	C.B.M.
	e(S)N	33						
23rd Feb., 1968.								
RAB	iPZ	014614.6	0.4	3.1	d	2¾°	014531	M_L= 4.2
	iSN	47.4						
RAB	eiPZ	030136.6	0.5	10.5	d	2¼°	030102	M_L= 4.6
	iSN	0203.1						
RAB	i(P)Z	060904.0	0.5	3.1	d			Local
	iSN	07.8						
RAB	iPZ	064127.6	0.6	2.5	u	2°	064055	M_L= 4.3
	iSN	53						
RAB	eiPZ	135509.2	0.6	1.5	u	2¼°	135435	M_L= 4.0
	iSN	35.2						
KRT	ePZ	135510				2°	135438	C.B.M.
	iSE	34½						
RAB	iPZ	185102.2	0.6	5.0	u	2½°	185024	M_L= 5.7
	iZ	04.4						
	iSE/	31.0						
RAL	iPZ	185102.1	0.4	2.0	d			
KRT	iPZ	185102	0.8	2.0	u			
RAB	iPZ	190318.6	0.5	3.0	d	2½°	190241	M_L= 4.2
	iSN	47.0						
RAL	iPZ	190318.0	0.6	0.5	u			
KRT	ePZ	190318	0.8	3.0	d	2¼°	190242	
	iSE	45½						
24th February, 1968.								
RAB	iPZ	011847.0	0.5	3.0	d			Regional
RAB	ePZ	025649	0.4	1.0	u	2½°	025606	
	iSN	5721.5						

			T sec	A mm	GM	Dist	H	Remarks
24th Feb.,1968 (cont'd).								
RAB	iPZ iSN	072339.0 2406.0	0.3	2.5	u	2¼°	072303	M_L= 4.2
RAB	iPZ iSN	073431.1 55.0	0.4	5.0	u	2°	073359	
RAB	ePZ iSN	103237½ 59.0	0.4	1.0	u	1¾°	103209	M_L= 4.2
KRT	iPZ iSE	103237 58	0.4		u	1¾°	103209	C.B.M.
RAB	iPZ iSN	113925.0 35.0	0.4	14.0	d	1°	113908	M_L= 3.6
WAN	iPZ	113924.5	0.5	2.0	d			
RAL	iPZ	113924.2	0.4	3.0	d			
KRT	iPZ eSE	113925 39½	0.4	2.0	d	1°	113906	
RAB	iPZ iSN	121026.8 45.5	0.4	1.8	u	1½°	121002	M_L= 4.0
KRT	e(P)Z iSN	121024½ 41				1¼°	121002	C.B.M.
RAB	iPZ iPZ iSN	141343.0 46.7 1414.0	0.5	3.0	d	2½°	141302	M_L= 5.2
KRT	iPZ	141341½	0.5	2.0	u			
RAB	ePZ	145741	0.4	1.5	d			Regional (Possible double shock)
KRT	ePZ iSE	145740½ 5859	0.4	0.6	d	6¾°	145559	
RAB	ePZ iSN	154916 51.4	0.4	1.0	d	3°	154830	M_L= 4.0
KRT	ePZ iSE	154915½ 49	0.4	1.0	d	2¾°	154831	
RAB	ePZ iSN	171124 57.5	0.4	1.0	d	2¾°	171040	
KRT	e(P)Z eSN	171123 55				(2¾°)	1710(41)	
RAB	iPZ iSN	192155.0 2206.5	0.3	10.0	d	¾°	192139	
WAN	iPZ	192154.8		3.0	d			
RAL	iPZ	192154.5	0.6	5.5	d			
KRT	iPZ iSE	192156 2209			d	1°	192138	C.B.M.
RAB	iPZ iSN	205346.3 5415.3	0.3	1.6	u	2½°	205308	
RAB	ePZ iSN	213605 32.0	0.5	2.0	d	2¼°	213529	

			T sec	A mm	GM	Dist	H	Remarks
24th Feb.,1968 (cont'd).								
RAB	iPZ	215545.5	0.5	3.0	u	2½°	215508	M_L= 4.9
	iSN	5614.0						
WAN	iPZ	215545.0	1.0	1.5	u			
RAL	iPZ	215544.6	1.0	2.9	u			
RAB	iPZ	224756.0	0.4	3.0	u	2°	224725	M_L= 4.6
	iSN	4819.5						
WAN	iPZ	224756.0						
RAL	iPZ	224755.6		3.9	u			
KRT	ePZ	224755½	0.6	4.0	u	2°	224724	
25th Feb.,1968.								
RAB	iPZ	054002.0	0.5	1.5	d	1½°	053937	M_L= 4.7
	iSE	21.0						
RAB	ePZ	065203	0.5	1.0	d	2¼°	065126	
	eSE	31						
RAB	iPZ	065445.5	0.4	3.7	u	1½°	065419	M_L= 4.0
	iSN	5505.5						
RAB	iPZ	151239.6	0.5	5.0	d	½°	151230	
	iSN	46.0						
KRT	iPZ	151243		2.5	d			
	e(S)N	46						
RAB	ePZ	165755.6	0.4	1.0	u	2½°	165718	M_L= 4.2
	iSN	5825.0						
KRT	iPZ	165757½	0.8	2.0	d	2¼°	165722	
	iSE	5824½						
RAB	iPZ	170025.4	0.3	8.0	d	¼°	170017	
	iSN	31.3						
WAN	iPZ	170025.1	0.4	1.5	d			
RAL	iPZ	170025.4						
KRT	iPZ	170029	0.6	2.0	u			
	eSE	32						
RAB	eZ/	181726			-			Traces
KRT	iPZ	181724½	0.6	0.5	d			
RAB	ePZ	220908	0.3	1.8	d	2°	220834	
	iSE	32.5						
RAB	iPZ	223632.3	0.3	4.0	u	¼°	223624	
	iSN	38.0						
RAB	ePZ	235531½	0.4	1.8	d	2°	235459	M_L= 4.4
	iSN	55.0						
26th Feb.,1968.								
RAB	iPZ	031201.0	0.3	4.0	d	1½°	031133	M_L= 4.5
	iSN	22.2						
RAB	ePZ	041418	0.4	5.0	d			Regional
RAB	ePZ	045002½	0.5	4.0	u			Regional

			T sec	A mm	CM	Dist	H	Remarks
26th Feb.,1968.								
RAB	iPZ	045622.6	0.4	8.0	d			Regional
RAB	iPZ	045808.5	0.4	6.0	u	½°	045756	M_L= 4.1
	iSE	17.0						
KRT	iPZ	045811			u			
RAB	iPZ	053246.6	0.4	2.0	u			Regional
RAB	eiPZ	062421½	0.3	2.5	d	1½°	062354	M_L= 4.3
	iZ	24.5						
	iSE	42.5						
KRT	eiPZ	062420				1½°	062352	
	iSE	41						
RAB	ePZ	072421	0.3	1.0	d	2¼°	072344	M_L= 4.1
	iSN	49						
RAB	ePZ	091501	0.5	1.0	d	2¼°	091425	M_L= 4.1
	iSN	28.0						
KRT	ePZ	091502	0.5	1.2	d	2½°	091422	
	iSN	32½						
RAB	ePZ	105755	0.6	3.8	dSE	(40°)		
	iZ	58.0						
	e(S)N/	110358						
KRT	ePZ	105758½						
RAB	iPZ	120657.6	0.4	5.0	d	1½°	120631	M_L= 4.5
	iSN	0717.5						
KRT	iPZ	120657½	0.6		d	1½°	120630	
8	iSN	0718½						
SUL	iPZ	120657						
RAB	eiPZ	161803	0.3	1.0	d	2¾°	161720	M_L= 5.9
	iZ	06.0						
	iSN	36.0						
KRT	iPZ	161803			d			
RAB	iPZ	193034.0	0.3	2.5	d	1½°	193009	M_L= 4.3
	iSN	53.0						
KRT	iPZ	193032			d	1½°	193013	
	iSN	46						
WAN	iPZ	193034	0.5	3.0	d			
RAB	iPZ	201324.0	0.4	1.0	d	2¼°	201248	M_L= 4.1
	iSN	51.2						
KRT	iPZ	201324				2¼°	201247	
	iSN	52						
RAB	ePZ	210707½	0.4	2.0	d	2½°	210628	M_L= 4.7
	iSN	37.0						
27th Feb.,1968.								
RAB	iPZ	000814.3	0.5	18.8	u	1¼°	000751	M_L= 3.9
	iSN	31.0						
KRT	iPZ	000813				1¼°	000754	
	iSE	28						

			T sec	A mm	GM	Dist	H	Remarks
27th Feb.,1968 (cont'd)								
RAB	iPZ iSN	012738.5 49.5	0.4	22.0	d	¾°	012723	M_L= 4.2
WAN	iPZ	012738.4	0.2	4.0	d			
RAL	iPZ	012738.2	0.5	4.0	d			
KRT	i(P)Z iSE	012740½ 52½			d	1°	012724	
RAB	iPZ iSE/ iLqN/	052335.0 2718 26	1.0	7.0	u	20°		
RAB	iPZ	103721.2	0.4	2.0	u			Regional
KRT	i(P)Z	103713						
RAB	ePZ iZ iSE/	105910 12.0 110301	0.6	2.0	d	21°		
RAB	iPZ iSN	122620.8 49.8	0.5	1.5	u	2½°	122543	M_L= 4.2
KRT	ePZ iSE	122622 52½	0.6		d	2½°	122542	
RAB	iPZ iSN/	125258.4 5315	0.5	50.0	dSE	1¼°	125235	M_L= 5.0
WAN	iPZ	125258.0			d			
SUL	iPZ	125258.0			d			
RAL	iPZ	125258.2			d			
KRT	iPZ	125300			d			
RAB	iPZ iSN	161643.3 1705.0	0.3	2.0	u	1¼°	161614	M_L= 4.0
WAN	iPZ	161643.5	0.2	1.0	u			
KRT	iPZ e(S)E	161641 1702½			u	1¼°	161613	
RAB	iPZ iSN	162559 2630.0	0.5	1.0	u	2½°	162518	
KRT	e(P)Z i(S)E	162604½ 32	0.4	0.5	d	(2¼°)	1625(28)	
RAB	iPZ iSN	172241.0 2307.0	0.4	1.5	u	2¼°	172207	M_L= 4.3
KRT	ePZ eSE	172242 2308½	0.6	1.0	d	2¼°	172207	
RAB	iPZ	175247.0	0.3	6.0	d			Regional
KRT	iPZ iSE	175249 5306½	0.4		d	1¼°	175226	
RAB	iPZ iSE	221940.5 2006.0	0.5	15.0	u	2¼°	221906	M_L= 5.0
WAN	iPZ	221940.4	0.6	6.0	u			
SUL	iPZ	221940.4	0.4	2.5	u			
RAL	iPZ	221940.0	0.5	12.0	u			

			T sec	A mm	GM	Dist	H	Remarks
ESA'A								
11th Dec.,1967.								
ESA			Nil recorded					
12th Dec.,1967.								
ESA	ePZ	081124	0.8	1.0	u	4½°	081017	
	eSE	1215						
ESA	ePZ	110919				5°	110805	
	iSE	1016						
ESA	ePZ	205643	0.4	1.4	d	2¼°	205608	
	iSE	5709½						
13th Dec.,1967.								
ESA	iPZ	191142½	0.8	1.6	d	1¾°	191114	
	iSE	1204						
ESA	iPZ	204920				1°	204901	
	iSN	34						
ESA	ePZ	231443½			d			
14th Dec.,1967.								
ESA	iPZ	072640	0.4	1.4	d	2¾°	072597	
	iSN	2712½						
ESA	ePZ	144329	2.0	0.8	d			
15th Dec.,1967.								
ESA	iPZ	194203	0.6	1.4				
16th Dec.,1967.								
ESA	ePZ	175731			d			
ESA	ePZ	210410			d	2½°	210334	
	eSE	37½						
17th Dec.,1967.								
ESA	eiPZ	003010	0.4	3.0	d	3½°	002916	
	iPZ	3151½						
ESA	iPZ	070952			d			
	iSN	1033½						
ESA	ePZ	215741			u	4°	215641	
	eSN	5827						
30th Jan.,1968.								
ESA	ePZ	021811½		0.6		4½°	021705	
	iSE	1902½						
ESA	iPZ	035049½	0.6	19.0	d	1°	035033	
	e(S)E	5101½						
ESA	ePZ	055803½				4¼°	055701	
	iSE	51½						
ESA	iPZ	074329½	0.4	1.4	d	2¾°	074246	
	eSE	4402½						
ESA	eiPZ	100204	0.6	1.5	u	5¼°	100045	
	iZ	04½						
	i(S)E	0305½						

			T sec	A mm	GM	Dist	H	Remarks
30th Jan.,1968 (cont'd).								
ESA	iPZ	121517	0.6	0.4	d	¼°	121509	
	iSE	23						
31st Jan.,1968.								
ESA	iPZ	030310.4	0.8	4.0	d			
ESA	iPZ	053148.0	0.8	1.6	d	4¼°	053043	
	iSE	3237.5						
ESA	iPZ	111925.1	0.6	1.5	u			
ESA	i(P)Z	133425	0.8	2.6	d			
ESA	iPZ	163120½	0.4		u			
	iSE	23						
1st Feb.,1968.								
ESA	eiPZ	034946½	0.6	2.0	d			
	iZ	47						
ESA	ePZ	101350½	0.6	1.2	d			
	iSE	1453.5						
ESA	ePZ	161321	1.0	0.4	d	3°	161234	
	iSE	57.0						
ESA	iPZ	211822½	0.4	0.6	u	3¼°	211733	
	iSE	1900.6						
ESA	ePZ	231806½	0.6	1.0	d			
2nd Feb.,1968.								
ESA	iPZ	095541.1	1.8	1.4	u			
ESA	ePZ	105517½	0.4	0.4	u			
ESA	iPZ	150532½	0.6	3.0	u	5¼°	150415	
	iSE	0633						
ESA	iPZ	234251	0.4	3.0	d			
3rd Feb.,1968.								
ESA	ePZ	125628½			d	¼°	125621	
	eSE	34						
ESA	ePZ	135244½	0.8	0.4	d	3½°	135150	
	iSE	5326						
4th Feb.,1968.								
ESA	ePZ	110944	1.0	0.2	d			
ESA	iPZ	161951	0.6	1.2	u			
ESA	iPZ	181505½		1.5	u			
	eSE	09½						
5th Feb.,1968.								
ESA	iPZ	190721½	0.6	0.8	d	¼°	190556	
	iSE	0827½						
ESA	iPZ	200704½	0.4	1.6	u	¼°	200658	
	iSE	09½						

		T sec	A mm	GM	Dist	H	Remarks
TABELE							
20th Feb.,1968.							
TBL	NIL RECORDED						
21st Feb.,1968.							
TBL	iPZ	142226		u			
22nd Feb.,1968.							
TBL	NIL RECORDED						
23rd Feb., 1968.							
TBL	ePZ	025732½		0.6	1.0		
24th Feb.,1968.							
TBL	NIL RECORDED						
25th Feb.,1968.							
TBL	NIL RECORDED						
26th Feb.,1968.							
TBL	NIL RECORDED						

Central Observatory Rabaul
13th March, 1968.

G. W. D'ADDARIO
Vulcanologist-in-Charge

PEA Feb.68 No. 12.

TERRITORY OF PAPUA AND NEW GUINEA
GEOLOGICAL AND VOLCANOLOGICAL BRANCH
VOLCANOLOGICAL SECTION

PRELIMINARY EARTHQUAKE ANALYSIS
RABAUL CENTRAL OBSERVATORY
1968

Rabaul	RAB	From; MAR. 13. 1968 To: MAR. 19. 1968
Keravat	KRT	From: MAR. 13. 1968 To: MAR. 19. 1968
Esa'ala	ESA	From: FEB. 28. 1968 To: MAR. - 9. 1968
Tabele	TBL	From: MAR. - 5. 1968 To: MAR. 11. 1968
Agenahambo	AGE	From; To:
Waris	WAA	Not operational
Ulamona	ULA	Not operational
Piva	PIV	Not operational
C.Gloucester	LAG	From: To:

STATION PERSONNEL

RAB Central Observatory, Rabaul

Volcanologist-in-Charge	G.W. D'Addario
Volcanologist	R.F. Heming
Seismologist	(Position Vacant)
Seismogram Readers	D.J. Cook : H.M. Carrick
Senior Technical Officer	N.O. Myers
Technical Officer	R.J. Conway
Volcanological Assistants	L. Topue : M. Gaiam
	V. Kaiba
Technical Assistant	P. Daimbari
Trainee Volcanological Assistants	B. Talai: M. Salaiau,
	C. Matapit
Secretary	R. Scott

KRT Kerevat Outstation

Observer (part-time)	G.E. Chorick

TBL Tabele Observatory

Observer	E. Ravian

ESA Esa'ala Observatory

Observer	F. Dira

AGE Agenahambo Outstation

Observer (part-time)	Br. B. Hughes

The Rabaul Preliminary Earthquake Analysis (PEA) is produced by the staff under the direction of the Volcanologist-in-Charge from whom additional information and photocopies of seismogram records from all stations may be obtained on request.

Please address all communications to:-

Volcanologist-in-Charge
Central Observatory,
P.O. Box 386,
RABAUL. T.P. & N.G.

SEISMOGRAPH STATIONS

Station (NEW GUINEA)	Code	South Latitude	East Longitude	Elev. (m)	Foundation
Rabaul	RAB	04°11'28.6"	152°10'11.4"	183.5	Basalt Flow
Wanliss Street	WAN*	04°11'39.6"	152°10'32.5"	25.0	Basalt Flow
Sulphur Creek	SUL*	04°13'09.8"	152°10'33.3"	8.5	Unconsolidated Volcanic Ash
Rabalanakaia	RAL*	04°13'13.0"	152°12'07.0"	91.0	Unconsolidated Volcanic Ash
Tavurvur	TAV*	04°13'52.2"	152°13'12.9"	27.0	Andesite Flow
Taviliu	VUL*	04°16'58.2"	152°08'44.6"	332.3	Unconsolidated Volcanic Ash
Keravat	KRT	04°21'10.5"	152°93'06"	20.0	Alluvium
Ulamona	ULA	04°59'24.6"	151°16'30.0"	17.0	Lapilli Tuff
Tabele	TBL	04°06'04.67"	145°00'41.37"	179.5	Basalt Flow
Waris	WAA	04°07'06"	145°06'00"	48.0	Lapilli Tuff
Piva	PIV	06°12'00"	155°03'30"	60.0	Alluvium
Cape Gloucester	~~LAE~~ CGG	04°27'20"	148°26'00"	24.0	Lapilli Tuff
(PAPUA)					
Agenahambo	AGE	08°48'49"	148°05'56"	303.0	Unconsolidated Volcanic Ash
Esa'ala	ESA	09°44'18.2"	150°48'40.7"	46.4	Granite Gneiss

* Rabaul Harbour Network

STATION INSTRUMENTATION

Station & Instruments (NEW GUINEA)	Comp.	To	Tg	Trace Speed mm/min	Approximate relative Magnification	Approximate damping
Rabaul Central Observatory RAB						
World-Wide Standard	Z	1.0	0.74	60	12,500	Critical
	N,E	1.0	0.74	60	6,250	Critical
	Z/N/E/	15.0	100.0	15	750	Critical
Benioff VR 14.7Kg	Zh	1.0	0.02	180 +	4,000	Critical
Omori 15Kg	No	3.6	-	24	12	10.1(air)
Omori 15Kg	Eo	3.8	-	24	10	10.1(air)
Wood-Anderson Torsion	Na,Ea	0.8	-	60	2,800	Critical

+Recording is triggered by the onset of any earthquake with pre-determined minimum amplitude. Recorder is stopped automatically by hour break pulse.

Rabaul Harbour Network

Readings from the Harbour Network are entered in the BEA only for large earthquakes

WAN°	Benioff VR 14.7Kg Z	1.0	0.02	60	5,240	Critical
SUL°	Benioff VR 14.7Kg Z	1.0	0.02	60	2,850	Critical
RAL°	Benioff VR 14.7Kg Z	1.0	0.02	60	8,075	Critical
TAV°	Benioff VR 14.7Kg Z	1.0	0.02	60	20,900	Critical
VUL°°	Benioff VR 14.7Kg Z	1.0	0.02	60	5,000	Critical

STATION INSTRUMENTATION

Station & Instruments	Comp.	To	Tg	Trace speed mm/min	Approximate relative Magnification	Approx. damping
Rabaul Harbour Network (Cont.)						
o Signals from these stations are telemetered by land line to Helicorders (Geotech Mod. 2484) at the Central Observatory.						
oo Signals from this station are telemetered via VHF to its Helicorder at the Central Observatory.						
KRT - Keravat Outstation						
Benioff Mc 50 Kg	Z	1.2	0.2	15	20% sensitivity	Critical
Benioff MC 50Kg	N/E	1.2	0.2	15	10% sensitivity	Critical
ULA - Ulamona Field Station						
Willmore portable	Z	0.6	0.25	60	3,000	underdamped
PIV - Piva Field Station						
Willmore portable	Z	0.6	0.25	60	3,000	underdamped
WAA - Waris Field Station						
Willmore portable	Z	0.6	0.25	60	3,000	underdamped
LAG - Cape Gloucester Field Station						
Willmore portable	Z	0.6	0.25	60	3,000	underdamped

N.B. These field stations consist of a permanent building in which instruments are installed when necessary.

Details of emergency field stations, within the Territory will be listed when in operation.

TBL - Tabele Observatory						
Benioff VR 107.5Kg	Z	1.0	0.2	60	1,350	critical
(PAPUA)						
ESA - Esa'ala Observatory						
Benioff VR 107.5Kg	Z	1.0	0.2	15	36,000	critical
Benioff VR 107.5Kg	N,E	1.0	0.2	15	18,000	critical
Benioff VR 107.5Kg	Z/N/E	1.0	60.0	30	50% sensitivity	critical
AGE - Agenahambo Station						
Willmore portable	Z	0.6	0.25	60	3,000	underdamped

VR Variable Reluctance

MC Moving-coil

Relative magnification curves of seismograph systems installed in the stations controlled by the Rabaul Central Observatory are listed once a month on the P.E.A.

PRESENTATION OF DATA

(reviewed in November, 1967)

All times are reduced to Greenwich Mean Time (GMT), which is 10 hours behind Eastern Standard Time.

At RAB and Harbour Network, the time signal is marked every minute on each seismogram record from the Observatory crystal chronometer. Second marks from Radio signal VNG (Australia) are recorded on World-wide Standard System S.P.-N. component only according with the W.W.S.S. programme, at six hour intervals. Primary time is provided by W.W.S.S. equipment and secondary time by a Labtronic crystal chronometer with the accuracy of ± 5 ms per day compared with VNG (Australia) with the aid of a chronoscope.

At TBL and AGE, the time signal is derived from a spring driven chronometer (Mercer) and marked each minute on records. Time accuracy is determined by comparison with signals from WWVH daily. Linear correction is applied to the daily drift.

On all seismogram records time increases from left to right and time break is upward.

At RAB* and Harbour Network the recording drum of each seismograph is driven by a 110VAC 60Hz synchronous motor. The 110VAC is frequency regulated by a crystal chronometer.

* The Omori recording drum is driven by a nonregulated 50Hz frequency supply.

At ESA and KRT power for recorder motors is frequency regulated by a crystal chronometer at 50Hz. Power for AGE and TBL and field stations is supplied by a 50Hz free running oscillator.

Direction of Motion

Upward direction of ground motion corresponds to upward trace motion on vertical seismogram records. Direction of component of ground motion to North or East corresponds to upward trace motion on horizontal seismogram records.

Vertical trace motion from impulsive onset of longitudinal waves of compressional or dilatational ground movement is indicated by "u" or "d" accompanied by N,S,E, or W, as per trace motion amplitude on horizontal seismogram records, to represent vectorially the direction of ground motion. "+" or "-" indicates upward or downward motion of the ground respectively, from a wave not known to be of the longitudinal type.

Accuracy of Readings

When readings are given with a decimal figure, they are to 1/10 of a second, other readings have been made to the nearest half second.

Crustal Phases

Px, Sx Crustal phases, other than Pn and Sn for local and near earthquakes.

Felt Intensity

Information on maximum intensities of shocks reported felt is included. Intensities are given in Roman numerals based on the Modified Mercalli Scale, of 1931.

PRESENTATION OF DATA (CONT)

Determinations of Epicentres

Where no source is cited, the determination of epicentres origin time, focal depth and distance in central angle degrees from the pertinent station for local and regional earthquakes, are carried out at the Central Observatory, Rabaul.

Geographical Designation of Epicentres

The regional names which follow the co-ordinates of epicentres located at the Central Observatory are meant only to supplement the co-ordinates and normally follow well-known geographical rather than geological features. Use is made of the full degree blocks according to the method defined by E.A. Flinn and E.R. Engadhl in "A PROPOSED BASIS FOR GEOGRAPHICAL AND SEISMIC REGIONALIZATION", Seismic Data Laboratory Report No. 101, U.I.D. Inc., Alexandria, Virginia, 1964, adopted by the U.S.C.G.S. for computer requirements.

Magnitude Definition and Determination

M_L Local Magnitude (Richter, 1935) is calculated from the recorded trace amplitude of the Wood-Anderson torsion seismographs of stated physical constants (installed at the Observatory in November, 1967).

Maximum trace amplitude (0 to peak) expressed in millimetres and tenths is measured directly on both components. Magnitude is determined independently and the arithmetic mean taken. M_L values are given to the tenth of a unit.

The station correction factor is assumed to be zero until better known.

M_S Surface Wave Magnitude (Gutemberg and Richter, 1956) is calculated from the amplitude of surface waves of period near 20 seconds for shallow distant earthquakes.

M_B Body Wave Magnitude is calculated from the ratio of amplitude over period for body waves S.P.-Z of World-wide Seismograph System only when depth is known. The magnification factor for the standard seismograph is taken into account.

m Unified magnitude (Gutemberg & Richter, 1956) has the following relation to M_L, M_S, and M_B.

$$m = 1.7 + 0.8\ M_L - 0.01\ M^2_L$$

$$m = M_B \text{ (without correction)}$$

$$m = 2.5 + 0.63\ M_S$$

Local Magnitude of earthquakes recorded at RAB with a clear S-P interval is tabulated on a Day-Distance (in Central Angle Degrees) graph which is added to the PEA monthly.

Symbols

i	-	impulsive and sharply defined beginning of phase.
e	-	emergent and poorly defined beginning of a phase.
T	-	Period in seconds
A	-	Peak-to-Trough trace amplitude in millimetres.
GM	-	Ground Motion
Dist	-	Distance in central angle degrees
H	-	Origin Time
h	-	Focal depth in Kilometres
CBM	-	Confused by microseisms.

PRESENTATION OF DATA (CONT)

Remarks

Local - Typical signature of an earthquake with epicentre within 0.9°.

Near - Typical signature of an earthquake with epicentre between 0.9° and 9°.

Distant - Typical signature of an earthquake with epicentre between 9° and 45°.

Teleseism - Typical signature of an earthquake with epicentre more than 45°.

Traces - Any recorded disperse waves or very weak unknown earthquake phases.

Local and Near earthquakes will be classified Regional, and Distant earthquakes will be grouped with Teleseisms if sheer waves and their reflections are unidentifiable.

(G.W. D'ADDARIO)

Vulcanologist-in-Charge.

			T sec	A mm	GM	Dist	H	Remarks
RABAUL								
13th March,1968. No Wood Anderson record in the World Wide Records.								
RAB	eZ/	023822			+			Traces
RAB	iPZ	045250.0	0.5	2.0	d	1°	045233	
	iSN	5302.5						
RAB	iPZ	050723.0	0.4	16.0	u			Regional
VUL	iPZ	050724.4	0.5	12.7	u			
RAB	iPZ	071316.0	0.5	2.8	u	1¼°	071253	
	iZ	20.0						
	iSN	33.0						
RAL	iPZ	071315.5			u			
RAB	ePZ	100251½	0.5	1.0	d	5°	100137	
	eSN	0348						
KRT	ePZ	100254			d	4¾°	100142	
	iSE	0349						
RAB	iPZ	120820.0	0.4	3.0	u	3¼°	120723	
	iSN	59.4						
RAL	iPZ	120819.0	0.8	2.5	u			
KRT	ePZ	120822				3¼°	120731	C.B.M.
	eSE	0901½						
RAB	iPZ	194032.0	0.5	2.0	u	1¼°	194011	
	iSN	48.0						
VUL	iPZ	194031.5	0.4	5.0	d			
KRT	iPZ	194033	0.6	2.0	d	1¼°	194011	
	iSE	49½						
RAB	ePZ	201155½	0.4	3.0	d	2°	201122	
	iSN	1220.0						
RAB	ePZ	203126	0.4	1.0	d			(Regional)
14th March, 1968.								
RAB	iPZ	091433.7	0.3	1.8	d	¾°	091419	M_L= 3.5
	iSN	45.0						
KRT	iPZ	091435			d	1°	091417	C.B.M.
	iSN	48						
RAB	iPZ	103424.6	0.4	2.0	d	2½°	103344	M_L= 4.5
	iZ	26.0						
	eSN	55						
VUL	iPZ	103423.4	0.4	2.0	d			
RAB	eiPZ	114002	0.5	2.0	u	4½°	113852	M_L= 5.6
	iZ	07.2						
	eSN	56						
RAB	eiPZ	132802	0.5	1.8	d	2°	132732	M_L= 4.2
	iZ	06.1						
	iSE	25.3						

			T	A	GM	Dist	H	Remarks
14th March, 1968 (cont'd).								
KRT	iPZ	132801½			u	1¼°	132733	
	iSN	23						
RAB	eiPZ	165304½	0.5	1.0	d	3½°	165213	M_L= 4.9
	iZ	11.0						
	eSN	43½						
KRT	iPZ	165307½	0.4	2.0	d	3½	165214	
	iSE	48						
RAB	ePZ	185224	0.5	1.0	u			Distant
KRT	ePZ	185227			u			Distant
15th March, 1968. KRT - NIL RECORDED								
RAB	iPZ	011418.2	0.4	1.8	d	2¼°	011341	M_L= 4.1
	iSN	46.0						
RAB	eZ/	024614			-			Traces
RAB	eiPZ	013317½	0.5	4.0	d	½°	013303	
	iSN	27.5						
RAB	eZ/	064804			-			Traces C.B.M.
RAB	eZ/	084730			-			Traces
RAB	iPZ	101525.8	0.4	2.3	d	2¼°	101450	M_L= 4.9
	iSIN	53.0						
VUL	iPZ	24.5	0.6	5.0	d			
RAB	iPZ	225739.3	0.2	2.1	u			Local
RAB	ePZ	235843	0.5	1.8	d			Regional
16th March, 1968.								
RAB	iPZ	032147.7	0.3	1.5	d	1¼°	032125	M_L= 4.1
	iSN	2205.0						
VUL	iPZ	032147.0	0.4	3.0	u			
RAB	iPZ	072916.4	0.3	2.2	d	1½°	072852	M_L= 3.6
	eSE	34						
RAB	ePZ	084009	0.5	1.3	u	1½°	083941	M = 4.4
	iSN	30.5						
VUL	iPZ	084008.8	1.0	7.0	u			
RAB	ePZ	085251	0.4	3.0	u	2½°	085212	M_L= 4.1
	iSN	5321.0						
RAB	ePZ	123628	0.5	1.0	u			Regional
RAB	iPZ	155408.5	0.5	71.0	d	1¼°	155345	M_L= 4.9
	iSN	25.0						
WAN	iPZ	155408.1			d			
SUL	iPZ	155408.2			d			
RAL	iPZ	155407.9			d			
VUL	iPZ	155408.0			d			

			T sec	A mm	GM	Dist	H	Remarks
16th March, 1968 (cont'd)								
KRT	iPZ	155409½			d			Regional
RAB	iPZ iSE	161710.6 34.0	0.5	3.4	d	2°	161641	M_L= 4.2
RAL	iPZ	161710.0		4.0	d			
VUL	iPZ	161710.5		12.0	d			
KRT	eiPZ iPZ iSN	161711½ 12 34		2.0	u	1¾°	161642	
RAB	iPZ iSN	192832.5 49.0	0.5	75.0	u	1¼°	192809	M_L= 4.5
WAN	iPZ	192832.2		25.0	u			
SUL	iPZ	192832.0		10.0	u			
RAL	iPZ	192831.9	0.4	13.0	u			
VUL	iPZ	192831.5			u			
KRT	iPZ	192832	0.4	2.0	u			Regional
17th March, 1968.								
RAB	ePZ iSN	023218 3310.5	0.5	1.5	u	1½°	023110	
RAB	ePZ eSN/	040556 0814	0.5	1.0	d	12½°		
RAB	iPZ iSN	134132.0 43.0	0.4	4.0	u	¾°	134117	M_L= 3.6
RAL	iPZ	134131.5		2.0	u			
VUL	iPZ	134132.0			u			
KRT	iPZ iSN	134134 46		2.0	d	(1°)	1341(18)	
RAB	iPZ iSN	141840.5 51.2	0.3	2.0	u	¾°	141825	M_L= 3.5
KRT	iPZ e(S)E	141843 55½	0.4	2.0	u	1°	141826	
RAB	iPZ iZ e(S)N/	201953.2 2016.5 2412	1.0	1.0	d	(31°)		
RAB	ePZ eSN	213104½ 40	0.4	1.0	d	3°	203017	
RAB	iPZ iSN	224159.5 4217.0	0.4	2.5	d	1¼°	224137	M_L= 3.8
18th March, 1968. Harbour Network - Nil recorded.								
RAB	iPZ iSN	003708.0 11.0	0.5	2.0	u			Local
RAB	ePZ	072855	0.5	1.0	u			Regional
RAB	iPZ iSN	135353.3 5413.0	0.5	3.5	u	1½°	135327	

			T sec	A mm	GM	Dist	H	Remarks
18th March, 1968 (cont'd).								
KRT	ePZ	135352		1.0	u	1½°	135326	
	iSE	5411½						
RAB	ePZ	172920½	0.4	1.0	d	3½°	172823	
	eSN	3004½						
KRT	ePZ	172919½			d	4¼°		
	e(S)E	3010						
RAB	iPZ	225826.2	0.5	3.0	d			Local
	iSN	29.0						
19th March, 1968.								
RAB	ePZ	014255	0.4	1.0	u	(7¾°)	0141(00)	
	e(S)E/	4424						
RAB	iPZ	023850.0	0.5	12.0	u			Regional
RAB	iPZ	025739.2	0.4	6.0	d	1½°	025713	M_L= 3.7
	iSN	59.0						
RAB	iPZ	050136.8	0.5	1.8	u			Local
RAB	ePZ	061105	0.4	1.8	d	4°	061004	M_L= 4.7
	e(S)N/	52						
RAB	iPZ	114807.2	0.4	2.3	u	2½°	114726	M_L= 4.7
	iSE	38.0						
RAB	ePZ	132843½	0.6	1.0	u			Regional
RAB	iPZ	152221.7	0.3	16.0	d	½°	152210	M_L= 3.4
	iSN	31.0						
RAB	iPZ	170236.0	0.5	3.5	d	1¼°	170213	M_L= 4.1
	iZ	37.6						
	iSE	53.0						
RAB	ePZ	182745½	1.0	2.6	u	20°		
	iZ	52.0						
	eSE/	3128						
RAB	e(P)Z	192452	1.0	1.0	d			(Distant)
RAB	iPZ	203159.5	0.3	3.0	d	¾°	203144	M_L= 3.5
	iSN	3210.5						

ESA'ALA

28th February, 1968.

ESA	iPZ	121535.8	4.0	d	

29th February, 1968.

ESA	eiPZ	065518.6			
ESA	iPZ	102234.4		d	

		T sec	A mm	GM	Dist	H	Remarks
29th February, 1968 (cont'd).							
ESA iPZ	124625.6			d			
ESA iPZ	125533.6			u			
ESA ePZ	142034	0.6	2.6	d			
ESA ePZ	210949	0.6	3.0	u			
1st March, 1968.							
ESA eiPZ	022913			u			
ESA ePZ	043342.6						
ESA ePZ	173638.4			u			
ESA iPZ	153129.6			u			
ESA ePZ	004341.6						
ESA iPZ	043510.2			d			
ESA iPZ iSE	005121.6 26.0	0.3	1.6	u			
ESA iPE	053846						
ESA ePZ iSE	125216 5311				4¼°	125104	
5th March, 1968.							
ESA ePZ	180124						
ESA ePZ	182254		1.6	u			Distant
ESA ePZ	184421	1.0	1.0	u			
ESA ePZ	212546½	1.8	2.2	u			
6th March, 1968.							
ESA ePZ eSN	002058 2110				1¾°	002029	
ESA iPZ	155549						(Regional)
ESA iPZ iSE	171301 1305			u			
ESA iPZ	185926½			d			
7th March, 1968.							
ESA iPZ	052109			u			
ESA eiPZ	132310½		3.0	u			
ESA iPZ eSE	144155 4237½			u	3½°	144059	
ESA ePZ iSE	150245½ 0319½				2¾°	150201	
ESA ePZ iSE	151219 1300½			d	3½°	151125	
ESA ePZ iSE	214816½ 4900	0.6	0.6	u	3¾°	214720	
ESA ePZ eSE	215826½ 5904½				3¼°	215736	
ESA iPZ iSE	220451½ 0532	0.6	0.6	d	3¼°	220358	

		T sec	A mm	GM	Dist	H	Remarks
8th March, 1968.							
ESA iPZ	091825	0.6	2.0	d			Regional
ESA ePZ	100440						
ESA iPZ	132604	0.4	1.2	d			
ESA ePZ	212409½			d		212317	
eSE	50						
9th March, 1968.							
ESA iPZ	032037			u	5¼°	031920	
iSN	2136						
ESA ePZ	062510	0.3	1.0	u	5°	062356	
eSN	2607						
ESA ePZ	063037½			d			
ESA iPZ	124908	0.5	1.4	u	4°	124808	
iSN	54						
ESA ePZ	133532½			d			
TABELE							
5th March, 1968.							
TBL ePZ	182145	0.5		u			Teleseism
6th March, 1968.							
TBL	NIL RECORDED						
7th March, 1968.							
TBL	NIL RECORDED						
8th March, 1968.							
TBL	NIL RECORDED						
9th March, 1968.							
TBL	NIL RECORDED						
10th March, 1968.							
TBL ePZ	135018½			d			Local
11th March, 1968.							
TBL iPZ	065018	0.2	20.0	u			Regional

Rabaul Central Observatory,
2nd April, 1968.

G. W. D'ADDARIO
Vulcanologist-in-Charge

PEA Feb.68 No.10.

TERRITORY OF PAPUA AND NEW GUINEA
GEOLOGICAL AND VOLCANOLOGICAL BRANCH
VOLCANOLOGICAL SECTION

PRELIMINARY EARTHQUAKE ANALYSIS
RABAUL CENTRAL OBSERVATORY
1968

Rabaul	RAB	From; FEB. 28. 1968 To: MAR. - 5. 1968
Keravat	KRT	From: FEB. 28. 1968 To: MAR. - 5. 1968
Esa'ala	ESA	From: FEB. 13. 1968 To: FEB. 26. 1968
Tabele	TBL	From: FEB. 27. 1968 To: MAR. - 4. 1968
Agenahambo	AGE	From; To:
Waris	WAA	Not operational
Ulamona	ULA	Not operational
Piva	PIV	Not operational
C.Gloucester	LAG	From: To:

STATION PERSONNEL

RAB Central Observatory, Rabaul

Volcanologist-in-Charge	G.W. D'Addario
Volcanologist	R.F. Heming
Seismologist	(Position Vacant)
Seismogram Readers	D.J. Cook : H.M. Carrick
Senior Technical Officer	N.O. Myers
Technical Officer	R.J. Conway
Volcanological Assistants	L. Topue : M. Gaiam
	V. Kaiba
Technical Assistant	P. Daimbari
Trainee Volcanological Assistants	B. Talai: M. Salaiau,
	C. Matapit
Secretary	R. Scott

KRT Kerevat Outstation

Observer (part-time)	G.E. Chorick

TBL Tabele Observatory

Observer	E. Ravian

ESA Esa'ala Observatory

Observer	F. Dira

AGE Agenahambo Outstation

Observer (part-time)	Br. B. Hughes

The Rabaul Preliminary Earthquake Analysis (PEA) is produced by the staff under the direction of the Volcanologist-in-Charge from whom additional information and photocopies of seismogram records from all stations may be obtained on request.

Please address all communications to:-

Volcanologist-in-Charge
Central Observatory,
P.O. Box 386,
RABAUL. T.P. & N.G.

SEISMOGRAPH STATIONS

Station	Code	South Latitude	East Longitude	Elev. (m)	Foundation
(NEW GUINEA)					
Rabaul	RAB	04°11'28.6"	152°10'11.4"	183.5	Basalt Flow
Wanliss Street	WAN*	04°11'39.6"	152°10'32.5"	25.0	Basalt Flow
Sulphur Creek	SUL*	04°13'09.8"	152°10'33.3"	8.5	Unconsolidated Volcanic Ash
Rabalanakaia	RAL*	04°13'13.0"	152°12'07.0"	91.0	Unconsolidated Volcanic Ash
Tavurvur	TAV*	04°13'52.2"	152°13'12.9"	27.0	Andesite Flow
Tavilia	VUL*	04°16'58.2"	152°08'44.6"	332.3	Unconsolicated Volcanic Ash
Keravat	KRT	04°21'10.5"	152°03'06"	20.0	Alluvium
Ulamona	ULA	04°59'24.0"	151°16'30.0"	17.0	Lapilli Tuff
Tabele	TBL	04°06'04.67"	145°00'41.37"	179.5	Basalt Flow
Wards	WAA	04°07'00"	145°06'00"	48.0	Lapilli Tuff
Piva	PIV	06°12'00"	155°03'30"	60.0	Alluvium
Cape Gloucester	LAG	04°27'20"	148°26'00"	24.0	Lapilli Tuff
(PAPUA)					
Agenahambo	AGE	08°48'49"	148°05'56"	303.0	Unconsolidated Volcanic Ash
Esa'ala	ESA	09°44'18.2"	150°48'50.7"	46.4	Granite Gneiss

* Rabaul Harbour Network

STATION INSTRUMENTATION

Station & Instruments	Comp.	To	Te	Trace Speed mm/min	Approximate relative Magnification	Approximate damping
(NEW GUINEA)						
Rabaul Central Observatory RAB						
World-Wide Standard	Z	1.0	0.74	60	12,500	Critical
	N,E	1.0	0.74	60	6,250	Critical
	Z/N/E/	15.0	100.0	15	750	Critical
Benioff VR 14.7Kg	Z	1.0	0.02	60 *	4,000	Critical

* Recording is triggered by the onset of any earthquake with pre-determined minimum amplitude. Recorder is stopped automatically by hour break pulse.

Omori 15Kg	No	3.6	-	24	12	10.1(air)
Omori 15Kg	Eo	3.8	-	24	10	10.1(air)
Wood-Anderson Torsion	Na,Ea	0.8	-	60	2,800	Critical

Rabaul Harbour Network

Readings from the Harbour Network are entered in the PEA only for large earthquakes.

WAN°	Benioff VR 14.7Kg	Z	1.0	0.02	60	5,240	Critical
SUL°	Benioff VR 14.7Kg	Z	1.0	0.02	60	2,850	Critical
RAL°	Benioff VR 14.7Kg	Z	1.	0.02	60	8,075	Critical
TAV°	Benioff VR 14.7Kg	Z	1.0	0.02	60	20,900	Critical
VUL°°	Benioff VR 14.7Kg	Z	1.0	0.02	60	5,000	Critical

STATION INSTRUMENTATION

Station & Instruments	Comp.	To	Tg	Trace Speed mm/min	Approximate relative Magnification	Approx. damping
Rabaul Harbour Network (Cont'd)						
KRT - Keravat Outstation						
Benioff Mc 50Kg	Z	1.2	0.2	15	20% sensitivity	Critical
Benioff MC 50Kg	N,E	1.2	0.2	15	10% sensitivity	Critical
ULA - Ulamona Field Station						
Willmore portable	Z	0.6	0.25	60	3,000	underdamped
PIV -Piva Field Station						
Willmore portable	Z	0.6	0.25	60	3,000	underdamped
WAA -Waris Field Station						
Willmore portable	Z	0.6	0.25	60	3,000	underdamped
LAG -Cape Gloucester Field Station						
Willmore portable	Z	0.6	0.25	60	3,000	underdamped
TBL -Tabele Observatory						
Benioff VR 107.5Kg (PAPUA)	Z	1.0	0.2	60	1,350	critical
ESA -Esa'ala Observatory						
Benioff VR 107.5Kg	Z	1.0	0.2	15	36,000	critical
Benioff VR 107.5Kg	N,E	1.0	0.2	15	18,000	critical
Benioff VR 107.5Kg	Z/N/E/	1.0	60.0	30	50% sensitivity	critical
AGE -Agenahambo Station						
Willmore portable	Z	0.6	0.25	60	3,000	underdamped

o Signals from these stations are telemetered by land line to Helicorders (Geotech Mod.2484) at the Central Observatory.

oo Signals from this station are telemetered via VHF to its Helicorder at the Central Observatory.

N.B. These field stations consist of a permanent building in which instruments are installed when necessary.

Details of emergency field stations, within the Territory will be listed when in operation.

VR Variable Reluctance

VR Moving-coil

Relative magnification curves of seismograph systems installed in the stations controlled by the Rabaul Central Observatory are listed once a month on the P.E.A.

PRESENTATION OF DATA

(reviewed in November, 1967)

All times are reduced to Greenwich Mean Time (GMT), which is 10 hours behind Eastern Standard Time.

At RAB and Harbour Network, the time signal is marked every minute on each seismogram record from the Observatory crystal chronometer. Second marks from radio signal VNG (Australia) are recorded on World-Wide Standard System S.P.-N component only according with the W.W.S.S. programme, at six hour intervals. Primary time is provided by W.W.S.S. equipment and secondary time by a Labtronic crystal chronometer with the accuracy of ± 5ms per day compared with VNG (Australia) with the aid of a chronoscope.

At TBL and AGE. the time signal is derived from a spring driven chronometer (Mercer) and marked each minute on records. Time accuracy is determined by comparison with signals from WWVH daily. Linear correction is applied to the daily drift.

On all seismogram records time increases from left to right and time break is upward.

At RAB* and Harbour Network the recording drum of each seismograph is driven by a 110VAC 60Hz synchronous motor. The 110VAC is frequency regulated by a crystal chronometer.

* The Omori recording drum is driven by a nonregulated 50Hz frequency supply.

At ESA and KRT power for recorder motors is frequency regulated by a crystal chronometer at 50Hz. Power for AGE and TBL and field stations is supplied by a 50Hz free running oscillator.

Direction of Motion

Upward direction of ground motion corresponds to upward trace motion on vertical seismogram records. Direction of component of ground motion to North or East corresponds to upward trace motion on horizontal seismogram records.

Vertical trace motion from impulsive onset of longitudinal waves of compressional or dilatational ground movement is indicated by "u" or "d" accompanied by N,S,E or W, as per trace motion amplitude on horizontal seismogram records, to represent vectorially the direction of ground motion. "+" or "-" indicates upward or downward motion of the ground respectively, from a wave not known to be of the longitudinal type.

Accuracy of Readings

When readings are given with a decimal figure, they are to 1/10 of a second, other readings have been made to the nearest half second.

Crustal Phases

Px, Sx Crustal phases, other than Pn and Sn for local and near earthquakes.

Felt Intensity

Information on maximum intensities of shocks reported felt is included. Intensities are given in Roman numerals based on the Modified Mercalli Scale, of 1931.

PRESENTATION OF DATA (CONT'D)

Determinations of Epicentres

Where no source is cited, the determination of epicentres, origin time, focal depth and distance in central angle degrees from the pertinent station for local and regional earthquakes, are carried out at the Central Observatory, Rabaul.

Geographical Designation of Epicentres

The regional names which follow the co-ordinates of epicentres located at the Central Observatory are meant only to supplement the co-ordinates and normally follow well-known geographical rather than geological features. Use is made of the full degree blocks according to the method defined by E.A. Flinn and E.R. Engadhl in "A PROPOSED BASIS FOR GEOGRAPHICAL AND SEISMIC REGIONALIZATION", Seismic Data Laboratory Report No. 101, U.I.D. Inc., Alexandria, Virginia, 1964, adopted by the U.S.C.G.S. for computer requirements.

Magnitude Definition and Determination

M_L - Local Magnitude (Richter, 1935) is calculated from the recorded trace amplitude of the Wood-Anderson torsion seismographs of stated physical constants (installed at the Observatory in November, 1967).

Maximum trace amplitude (0 to peak) expressed in millimetres and tenths is measured directly on both components. Magnitude is determined independently and the arithmetic mean taken. M_L values are given to the tenth of a unit.

The station correction factor is assumed to be zero until better known.

M_S -Surface Wave Magnitude (Gutemberg & Richter, 1956) is calculated from the amplitude of surface waves of period near 20 seconds for shallow distant earthquakes.

M_B -Body Wave Magnitude is calculated from the ratio of amplitude over period for body waves on S.P.-Z of World-wide Seismograph System only when depth is known. The magnification factor for the standard seismograph is taken into account.

m -Unified magnitude (Gutemberg & Richter, 1956) has the following relation to M_L, M_S, and M_B.

$$m = 1.7 + 0.8\ M_L - 0.01\ M^2_L$$

$$m = M_B \text{ (without correction)}$$

$$m = 2.5 + 0.63\ M_S$$

Local Magnitude of earthquakes recorded at RAB with a clear S-P interval is tabulated on a Day-Distance (in Central Angle Degrees) graph which is added to the PEA monthly.

Symbols

i - impulsive and sharply defined beginning of a phase.

e - emergent and poorly defined beginning of a phase.

T - Period in seconds

A - Peak-to-Trough trace amplitude in millimetres.

GM - Ground Motion.

Dist -Distance in central angle degrees.

H - Origin Time

h - Focal depth in Kilometres

CBM - Confused by microseisms.

PRESENTATION OF DATA (CONT'D)

Remarks

Local - Typical signature of an earthquake with epicentre within 0.9°.

Near - Typical signature of an earthquake with epicentre between 0.9° and 9°.

Distant - Typical signature of an earthquake with epicentre between 9° and 45°.

Teleseism - Typical signature of an earthquake with epicentre more than 45°.

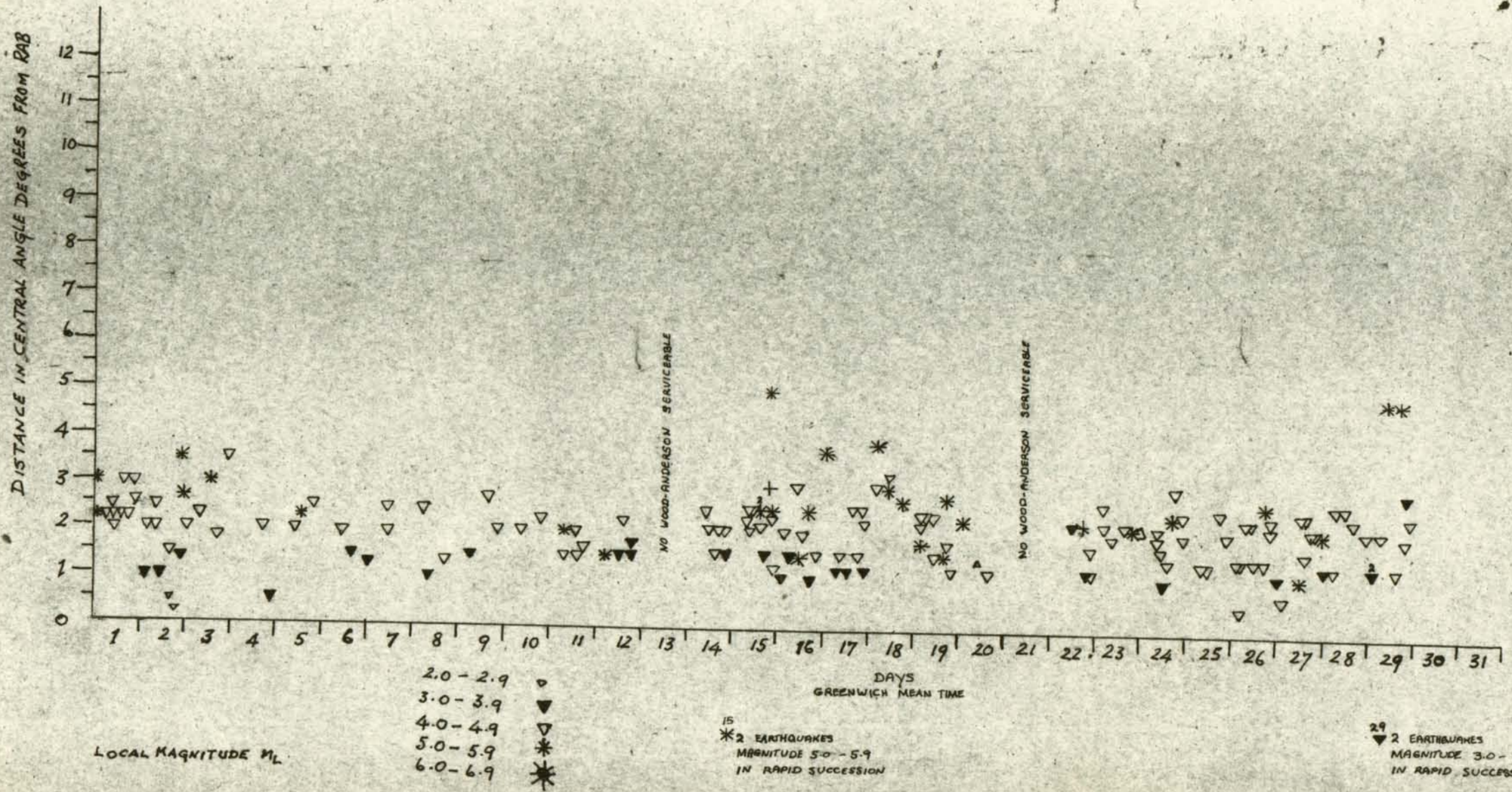
Traces - Any recorded disperse waves or very weak unknown earthquake phases.

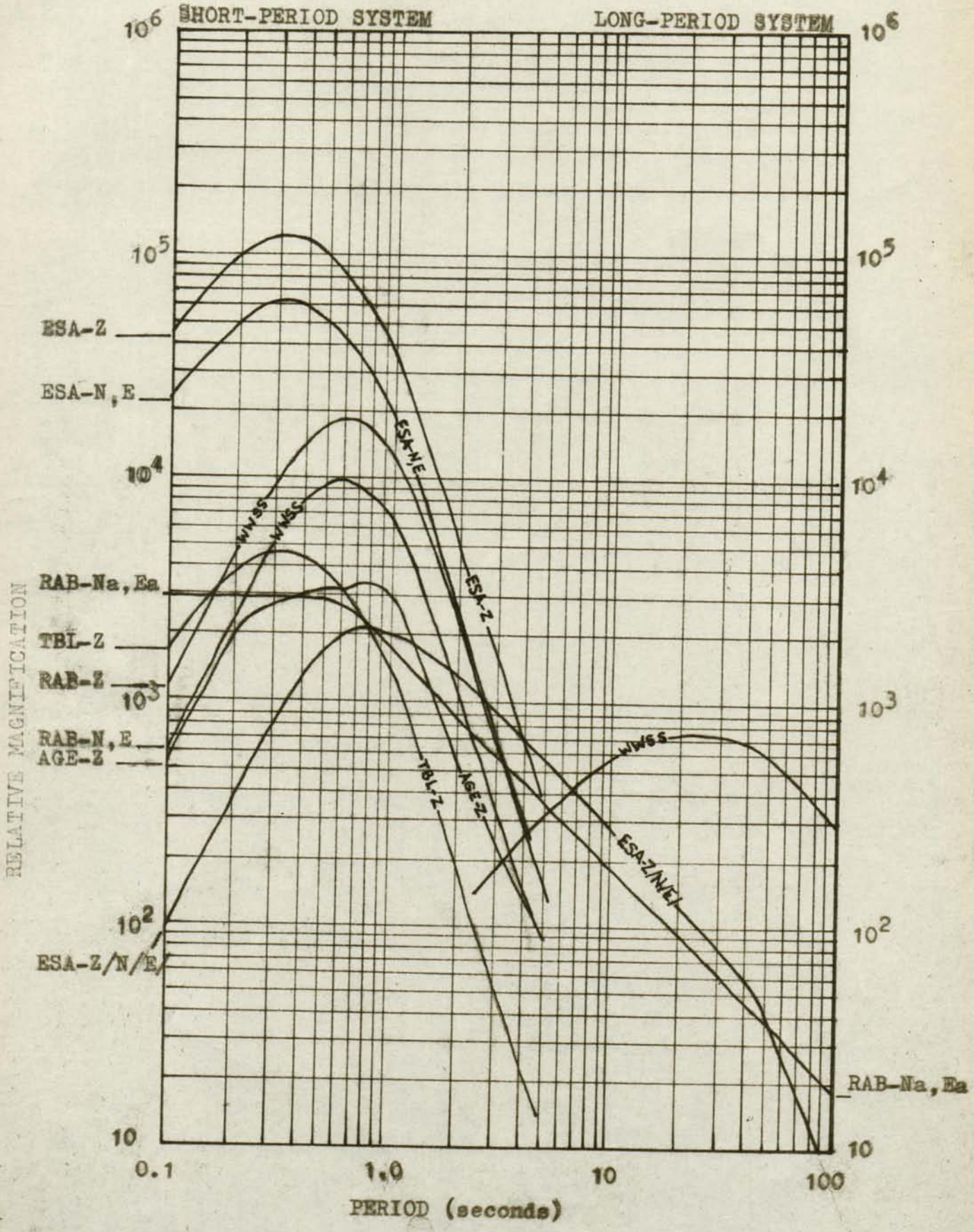
Local and Near earthquakes will be classified Regional, and Distant earthquakes will be grouped with Teleseisms if sheer waves and their reflections are unidentifiable.

G.W. D'ADDARIO
Vulcanologist-in-Charge

MAGNITUDE OF EARTHQUAKES WITH A CLEAR S-P INTERVAL

FEBRUARY 1968





FREQUENCY RESPONSE CURVES OF THE INSTRUMENTS

GWDA Nov.67

			T sec	A mm	GM	Dist	H	Remarks
RABAUL FEB. 29. 1968								
RAB	iPZ	010518.2	0.5	3.0	u	1½°	010450	M_L= 3.1
	iSN	39.0						
RAB	iPZ	011638.0	0.4	1.8	d	1½°	011610	M_L= 3.3
	eSN	59						
RAB	iPZ	054037.0	0.3	7.0	u	2¼°	054003	M_L= 4.4
	iZ	40.3						
	iSN	4103.0						
RAL	iPZ	054036.5	0.6	2.0	d			
RAB	iPZ	065546.2	0.3	7.0	d			Regional
RAB	iPZ	102227.8	0.4	3.0	d	5°	102113	M_L= 5.5
	iSN	2326.0						
RAL	iPZ	102226.5	0.6	2.2	d			
KRT	ePZ	102226½	0.5	4.0	d	4¾°	102113	
	iSN	2323						
RAB	iPZ	125533.0	0.5	27.0	d			Regional
RAL	iPZ	125532.8	0.8	4.0	d			Regional
SUL	iPZ	125532.5			d			
WAN	iPZ	125532.5	0.9	7.5	d			
KRT	iPZ	125530½	1.0	4.0	d			
RAB	iPZ	142104.0	0.5	2.5	u	5°	141947	M_L= 5.5
	iSN	2202.7						
KRT	eiPZ	142103	0.4	3.0	u	4¾°	141950	
	iSE	56						
RAB	iPZ	142509.3	0.5	3.0	d	1½°	142444	M_L= 3.2 Onset of the previous shock.
	iSN	28.2						
RAB	ePZ	155549½	0.5	1.0	d			Regional
RAB	ePZ	163803	0.8	1.0	d	33½°		
	eSN/	4318						
KRT	ePZ	163802½			d			
RAB	iPZ	190319.0	0.4	1.0	d	2°	190246	M_L= 4.4
	iZ	24.0						
	iSN	44.0						
KRT	iPZ	190316½			d	2¼°	190242	
	iSN9	42½						
RAB	ePZ	204515½	0.5	1.5	d	3°	204430	M_L= 4.6
	iSN	49.0						
RAL	iPZ	204514	0.6	2.0	d			
RAB	iPZ	210905.2	0.5	6.0	d	2½°	210826	M_L= 4.7
	iSE	35						
RAL	iPZ	210904.2	0.6	4.0	d			
WAN	iPZ	210904.8	0.8	3.0	d			
RAB	iPZ	234003.0	0.4	2.0	u			Regional

			T sec	A mm	GM	Dist	H	Remarks
28th Feb.,1968.								
RAB	iPZ	010703.0	0.5	3.0	d	1½°	010638	M_L= 3.4
	iSE	22.5						
RAL	iPZ	010655			u			
RAB	iPZ	030116.5	0.5	4.0	u			Local
	iSN	21.0						
RAL	iPZ	030116	0.3	4.0	u			
WAN	iPZ	030116			u			
RAB	iPZ	071355.2	0.5	2.0	u	2¾°	071312	M_L= 4.6
	eSN	1428						
RAL	iPZ	071354.5	0.8	2.8	u			
RAB	iPZ	075856.6	0.3	5.0	d	1½°	075835	M_L= 4.1
	iSN	5917.5						
WAN	iPZ	075856.5			d			
RAB	iPZ	121459.2	0.8	11.0	u	3?°		
	iSE/	2032						
RAL	iPZ	121459	0.6	3.0	u			
WAN	iPZ	121459	0.8	3.0	u			
KRT	iPZ	121501	0.8	3.2	d	(¾°)	1214(47)	
	i(S)N	1511½						
RAB	ePZ	144307	0.5	1.4	d	2¾°	144222	M_L= 4.4
	iZ	11.5						
	iSN	41.0						
KRT	iPZ	144307	0.5	1.0	d	2¾°	144223	
	iSN	40½						
RAB	ePZ	165504	0.5	2.0	d	2½°	165422	M_L= 4.5
	iSN	36.0						
KRT	iPZ	165504	0.7	1.0	d	2¾°	165419	
	iSN	38						
RAB	eZ/	183638			+			Traces
RAB	ePZ	221828½	0.4	2.2	d	1½°	221804	
	iSN	46.0						
RAB	iPZ	231012.0	0.4	2.0	d	2¼°	230938	
	iSN	38.0						
RAL	iPZ	231012.0	0.6	1.5	d			
WAN	iPZ	231012.5			d			
KRT	iPZ	231013½			d	2°	230942	
	iSN	37½						
RAB	iPZ	235458.0	0.5	4.0	u	2°	235428	
	eSE	5521						
RAL	iPZ	56.8	0.5	1.8	d			
KRT	iPZ	235459	0.5	5.0	d	1¾°	235430	
	iSN	5520½						

			T sec	A mm	GM	Dist	H	Remarks
1st March, 1968.								
RAB	iPZ iSN/	043601.0 24	0.5	9.0	u	2°	043531	M_L= 5.0
WAN	iPZ	043600.8	0.5	3.0	u			
RAL	iPZ	043600.6	1.0	14.0	u			
RAB	iPZ iSN	090153.0 0224.0	0.5	2.0	d	2½°	090112	
RAB	eZ/	105448			-			Traces
RAB	iPZ iZ iSN	145453.2 54.6 5526.0	0.3	1.0	d	2¾°	145412	M_L= 4.3
KRT	iPZ iSN	145452½ 5521	0.2	1.0	d	2½°	145415	
RAB	ePZ iSN	152950 3009.0	0.4	1.2	u	1½°	152925	M_L= 3.8
KRT	iPZ iSN	152949 3006			u	1½°	152926	
RAB	ePZ	173642	0.5	1.0	u			Regional
KRT	ePZ	173645			u			
RAB	iPZ iSN	193608.0 25.0	0.5	3.0	u	1¼°	193545	
KRT	iPZ iSN	193606½ 21½			u	1¼°	193546	
RAB	iPZ	201521.3	0.4	1.5	u			Regional
RAB	ePZ eSN	215930 59½	0.5	2.0	u	2½°	215852	
2nd March, 1968.								
RAB	iPZ iSN/	020049.3 0118	0.5	2.0	u	2½°	020011	M_L= 4.9
RAL	iPZ	020048.0	1.0	2.5	u			
RAB	eZ/	034412			-			Traces
RAB	iPZ iSN	132656.0 2726.3	0.6	1.7	u	2½°	132617	M_L= 4.2
KRT	ePZ iSN	132656½ 2727½	0.8	1.2	u	2½°	132616	
RAB	iPZ iSE	140216.3 48.0	0.5	1.2	u	2½°	140134	M = 4.2
RAL	iPZ	140215.8	1.0	2.0				
KRT	iPZ iSN	140216½ 48	0.6	4.5	u	2½°	140135	
RAB	ePZ iSN	140844½ 0915.5	0.4	2.0	u	2½°	140803	
KRT	ePZ iSN	140845 0916	0.6	2.0	u	2½°	140804	

			T sec	A mm	GM	Dist	H	Remarks
2nd March, 1968 (cont'd).								
RAB	ePZ	142534	0.4	2.0	d	2½°	142453	
	iSN	2605.0						
KRT	ePZ	142534½	0.8	2.0	d	2½°	142454	
	iSN	2605½						
RAB	ePZ	162738½	0.8	1.0	d			
	iZ	40.2						Regional
KRT	ePZ	162740½	1.2	1.0	d			
RAB	iPZ	171430.2	0.4	1.0	d	2½°	171351	
	iZ	32.1						
	iZ	36.2						M_L= 3.4
	iSN	1500.2						
WAN	iPZ	171431.6	1.2	6.0	u			
KRT	ePZ	171432		7.5	d			
RAB	iPZ	215811.2	0.5	1.5	d	2½°	215657	
	e(S)N	39						
3rd March, 1968.								
RAB	iPZ	002920.6	0.5	5.0	d	2°	002850	
	iSE	44.0						M_L= 4.6
WAN	iPZ	002920.0		2.0	d			
RAL	iPZ	002920.0	0.8	3.0	d			
KRT	i(P)Z	002920½				1¾°	002852	C.B.M.
	iSN	42						
RAB	ePZ	022604½	0.5	2.0	u	4°	022501	
	iSN	52.5						M_L= 5.3
WAN	iPZ	022604.5	1.8	2.0	u			
RAL	iPZ	022603.8	0.8	6.0	u			
RAB	iPZ	024649.4	0.4	2.0	u	1½°	024625	
	iSN	4707.2						
RAB	ePZ	033746	0.5	1.0	u			Distant
RAB	iPZ	063402.5	0.5	2.3	d	2¼°	063326	
	iSN	29.5						
RAB	ePZ	080007	0.5	1.0	d			Regional
RAB	iPZ	130831.0	0.4	1.0	d	2½°	130752	
	iZ	33.0						M_L= 4.6
	iSN	0901.0						
WAN	iPZ	130832.3			u			
RAL	iPZ	130831.5	0.8	9.0	u			
KRT	ePZ	130830			d	2½°	130749	
	iSN	0901						
RAB	iPZ	150444.0	0.5	1.5	d	2¼°	150407	
	iSN	0512.0						
KRT	iPZ	150443	0.8	1.5	u	2½°	150404	
	iSE	0512½						

			T sec	A mm	GM	Dist	H	Remarks
3rd March, 1968 (cont'd).								
RAB	iPZ	181506.0	0.5	2.6	u	2½°	181427	M_L= 5.0
	iSN	36.0						
KRT	iPZ	181505½	0.4	1.0	d	2¾°	181422	
	iSE	39						
RAB	iPZ	181713.8	0.4	4.0	d	1¾°	181644	M_L= 4.5 In coda of preceeding shock.
	iSN	36.5						
RAB	iPZ	182625.5	0.5	1.6	u	2½°	182543	M = 5.4
	iZ	28.5						
	iS!E	57.0						
KRT	eiPZ	182625			d	2½°	182545	
	iZ	25½						
	eSE	55½						
RAB	iPZ	230111.2	0.5	2.0	u	26°		
	iZ	12.0						
	iZ/	0228						
	iSN/	0540						
	iScPN/	0812						
4th March, 1968.								
RAB	eiPZ	035146	0.5	1.0	u	1½°	035118	M_L= 4.2
	iZ	48.2						
	iZ	52.0						
	eSE/	5207						
RAL	eiPZ	035147.5	0.9	3.0	u			
KRT	ePZ	035147½			u			
RAB	eiPZ	084034½	0.4	1.0	d	2¼°	083957	
	iZ	36.7						
	iSN	4102.0						
RAB	iPZ	125128.3	0.4	3.0	d	2¼°	125054	M_L= 5.8
	iZ	30.0						
	iSN/	54						
SUL	iPZ	125128.5	0.8	13.0	u			
RAL	iPZ	125127.8		5.0	d			
KRT	iPZ	125128½		4.0	d			
RAB	iPZ	135807.5	0.4	1.5	d	2¼°	135730	M = 4.5
	iSN	35.3						
KRT	iPZ	135806½	1.0	1.8	u	2½°	135724	
	iSE	39						
RAB	ePZ	162449	0.5	1.2	d	4½°	162341	
	iSN	2540.6						
KRT	ePZ	162452½			d	4¼°	162346	
	iSN	2543						
RAB	iPZ	171520.3	0.4	1.8	d	4¼°	171415	
	iSE	1610.0						
KRT	ePZ	171523½	0.5	1.2	d		171418	
	iSN	1613½						
RAB	iPZ	171743.4	0.4	7.0	u	1¾°	171714	In coda of preceeding shock
	iZ	48.0						
	iSN	1805.5						

			T sec	A mm	GM	Dist	H	Remarks
4th March, 1968 (cont'd).								
SUL	iPZ	171743	0.6	4.0	u			
RAL	iPZ	171742.5	0.8	12.0	u			
KRT	iPZ	171743			u	1¾°		
	iSE	1805						
RAB	iPZ	195443.0	0.4	11.0	d	1½°	195417	M_L= 4.4
	iZ	46.0						
	iSN	5503.0						
SUL	iPZ	195442.5	0.5	3.0	d			
RAL	iPZ	195442.8	0.5	2.0	u			
KRT	ePZ	195440						
RAB	iPZ	203155.3	0.5	2.0	d	1½°	203130	M_L= 4.1
	iSN	3214.3						
KRT	iPZ	203153½				1¼°	203131	
	iSN	3210						
RAB	eiPZ	204832	0.4	1.5	d	1¾°	204803	
	iZ	35.5						
	iSN	54.5						
5th March, 1968.								
RAB	eZ/	005013			-			Traces
RAB	iPZ	084638.6	0.4	2.3	d	2¼°	084602	M_L= 4.1
	iSN	4706.5						
RAB	iPZ	095852.5	0.3	3.0	u	¼°	095844	M_L= 3.5
	iSN	58.0						
WAN	iPZ	095852.3	0.2	1.0	u			
RAL	iPZ	095852.0	0.2	1.0	u			
VUL	iPZ	095852.0			d			
KRT	iPZ	095853				¼°	095845	
	iSN	59						
RAB	ePZ	144324	1.0	1.0	d	60°		
	eSN/	5138						
KRT	ePZ	144325			d			
RAB	iPZ	175831.1	0.5	49.0	d	1°	175815	M_L= 4.3
	iSN/	43						
WAN	iPZ	175831.0	0.3	23.0	d			
SUL	iPZ	175831.0	0.3	12.0	d			
RAL	iPZ	175830.6			d			
VUL	iPZ	175830.0			d			
KRT	iPZ	175830			d			
RAB	ePZ	182237	0.5	1.0	u	30½°		
	iZ	42.1						
	ePcPZ/	2532						
	iSN/	2730						
	eLqE/	2856						
	eScPN/	2910						
KRT	iPZ	182240		1.5	u	(35°)		
	e(S)E	2725½						
	e(S)E	2812						

			T sec	A mm	GM	Dist	H	Remarks
5th March, 1968 (cont'd).								
RAB	ePZ	184403½	0.8	1.0	d			Distant
KRT	ePZ	184403½			d			
RAB	ePZ	212609	0.8	1.0	d			Distant
KRT	ePZ	184403½			d			
RAB	ePZ	212609	0.8	1.0	d			Distant
ESA'ALA								
13th Feb.,1968. No N-S, E-W time breaks								
ESA	iPZ	021449.8						
ESA	ePZ	111307						
ESA	iPZ	135521.4	0.8	1.0	d			
ESA	ePZ	184459	0.8	2.0	d			
14th Feb.,1968. No N-S, E-W time breaks								
ESA	iPZ	051046	0.6	1.0	u			
ESA	iPZ	073140	0.6	0.4	d			
ESA	ePZ	101957½			d			
15th Feb.,1968. No N-S, E-W time breaks								
ESA	ePZ	091829	0.2	0.6	u			
ESA	ePZ	101451						
ESA	iPZ	171747½			u			
ESA	iPZ	174530	0.6	1.0	u			
16th Feb.,1968. No N-S, E-W time breaks								
ESA	ePZ	075742			u			
ESA	iPZ	130716½	1.0	1.5	d			Overlapping traces
ESA	iPZ	141127	0.4	3.0	d			
17th Feb., 1968. No N-S, E-W time breaks								
ESA	iPZ	003350	0.6	2.0	u			
ESA	iPZ	130544½	0.8	0.8	d			
ESA	ePZ	200624						
18th Feb.,1968. No N-S,E-W time breaks								
ESA	iPZ	001746	0.6	1.5	d			
ESA	iPZ	040614		3.0	u			
ESA	ePZ	043119½	0.8	0.6	u			
ESA	iPZ	211744			d			

		T sec	A mm	GM	Dist	H	Remarks
19th Feb.,1968.							
ESA			EXPOSED RECORDS				
20th Feb.,1968.	No N-S,E-W time breaks						
ESA	iPZ	023254		0.2	2.0	d	
ESA	iPZ	065141½		0.4	2.0	u	
ESA	iPZ	083600½		0.6	1.5	u	
ESA	ePZ	164446½				d	
21st Feb.,1968	No N-S,E-W time breaks						
ESA	ePZ	002810½					
ESA	iPZ	070151		0.2	0.6	u	
ESA	ePZ	090254½		0.4	2.0	d	
ESA	iPZ	142305½		0.4	0.4	d	
ESA	ePZ	183438½		0.4	0.2	d	
ESA	ePZ	193730½				u	
22nd Feb.,1968.	No N-S,E-W time breaks						
ESA	iPZ	033029			1.0		
ESA	iPZ	184929		0.4	0.6	u	
ESA	ePZ	192619				u	
23rd Feb.,1968.	No N-S,E-W time breaks						
ESA	iPZ	021119				d	
ESA	iPZ	021814		0.2	0.4	u	
ESA	iPZ	044605		0.4	2.0	d	
ESA	iPZ	053553				d	
ESA	iPZ	125647				u	
ESA	iPZ	130641½					
ESA	iPZ	132051½		0.4		d	
ESA	iPZ	161912½		0.4	1.0	d	
ESA	ePZ	185141½		0.8	0.4	d	
24th Feb.,1968.	No N-S,E-W time breaks						
ESA	iPZ	134742½		0.4			
ESA	e(P)Z	141514			1.0	u	
25th Feb., 1968.	No N-S,E-W time breaks						
ESA	iPZ	005719½		0.4	0.4	u	
ESA	ePZ	055252					

		T sec	A mm	GM	Dist	H	Remarks
26th Feb.,1968.	No N-S,E-W time breaks						
ESA	ePZ 031235			d			
ESA	iPZ 062553	0.4	1.5	d			
ESA	ePZ 105820½	2.5	3.0	u			
ESA	ePZ 161844½			d			
ESA	iPZ 174541			d			
ESA	iPZ 185452½			d			
ESA	e(P)Z 210853½			u			
27th Feb.,1968.	No N-S, E-W time breaks						
ESA	iPZ 052414½	1.0	1.5	d			
ESA	iPZ 084535½	0.4	0.8	d			
ESA	ePZ 090547			d			
ESA	iPZ 103653½		0.4	d			
ESA	iPZ 105953½	1.5	2.0	u			
ESA	iPZ 114903	0.4	0.6	d			
ESA	iPZ 125356½	0.8	0.6	u			

TABELE

27th Feb.,1968.							
TBL	ePZ 012834		2.8	d			Local
TBL	ePZ 090457						
TBL	ePZ 135647	0.3	3.3	d			Local
28th Feb.,1968.							
TBL	NIL RECORDED						
29th Feb..1968.							
TBL	NIL RECORDED						
1st March,1968.							
TBL	ePZ 005310		2.0	u			
TBL	ePZ 100312			d			
2nd March, 1968.							
TBL	iPZ 034325	0.4	4.0	d			
3rd March, 1968.							
TBL	NIL RECORDED						
4th March, 1968.							
TBL	iPZ 235021½	0.6	3.0	u			

Rabaul Central Observatory
20th March, 1968.

G. W. D'ADDARIO
Vulcanologist-in-Charge

PEA MAR.68 No.1 1.

9 APR 1968

TERRITORY OF PAPUA AND NEW GUINEA
GEOLOGICAL AND VULCANOLOGICAL BRANCH
VULCANOLOGICAL SECTION

PRELIMINARY EARTHQUAKE ANALYSIS
RABAUL CENTRAL OBSERVATORY
1968

Rabaul	RAB	From: MAR. 6. 1968 To: MAR. 1 2. 1968
Keravat	KRT	From: MAR. 6. 1968 To: MAR. 1 2. 1968
Esa'ala	ESA	From: DEC. 2 7. 1967 JAN. 2 3. 1968 To: DEC. 3 1. 1967 JAN. 2 9. 1968
Tabele	TBL	From: To:
Agenahambo	AGE	From: To:
Waris	WAA	Not operational
Ulamona	ULA	Not operational
Piva	PIV	Not operational
C.Gloucester	LAG	Not operational

STATION PERSONNEL

RAB Central Observatory, Rabaul

Volcanologist-in-Charge	G.W. D'Addario
Volcanologist	R.F. Heming
Seismologist	(Position Vacant)
Seismogram Readers	D.J. Cook : H.M. Carrick
Senior Technical Officer	N.O. Myers
Technical Officer	R.J. Conway
Volcanological Assistants	L. Topue : M. Gaiam
	V. Kaiba
Technical Assistant	P. Daimbari
Trainee Volcanological Assistants	B. Talai: M. Salaiau,
	C. Matapit
Secretary	R. Scott

KRT Kerevat Outstation

Observer (part-time)	G.E. Chorick

TBL Tabele Observatory

Observer	E. Ravian

ESA Esa'ala Observatory

Observer	F. Dira

AGE Agenahambo Outstation

Observer (part-time)	Br. B. Hughes

The Rabaul Preliminary Earthquake Analysis (PEA) is produced by the staff under the direction of the Volcanologist-in-Charge from whom additional information and photocopies of seismogram records from all stations may be obtained on request.

Please address all communications to:-

Volcanologist-in-Charge
Central Observatory,
P.O. Box 386,
RABAUL. T.P. & N.G.

SEISMOGRAPH STATIONS

Station (NEW GUINEA)	Code	Scuth Latitude	East Longitude	Elev. (m)	Foundation
Rabaul	RAB	04°11'28.6"	152°10'11.4"	183.5	Basalt Flow
Wanliss Street	WAN*	04°11'39.6"	152°10'32.5"	25.0	Basalt Flow
Sulphur Creek	SUL*	04°13'09.8"	152°10'33.3"	8.5	Unconsolidated Volcanic Ash
Rabalanakaia	RAL*	04°13'13.0"	152°12'07.0"	91.0	Unconsolidated Volcanic Ash
Tavurvur	TAV*	04°13'52.2"	152°13'12.9"	27.0	Andesite Flow
Taviliu	VUL*	04°16'58.2"	152°08'44.6"	332.3	Unconsolidated Volcanic Ash
Keravat	KRT	04°21'10.5"	152°03'06"	20.0	Alluvium
Ulamona	ULA	04°59'24.0"	151°16'30.0"	17.0	Lapilli Tuff
Tabele	TBL	04°06'04.67"	145°00'41.37"	179.5	Basalt Flow
Waris	WAA	04°07'00"	145°06'00"	48.0	Lapilli Tuff
Piva	PIV	06°12'00"	155°03'30"	60.0	Alluvium
Cape Gloucester	LAG	04°27'20"	148°26'00"	24.0	Lapilli Tuff
(PAPUA)					
Agenahambo	ACE	08°48'49"	148°05'56"	303.0	Unconsolidated Volcanic Ash
Esa'ala	ESA	09°44'18.2"	150°48'40.7"	46.4	Granite Gneiss

* Rabaul Harbour Network

STATION INSTRUMENTATION

Station & Instruments (NEW GUINEA)	Comp.	To	Tg	Trace Speed mm/min	Approximate relative Magnification	Approximate damping
Rabaul Central Observatory RAB						
World-Wide Standard	Z	1.0	0.74	60	12,500	Critical
	N,E	1.0	0.74	60	6,250	Critical
	Z/N/E/	15.0	100.0	15	750	Critical
Benioff VR 14.7Kg	Zh	1.0	0.02	180 +	4,000	Critical
Omori 15Kg	No	3.6	-	24	12	10.1(air)
Omori 15Kg	Eo	3.8	-	24	10	10.1(air)
Wood-Anderson Torsion	Na,Ea	0.8	-	60	2,800	Critical

+Recording is triggered by the onset of any earthquake with pre-determined minimum amplitude. Recorder is stopped automatically by hour break pulse.

Rabaul Harbour Network

Readings from the Harbour Network are entered in the BEA only for large earthquakes

WAN°	Benioff VR 14.7Kg Z	1.0	0.02	60	5,240	Critical
SUL°	Benioff VR 14.7Kg Z	1.0	0.02	60	2,850	Critical
RAL°	Benioff VR 14.7Kg Z	1.0	0.02	60	8,075	Critical
TAV°°	Benioff VR 14.7Kg Z	1.0	0.02	60	20,900	Critical
VUL°	Benioff VR 14.7Kg Z	1.0	0.02	60	5,000	Critical

STATION INSTRUMENTATION

Station & Instruments	Comp.	To	Tg	Trace speed mm/min	Approximate relative Magnification	Approx. damping
Rabaul Harbour Network (Cont.)						
o Signals from these stations are telemetered by land line to Helicorders (Geotech Mod. 2484) at the Central Observatory.						
oo Signals from this station are telemetered via VHF to its Helicorder at the Central Observatory.						
KRT - Keravat Outstation						
Benioff Mc 50 Kg	Z	1.2	0.2	15	20% sensitivity	Critical
Benioff MC 50Kg	N/E	1.2	0.2	15	10% sensitivity	Critical
ULA - Ulamona Field Station						
Willmore portable	Z	0.6	0.25	60	3,000	underdamped
PIV - Piva Field Station						
Willmore portable	Z	0.6	0.25	60	3,000	underdamped
WAA - Waris Field Station						
Willmore portable	Z	0.6	0.25	60	3,000	underdamped
LAG - Cape Gloucester Field Station						
Willmore portable	Z	0.6	0.25	60	3,000	underdamped

N.B. These field stations consist of a permanent building in which instruments are installed when necessary.

Details of emergency field stations, within the Territory will be listed when in operation.

TBL - Tabele Observatory						
Benioff VR 107.5Kg	Z	1.0	0.2	60	1,350	critical
(PAPUA)						
ESA - Esa'ala Observatory						
Benioff VR 107.5Kg	Z	1.0	0.2	15	36,000	critical
Benioff VR 107.5Kg	N,E	1.0	0.2	15	18,000	critical
Benioff VR 107.5Kg	Z/N/E	1.0	60.0	30	50% sensitivity	critical
AGE - Agenahambo Station						
Willmore portable	Z	0.6	0.25	60	3,000	underdamped

VR Variable Reluctance

MC Moving-coil

Relative magnification curves of seismograph systems installed in the stations controlled by the Rabaul Central Observatory are listed once a month on the P.E.A.

PRESENTATION OF DATA

(reviewed in November, 1967)

All times are reduced to Greenwich Mean Time (GMT), which is 10 hours behind Eastern Standard Time.

At RAB and Harbour Network, the time signal is marked every minute on each seismogram record from the Observatory crystal chronometer. Second marks from Radio signal VNG (Australia) are recorded on World-wide Standard System S.P.-N. component only according with the W.W.S.S. programme, at six hour intervals. Primary time is provided by W.W.S.S. equipment and secondary time by a Labtronic crystal chronometer with the accuracy of ± 5 ms per day compared with VNG (Australia) with the aid of a chronoscope.

At TBL and AGE, the time signal is derived from a spring driven chronometer (Mercer) and marked each minute on records. Time accuracy is determined by comparison with signals from WWVH daily. Linear correction is applied to the daily drift.

On all seismogram records time increases from left to right and time break is upward.

At RAB* and Harbour Network the recording drum of each seismograph is driven by a 110VAC 60Hz synchronous motor. The 110VAC is frequency regulated by a crystal chronometer.

* The Omori recording drum is driven by a nonregulated 50Hz frequency supply.

At ESA and KRT power for recorder motors is frequency regulated by a crystal chronometer at 50Hz. Power for AGE and TBL and field stations is supplied by a 50Hz free running oscillator.

Direction of Motion

Upward direction of ground motion corresponds to upward trace motion on vertical seismogram records. Direction of component of ground motion to North or East corresponds to upward trace motion on horizontal seismogram records.

Vertical trace motion from impulsive onset of longitudinal waves of compressional or dilatational ground movement is indicated by "u" or "d" accompanied by N,S,E, or W, as per trace motion amplitude on horizontal seismogram records, to represent vectorially the direction of ground motion. "+" or "-" indicates upward or downward motion of the ground respectively, from a wave not known to be of the longitudinal type.

Accuracy of Readings

When readings are given with a decimal figure, they are to 1/10 of a second, other readings have been made to the nearest half second.

Crustal Phases

Px, Sx Crustal phases, other than Pn and Sn for local and near earthquakes.

Felt Intensity

Information on maximum intensities of shocks reported felt is included. Intensities are given in Roman numerals based on the Modified Mercalli Scale, of 1931.

PRESENTATION OF DATA (CONT)

Determinations of Epicentres

Where no source is cited, the determination of epicentres origin time, focal depth and distance in central angle degress from the pertinent station for local and regional earthquakes, are carried out at the Central Observatory, Rabaul.

Geographical Designation of Epicentres

The regional names which follow the co-ordinates of epicentres located at the Central Observatory are meant only to supplement the co-ordinates and normally follow well-known geographical rather than geological features. Use is made of the full degree blocks according to the method defined by E.A. Flinn and E.R. Engadhl in "A PROPOSED BASIS FOR GEOGRAPHICAL AND SEISMIC REGIONALIZATION", Seismic Data Laboratory Report No. 101, U.I.D. Inc., Alexandria, Virginia, 1964, adopted by the U.S.C.G.S. for computer requirements.

Magnitude Definition and Determination

M_L Local Magnitude (Richter, 1935) is calculated from the recorded trace amplitude of the Wood-Anderson torsion seismographs of stated physical constants (installed at the Observatory in November, 1967).

Maximum trace amplitude (0 to peak) expressed in millimetres and tenths is measured directly on both components. Magnitude is determined independently and the arithmetic mean taken. M_L values are given to the tenth of a unit.

The station correction factor is assumed to be zero until better known.

M_S Surface Wave Magnitude (Gutemberg and Richter, 1956) is calculated from the amplitude of surface waves of period near 20 seconds for shallow distant earthquakes.

M_B Body Wave Magnitude is calculated from the ratio of amplitude over period for body waves S.P.-Z of World-wide Seismograph System only when depth is known. The magnification factor for the standard seismograph is taken into account.

m Unified magnitude (Gutemberg & Richter, 1956) has the following relation to M_L, M_S, and M_B.

$$m = 1.7 + 0.8\ M_L - 0.01\ M^2_L$$

$$m = M_B \text{ (without correction)}$$

$$m = 2.5 + 0.63\ M_S$$

Local Magnitude of earthquakes recorded at RAB with a clear S-P interval is tabulated on a Day-Distance (in Central Angle Degrees) graph which is added to the PEA monthly.

Symbols

i	-	impulsive and sharply defined beginning of phase.
e	-	emergent and poorly defined beginning of a phase.
T	-	Period in seconds
A	-	Peak-to-Trough trace amplitude in millimetres.
GM	-	Ground Motion
Dist	-	Distance in central angle degrees
H	-	Origin Time
h	-	Focal depth in Kilometres
CBM	-	Confused by microseisms.

PRESENTATION OF DATA (CONT'D)

Remarks

Local - Typical signature of an earthquake with epicentre within 0.9°.

Near - Typical signature of an earthquake with epicentre between 0.9° and 9°.

Distant - Typical signature of an earthquake with epicentre between 9° and 45°.

Teleseism - Typical signature of an earthquake with epicentre more than 45°.

Traces - Any recorded disperse waves or very weak unknown earthquake phases.

Local and Near earthquakes will be classified Regional, and Distant earthquakes will be grouped with Teleseisms if sheer waves and their reflections are unidentifiable.

G.W. D'ADDARIO
Vulcanologist-in-Charge

			T sec	A mm	GM	Dist	H	Remarks
6th March, 1968								
RAB	iPZ iSN	010031.2 49.0	0.4	4.0	d	1½°	010007	M_L= 3.6
RAB	iPZ iSN	101925.0 45.6	0.4	6.0	d	1½°	101857	M_L= 4.0
KRT	eiPZ eSN	101921½ 41	-	-	d	1½°	101856	
RAB	iPZ iSN	111817.6 27.5	0.5	10.0	d	½°	111804	M_L= 3.9
WAN	iPZ	111817.5	0.3	13.0	d			
SUL	iPZ	111817.3	0.2	8.0	d			
RAL	iPZ	111817.0	0.3	18.0	d			
VUL	iPZ	111818.2	0.4	6.0	d			
KRT	iPZ iSE	111820 31½	-	-	d	¾°	111804	
RAB	iPZ iSE	121249.3 1259.0	0.4	19.0	d	½°	121235	M_L= 3.5
WAN	iPZ	121249.2	0.2	10.0	d			
SUL	iPZ	121249.0	0.3	4.0	d			
RAL	iPZ	121248.8	0.3	9.0	d			
VUL	iPZ	121250.0	0.2	11.0	d			
KRT	iPZ iSE	121251½ 1303	-	-	d	¾°	121236	
RAB	ePZ iSN	122252½ 2315.0	0.4	1.0	U	2°	122222	M_L= 3.9
KRT	ePZ iSN	122253½ 2316½	0.5	1.2	u	2°	122223	
RAB	ePZ e(S)N/	155551 5912	0.8	1.0	d	(16°)		
KRT	iPZ	155545½	1.0	1.2	u			
RAB	iPZ	163719.5	0.5	53.0	d			Regional
WAN	iPZ	163719.2	0.4	8.0	d			
SUL	iPZ	163719.5	0.5	11.0	d			
RAL	iPZ	163719.4	0.5	19.0	d			
VUL	iPZ	163719.6	0.2	13.0	d			
KRT	iPZ	163720			d			
RAB	iPZ iSE	194923.6 39.5	0.4	8.0	d	1¼°	194902	M_L= 3.9
WAN	iPZ	194923.2	0.3	2.0	d			
VUL	iPZ	194922.5	0.4	7.0	d			
KRT	iPZ iSE	194922 35	-	-	d	1°	194904	
RAB	iPZ iSN	212559.0 2622.5	0.4	26.0	U	2°	212528	M_L= 3.9

			T sec	A mm	GM	Dist	H	Remarks
7th March, 1968								
RAB	eZ/	030248	-	-	+			Traces
RAB	eiPZ	052418½	0.3	2.0	U	3¼°		
	iZ	22.5					042330	
	eSN	55½						
KRT	ePZ	052420½	-	-	-	5¼°		
	eSE	2521½					052301	
RAB	eZ/	081424	-	-	+			Traces
RAB	iPZ	123258.5	0.3	1.6	d	2¼°		M_L= 4.7
	iSN	3326.4					123221	
KRT	iPZ	123257	0.4	4.0	u	2¼°		
	eSN	3322					123224	
RAB	iPZ	132250.0	0.4	4.0	u	2¼°		M_L= 6.0
	iSNo	2318.0					132213	Felt: Pomio Int. IV-V .05° 30S, 151° 30'E Ulamona Int III 05° 00'S, 151° 15'E. Rongamatane II 04° 31'S, 152° 11'E
KRT	iPZ	132248	-	-	u			Regional
RAB	iPZ	133143.5	0.4	5.0	d	2½°		M_L= 5.0 in coda
	eSN	3212					133105	
SUL	iPZ	133144.5	0.8	5.0	d			
RAL	iPZ	133144.5	0.8	9.0	d			
RAB	iPZ	133433.0	0.3	5.0	u	2°		
	iSN	58.5					133359	
RAB	iPZ	134031.0	0.4	10.0	u	2¼°		
	iSN	57.0					133957	
RAB	iPZ	144133.6	-	-	u	1½°		M_L= 4.7
	eSE	54					144108	
WAN	iPZ	144133.6	0.2	5.0	u			
RAL	iPZ	144133.6	0.8	4.0	u			
KRT	iPZ	144134.2	-	-	u			Regional
RAB	iPZ	150217.5	0.3	3.0	d	2½°		
	eSN/	46					150139	
RAB	iPZ	151157.2	0.3	7.0	u	2½°		
	iSN/	1227					151118	
WAN	iPZ	151157.0						
KRT	iPZ	151156	-	-	u			Regional
RAB	iPZ	173830.4	0.3	3.0	u	2¼°		M_L= 4.9
	iZ	31.2					173753	
	iSN/	58						
KRT	iPZ	173828	0.6	6.0	u	2¼°		
	eSE	56					173751	

			T sec	A mm	GM	Dist	H	Remarks
7th March, 1968								
RAB	iPZ	214756.6	0.4	7.0	u	2¼°		M_L= 5.3
	iZ	57.6					214720	
	iSE	4825						
SUL	iPZ	214757.8		1.5	d			
RAL	iPZ	214756.6	-	-	u			
RAB	iPZ	215801.5	0.3	2.0	d	2½°		
	iZ	02.8					215723	
	iSN	30.5						
WAN	iPZ	215802.1	-	-	d			
VUL	iPZ	215801.2	0.2	5.0	d			
RAL	iPZ	215802.0	1.0	6.0	d			
KRT	iPZ	215759	0.5	7.0	u	(2°)		
	i(S)E	5823					2157(27)	
RAB	iPZ	220438.0	0.4	2.0	d	3°		
	eSN/	0512					220353	
RAB	iPZ	222034.2	0.4	3.0	d	2½°		
	eSN/	2106					221952	
RAB	iPZ	231508.0	0.4	3.0	u	2½°		
	iSN	39.0					231427	
8th March, 1968								
RAB	iPZ	002321.3	0.4	36.0	d	2¼°		M_L= 4.6
	iSN	47.0					002247	
KRT	ePZ	002317½	-	-	d	2°		C.B.M.
	iSN	41					002246	
RAB	iPZ	011556.5	0.4	30.0	d	2¼°		
	iSN	1622.5					011522	
KRT	iPZ	011554	-	-	d	2°		C.B.M.
	iSN	1617½					011523	
RAB	iPZ	085637.6	0.4	7.0	u	2¼°		M_L= 3.9
	iSN	5704.1					085603	
RAL	iPZ	085637.0	0.6	1.5	u			
RAB	iPZ	091815.0	0.4	2.0	d			Regional
KRT	ePZ	091814	-	-	-			C.B.M.
RAB	eiPZ	144711½	0.4	1.2	d	2¾°		M_L= 4.4
	iZ	14.2					144628	
	iSN	44.2						
KRT	iPZ	144710½	0.4	2.0	d	2½°		
	eSN	40½					144631	
RAB	iPZ	174515.2	0.4	1.5	d	2¼°		M_L= 4.7
	1Z	16.2					174439	
	iSE	42.0						
SUL	iPZ	174516.6	0.4	6.0	d			
RAL	iPZ	174515.7	0.8	15	d			
KRT	iPZ	174513	0.6	-	u	1¾°		
	i(S)E	35½					1744(43)	
RAB	ePZ	195321½	0.5	1.0	d			Distant

			T sec	A mm	GM	Dist	H	Remarks
8th March, 1968 (Cont.)								
RAB	iPZ	212352.8	0.3	3.0	u	2½°		M_L= 5.1
	1Z	54.5					212312	
	iSN	2424.0						
KRT	ePZ	212356	-	-	u			
9th March, 1968								
RAB	ePZ	005604	0.3	1.0	u			Distant
RAB	iPZ	032001.3	0.5	20.0	d	1¼°		M_L= 5.2
	iSN	17					031940	
RAL	iPZ	031900.8	1.0	5.0	d			
KRT	ePZ	032001	-	-	d			C.B.M.
RAB	eiPZ	062426	0.4	2.0	d	2°		M_L= 5.1
	iZ	27.1					062354	
	iSE	50.0						
RAL	iPZ	062426	1.2	8.0	u			
KRT	ePZ	062425½	-	-	d			C.B.M.
RAB	iPZ	062954.5	0.5	3.0	d			Regional
RAB	iPZ	095131.0	0.4	2.5	u	1½		M_L= 4.1
	iSN	49.0					095107	
VUL	iPZ	095130.4	0.2	5.0	d			
KRT	ePZ	095130	-	1.5	u	1½		
	iSE	49					095105	
RAB	iPZ	133356.2	0.4	1.8	d	1¾°		M_L= 4.8
	iZ	57.2					133327	
	iSN	3418.5						
RAL	iPZ	133356.8	0.8	9.0	d			
KRT	iPZ	133357	0.2	2.0	d	1¾		
	iSE	3417					133330	
RAB	ePZ	210619	0.5	1.2	d			Regional
10th March, 1968								
RAB	iPZ	023736.5	0.5	49.0	d	1½°		M_L= 4.5
	iSE	54					023712	
RAL	iPZ	023736.1	-	11.0	d			
VUL	iPZ	023735.5	-	-	d			
KRT	iPZ	023735½	-	-	d			
RAB	eZ/	040750	-	-	+			Traces
RAB	iPZ	063758.0	0.4	14.0	u	2½°		
	iSN	3828.0					063719	
RAB	iPZ	063920.5	0.4	4.0	u	2½°		M_L= 4.5 In coda of preceeding shock
	iSN	50.0					063841	
RAB	iPZ	064626.6	0.5	11.0	u	2½°		
	eSN	55½					064548	

			T sec	A mm	GM	Dist	H	Remarks
10th March, 1968 (cont)								
RAB	iPZ	071856.0	0.8	2.0	d			Regional
RAL	iPZ	071855.6	0.8	6.0	d			
VUL	iPZ	071855.1	1.5	18.0	u			
KRT	ePZ	071856	-	-	-			Regional
RAB	iPiZ	072005.6	0.5	31.0	u	1¾°		In coda
	iSN	28.5					071937	
RAB	iPZ	115456.0	0.4	2.0	d	2½°		M_L= 4.8
	iZ	57.8					115414	
	iSE	5528.0						
RAL	iPZ	115457.8	0.4	5.0	u			
KRT	ePZ	115455	-	-	-	2¼°		
	iSN	5523					115418	
RAB	iPZ	171433.2	0.4	7.0	d	1½°		M_L= 4.1
	iSiN	54.5					171405	
KRT	iPZ	171431	-	-	-	1¼°		
	iSN	49					171407	
RAB	iPZ	190232.0				2½°		
	iSN	0302.0	0.4	7.0	u		190153	
KRT	ePZ	190228	-	-	-			
RAB	eZ/	202630	-	-	-			Traces
11th March, 1968								
RAB	iPZ	000336.0	0.3	7.0	u	1½°		M_L= 4.1
	iSN	54.6					000311	
KRT	ePZ	000333	-	-	-	1¼°		
	iSN	50					000310	
RAB	iPZ	045017.2	0.4	6.0	d	1°		M_L= 4.1
	iSE	31.0					044958	
VUL	iPZ	045016.8	-	-	d			
KRT	ePZ	045015½	-	-	d	1¼°		
	iSN	30½					004955	
RAB	iPZ	050621.5	0.5	5.0	u			Regional
RAB	iPZ	060915.0	0.4	8.0	d	2°		
	iSiN	40.5					060841	
RAB	iPZ	065252	0.5	2.6	d	(5¾)		
	e(S)N/	5359					0651(25)	
RAB	ePZ	083317	0.6	2.0	d	(36°)		
	e(S)N/	3825						
	eLqN/	4115						
KRT	ePZ	083319	1.0	2.8	d			Distant
RAB	ePZ	170434	0.5	1.5	u	2½°		M_L= 4.2
	iSN	0503.3					170356	
KRT	iPZ	170434	0.6	1.5	u			
	iSN	0504½				2½°	170354	
RAB	iPZ	175518.3	0.3	1.0	d	1°		
	iSN	30.5					175502	

			T sec	A mm	GM	Dist	H	Remarks
11th March, 1968 (cont)								
RAL	iPZ	175518.0	0.6	3.5	u			
VUL	iPZ	175517.2	0.4	2.0	d			
KRT	eiPZ	175517	-	-	d	1°		
	iSN	31	-	-	-		175458	
RAB	iPZ	195920.0	0.5	2.5	d	1½°		M_L= 4.6
	iS!N	38.0					195956	
VUL	iPZ	195919.5	-	-	d			
KRT	ePZ	195917½	-	-	d	1½°		
	iS!E	37½					195851	
RAB	eiPZ	203530	0.4	3.0	d	1°		
	iZ	36.8					203458	
	iSN/	44						
VUL	iPZ	203530.6	0.5	4.0	d			
KRT	iPZ	203530½	-	-	d	1°		
	iSE	45					203511	
RAB	iPZ	203843.0	0.4	2.8	d	1°		M_L= 3.9 In Coda of preceeding shock
	iSE	57					203824	
KRT	ePZ	203841½	0.6	2.8	d			
	iSE	58½					203819	
12/3 RAB	eiPZ	110941	0.4	2.0	u	2¼°		M_L= 3.8
	iZ	41.9					110905	
	iSN	1008.0						
KRT	iPZ	110938½	0.5	2.0	u	(2¼°)		C.B.M.
	i(S)E	1004					1109(05)	
RAB	iPZ	111623.0	0.5	1.5	u	1°		M_L= 3.9
	iSN	37.0					111604	
KRT	ePZ	111620½	-	-	u	(¾°)		C.B.M.
	e(SE	31					1116(06)	
RAB	eZ/	120448	-	-	-			Traces
RAB	ePZ	174732½	0.4	1.0	u	4¾°		M_L= 5.0
	iSN	4827.0					174620	
KRT	e(P)Z	174726	-	-	u	(5¼°)		
	eSE	4827½					1746(06)	
RAB	eZ/	174916	-	-	-			Traces
RAB	ePZ	183002½	1.0	1.0	u	(35°)		
	e(S)E/	3530						
KRT	iPZ	183003	1.0	0.5	d			
RAB	iPZ	185954.2	0.5	4.0	d	1½°		
	iSN	190014.5					185928	
KRT	iPZ	185953½	1.0	1.5	d	1¾°		
	eSE	190016					185924	
RAB	eiPZ	212509	0.4	5.0	u	3°		
	iZ	10.5					212422	
	iSE	45.0						
KRT	ePZ	212509	-	-	-			

				T sec	A mm	GM	Dist	H	Remarks
ESA'ALA									
27/12/67									
	ESA	iPZ	004443	-	-	d	5¼°		
		iSN	4544					004324	
	ESA	iPZ	011247	0.6	3.0	d	5½°		
		iSN	1349					011116	
	ESA	eiPZ	032941	-	-	d			
	ESA	iPZ	083656½	1.8	6.0	d			
	ESA	iPZ	122035	0.6	1.2	u	5½°		
		iSN	2133					121920	
	ESA	ePZ	134147½	0.8	3.4	u			
	ESA	eiPZ	152943½	1.4	2.2	u			
28/12	ESA		0040						
	RAB	ePZ	122320½	0.8	1.4	d	5¼°		
		iSE	2422					122201	
	ESA	ePZ	123227½	0.4	2.0	d			
	ESA	iPZ	154662	0.6	2.0	d			
		iSE	4764					154542	
	ESA	iPZ	161463	0.4	1.8	d	4½°		
		iSN	1556					161354	
29/12/67									
	ESA	iPZ	030120½	-	-	-	5¼°		
		iSE	0221					030002	
	ESA	iPZ	041131½	0.3	1.8	d			
	ESA	iPZ	051138	0.6	3.6	d	5°		
		iSE	1234½					051024	
	ESA	ePZ	055353	0.6	0.8	d			
	ESA	iPZ	155711	0.4	1.6	u	1½°		
		iSE	5729					155647	
30/12/67									
	ESA	iPZ	005524½	-	-	d	3½°		
		iSE	5605½					005431	
	ESA	iPZ	014218½	-	-	-	1¾°		
		iSE	40					014150	
	ESA	iPZ	050749	-	6.0	u	4½°		
		iSE	0841					050741	
	ESA	iPZ	175834½	0.4	1.2	d	1¼°		
		iSE	51½					175812	
31/12/67									
	ESA	iPZ	061932½	-	-	d			
	ESA	iPZ	141350	-	-	u	2¼°		
		iSE	1416					141316	
	ESA	iPZ	150647	0.8	10.6	d	4¾°		
		iSE	0741½					150536	
	ESA	iPZ	153210½	1.0	3.6	u			
		iSN	3306½					153058	
	ESA	ePZ	155510	0.8	2.0	d			

			T sec	A mm	GM	Dist	H	Remarks
ESA'ALA (cont)								
23/1/68								
ESA	iPZ	002118.9	0.4	2.4	d	3¾°		
	iSE	2203.2					002021	
ESA	iPZ	014048.4						Regional
ESA	ePZ	064312.4	-	-	u	2°		
	iSE	37.6					064239	
ESA	iPZ	142315.8	0.6	3.0	u	2°		
	iSE	39					142245	
ESA	iPZ	125347.2	-	-	u			
24/1/68								
ESA	iPZ	071602.8	-	-	d			
ESA	iPZ	093149.2	-	-	d			
ESA	iPZ	095415.8	-	-	-			
ESA	iPZ	125222.2	-	-	-			
ESA	iPZ	140140.8	-	-	u	¼°		
	iSE	46.0					140134	
ESA	iPZ	160440	-	-	-			
ESA	iPZ	224120	-	-	-			
25/1/68								
ESA								N-S No time breaks
	iPZ	131154.8	-	-	u		131137	
	iSE	1208						
ESA	iPZ	141526.4	0.4	6.2	d			
ESA	iPZ	210048.6	-	2.8	d			
26/1/68								
								No N-S time breaks
ESA	eiPZ	045154.6	1.0	4.0	¾°			Lelesism
	iSE	5206.0					045139	
ESA	iPZ	125930	0.8	3.0	u			
27/1/68								
ESA	iPZ	030039.4	-	-	d	2°		
	iSE	0103.8					030008	
ESA	ePZ	034908.4	0.6	1.0	d	½°		
	iSE	17.6					034856	
ESA	ePZ	035303.0	-	-	-			
	iSE	12.8					035259	
ESA	iPZ	064209.6	-	-	u			
ESA	iPZ	100346.4	-	3.2	u			
	iSE	52					100338	
ESA	iPZ	140428.6	1.0	1.0	u			
ESA	iPZ	182108.6	-	4.4	d			
28/1/68								
								No N-S time breaks

			T sec	A mm	GM	Dist	H	Remarks
ESA'ALA								
28/1/68								
ESA	iPZ	052604.6	0.8	4.4	u	5¼°		
	iSE	2706.2					052445	
ESA	iPZ	075436	0.8	1.8	u	4¼°		
	iSE	5524.6					075345	
29/1/68								
						4¾°	102811	No P-S time breaks
ESA	iPZ	101430.2	-	-	d			
	iSE	1525.4						
	iPZ	102827.4	-	4.6	d	¾°	102811	
	eSE	40						
ESA	iPZ	161025.2	-	-	d	5¼°		
	iSE	1126.4					160906	
ESA	eiPZ	175953.6	-	-	-			
ESA	eiPZ	190330.6	0.8	2.0	u	4¼°		
	iSE	0419.6					190227	

Central Observatory

27th March, 1968.

(G.W. D'Addario)
Volcanologist-in-Charge

PEA MAR.68 No. 13.

TERRITORY OF PAPUA AND NEW GUINEA
GEOLOGICAL AND VULCANOLOGICAL BRANCH
VULCANOLOGICAL SECTION

PRELIMINARY EARTHQUAKE ANALYSIS
RABAUL CENTRAL OBSERVATORY
1968

Rabaul	RAB	From: MAR. 20. 1968 To: MAR. 26. 1968
Keravat	KRT	From: MAR. 20. 1968 To: MAR. 26. 1968
Esa'ala	ESA	From: MAR. 10. 1968 To: MAR. 12. 1968
Tabele	TBL	From: MAR. 11. 1968 To: MAR. 18. 1968
Agenahambo	AGE	From: To:
Waris	WAA	Not operational
Ulamona	ULA	Not operational
Piva	PIV	Not operational
C.Gloucester	LAG	Not operational

STATION PERSONNEL

RAB **Central Observatory, Rabaul**

Volcanologist-in-Charge	G.W. D'Addario
Volcanologist	R.F. Heming
Seismologist	(Position Vacant)
Seismogram Readers	D.J. Cook : H.M. Carrick
Senior Technical Officer	N.O. Myers
Technical Officer	R.J. Conway
Volcanological Assistants	L. Topue : M. Gaiam
	V. Kaiba
Technical Assistant	P. Daimbari
Trainee Volcanological Assistants	B. Talai: M. Salaiau,
	C. Matapit
Secretary	R. Scott

KRT **Kerevat Outstation**

Observer (part-time)	G.E. Chorick

TBL **Tabele Observatory**

Observer	E. Ravian

ESA **Esa'ala Observatory**

Observer	F. Dira

AGE **Agenahambo Outstation**

Observer (part-time)	Br. B. Hughes

The Rabaul Preliminary Earthquake Analysis (PEA) is produced by the staff under the direction of the Volcanologist-in-Charge from whom additional information and photocopies of seismogram records from all stations may be obtained on request.

Please address all communications to:-

Volcanologist-in-Charge
Central Observatory,
P.O. Box 386,
RABAUL. T.P. & N.G.

SEISMOGRAPH STATIONS

Station (NEW GUINEA)	Code	South Latitude	East Longitude	Elev. (m)	Foundation
Rabaul	RAB	04°11'28.6"	152°10'11.4"	183.5	Basalt Flow
Wanliss Street	WAN*	04°11'39.6"	152°10'32.5"	25.0	Basalt Flow
Sulphur Creek	SUL*	04°13'09.8"	152°10'33.3"	8.5	Unconsolidated Volcanic Ash
Rabalanakaia	RAL*	04°13'13.0"	152°12'07.0"	91.0	Unconsolidated Volcanic Ash
Tavurvur	TAV*	04°13'52.2"	152°13'12.9"	27.0	Andesite Flow
Taviliu	VUL*	04°16'58.2"	152°08'44.6"	332.3	Unconsolidated Volcanic Ash
Keravat	KRT	04°21'10.5"	152°03'06"	20.0	Alluvium
Ulamona	ULA	04°59'24.8"	151°16'30.0"	17.0	Lapilli Tuff
Tabele	TBL	04°06'04.67"	145°00'41.37"	179.5	Basalt Flow
Waris	WAA	04°07'06"	145°06'00"	48.0	Lapilli Tuff
Piva	PIV	06°12'00"	155°03'30"	60.0	Alluvium
Cape Gloucester (PAPUA)	LAG	04°27'20"	148°26'00"	24.0	Lapilli Tuff
Agenahambo	AGE	08°48'49"	148°05'56"	303.0	Unconsolidated Volcanic Ash
Esa'ala	ESA	09°44'18.2"	150°48'40.7"	46.4	Granite Gneiss

* Rabaul Harbour Network

STATION INSTRUMENTATION

Station & Instruments (NEW GUINEA)	Comp.	To	Tg	Trace Speed mm/min	Approximate relative Magnification	Approximate damping
Rabaul Central Observatory RAB						
World-Wide Standard	Z	1.0	0.74	60	12,500	Critical
	N,E	1.0	0.74	60	6,250	Critical
	Z/N/E/	15.0	100.0	15	750	Critical
Benioff VR 14.7Kg	Zh	1.0	0.02	180 +	4,000	Critical

+Recording is triggered by the onset of any earthquake with pre-determined minimum amplitude. Recorder is stopped automatically by hour break pulse.

Omori 15Kg	No	3.6	-	24	12	10.1(air)
Omori 15Kg	Eo	3.8	-	24	10	10.1(air)
Wood-Anderson Torsion	Na,Ea	0.8	-	60	2,800	Critical

Rabaul Harbour Network

Readings from the Harbour Network are entered in the BEA only for large earthquakes

WAN°	Benioff VR 14.7Kg	Z	1.0	0.02	60	5,240	Critical
SUL°	Benioff VR 14.7Kg	Z	1.0	0.02	60	2,850	Critical
RAL°	Benioff VR 14.7Kg	Z	1.0	0.02	60	8,075	Critical
TAV°°	Benioff VR 14.7Kg	Z	1.0	0.02	60	20,900	Critical
VUL°°	Benioff VR 14.7Kg	Z	1.0	0.02	60	5,000	Critical

STATION INSTRUMENTATION

Station & Instruments	Comp.	To	Tg	Trace speed mm/min	Approximate relative Magnification	Approx. damping
Rabaul Harbour Network (Cont.)						
o Signals from these stations are telemetered by land line to Helicorders (Geotech Mod. 2484) at the Central Observatory.						
oo Signals from this station are telemetered via VHF to its Helicorder at the Central Observatory.						
KRT - Keravat Outstation						
Benioff Mc 50 Kg	Z	1.2	0.2	15	20% sensitivity	Critical
Benioff MC 50Kg	N/E	1.2	0.2	15	10% sensitivity	Critical
ULA - Ulamona Field Station						
Willmore portable	Z	0.6	0.25	60	3,000	underdamped
PIV - Piva Field Station						
Willmore portable	Z	0.6	0.25	60	3,000	underdamped
WAA - Waris Field Station						
Willmore portable	Z	0.6	0.25	60	3,000	underdamped
LAG - Cape Gloucester Field Station						
Willmore portable	Z	0.6	0.25	60	3,000	underdamped

N.B. These field stations consist of a permanent building in which instruments are installed when necessary.

Details of emergency field stations, within the Territory will be listed when in operation.

TBL - Tabele Observatory						
Benioff VR 107.5Kg	Z	1.0	0.2	60	1,350	critical
(PAPUA)						
ESA - Esa'ala Observatory						
Benioff VR 107.5Kg	Z	1.0	0.2	15	36,000	critical
Benioff VR 107.5Kg	N,E	1.0	0.2	15	18,000	critical
Benioff VR 107.5Kg	Z/N/E	1.0	60.0	30	50% sensitivity	critical
AGE - Agenahambo Station						
Willmore portable	Z	0.6	0.25	60	3,000	underdamped

VR Variable Reluctance

MC Moving-coil

Relative magnification curves of seismograph systems installed in the stations controlled by the Rabaul Central Observatory are listed once a month on the P.E.A.

PRESENTATION OF DATA

(reviewed in November, 1967)

All times are reduced to Greenwich Mean Time (GMT), which is 10 hours behind Eastern Standard Time.

At RAB and Harbour Network, the time signal is marked every minute on each seismogram record from the Observatory crystal chronometer. Second marks from Radio signal VNG (Australia) are recorded on World-wide Standard System S.P.-N. component only according with the W.W.S.S. programme, at six hour intervals. Primary time is provided by W.W.S.S. equipment and secondary time by a Labtronic crystal chronometer with the accuracy of ± 5 ms per day compared with VNG (Australia) with the aid of a chronoscope.

At TBL and AGE, the time signal is derived from a spring driven chronometer (Mercer) and marked each minute on records. Time accuracy is determined by comparison with signals from WWVH daily. Linear correction is applied to the daily drift.

On all seismograph records time increases from left to right and time break is upward.

At RAB* and Harbour Network the recording drum of each seismograph is driven by a 110VAC 60Hz synchronous motor. The 110VAC is frequency regulated by a crystal chronometer.

* The Omori recording drum is driven by a nonregulated 50Hz frequency supply.

At ESA and KRT power for recorder motors is frequency regulated by a crystal chronometer at 50Hz. Power for AGE and TBL and field stations is supplied by a 50Hz free running oscillator.

Direction of Motion

Upward direction of ground motion corresponds to upward trace motion on vertical seismogram records. Direction of component of ground motion to North or East corresponds to upward trace motion on horizontal seismogram records.

Vertical trace motion from impulsive onset of longitudinal waves of compressional or dilatational ground movement is indicated by "u" or "d" accompanied by N,S,E, or W, as per trace motion amplitude on horizontal seismogram records, to represent vectorially the direction of ground motion. "+" or "-" indicates upward or downward motion of the ground respectively, from a wave not known to be of the longitudinal type.

Accuracy of Readings

When readings are given with a decimal figure, they are to 1/10 of a second, other readings have been made to the nearest half second.

Crustal Phases

Px, Sx Crustal phases, other than Pn and Sn for local and near earthquakes.

Felt Intensity

Information on maximum intensities of shocks reported felt is included. Intensities are given in Roman numerals based on the Modified Mercalli Scale, of 1931.

PRESENTATION OF DATA (CONT)

Determinations of Epicentres

Where no source is cited, the determination of epicentres origin time, focal depth and distance in central angle degrees from the pertinent station for local and regional earthquakes, are carried out at the Central Observatory, Rabaul.

Geographical Designation of Epicentres

The regional names which follow the co-ordinates of epicentres located at the Central Observatory are meant only to supplement the co-ordinates and normally follow well-known geographical rather than geological features. Use is made of the full degree blocks according to the method defined by E.A. Flinn and E.R. Engadhl in "A PROPOSED BASIS FOR GEOGRAPHICAL AND SEISMIC REGIONALIZATION", Seismic Data Laboratory Report No. 101, U.I.D. Inc., Alexandria, Virginia, 1964, adopted by the U.S.C.G.S. for computer requirements.

Magnitude Definition and Determination

M_L Local Magnitude (Richter, 1935) is calculated from the recorded trace amplitude of the Wood-Anderson torsion seismographs of stated physical constants (installed at the Observatory in November, 1967).

Maximum trace amplitude (O to peak) expressed in millimetres and tenths is measured directly on both components. Magnitude is determined independently and the arithmetic mean taken. M_L values are given to the tenth of a unit.

The station correction factor is assumed to be zero until better known.

M_S Surface Wave Magnitude (Gutemberg and Richter, 1956) is calculated from the amplitude of surface waves of period near 20 seconds for shallow distant earthquakes.

M_B Body Wave Magnitude is calculated from the ratio of amplitude over period for body waves S.P.-Z of World-wide Seismograph System only when depth is known. The magnification factor for the standard seismograph is taken into account.

m Unified magnitude (Gutemberg & Richter, 1956) has the following relation to M_L, M_S, and M_B.

$$m = 1.7 + 0.8\ M_L - 0.01\ M^2_L$$

$$m = M_B \text{ (without correction)}$$

$$m = 2.5 + 0.63\ M_S$$

Local Magnitude of earthquakes recorded at RAB with a clear S-P interval is tabulated on a Day-Distance (in Central Angle Degrees) graph which is added to the PEA monthly.

Symbols

i	-	impulsive and sharply defined beginning of phase.
e	-	emergent and poorly defined beginning of a phase.
T	-	Period in seconds
A	-	Peak-to-Trough trace amplitude in millimetres.
GM	-	Ground Motion
Dist	-	Distance in central angle degrees
H	-	Origin Time
h	-	Focal depth in Kilometres
CBM	-	Confused by microseisms.

PRESENTATION OF DATA (CONT)

Remarks

Local - Typical signature of an earthquake with epicentre within 0.9°.

Near - Typical signature of an earthquake with epicentre between 0.9° and 9°.

Distant - Typical signature of an earthquake with epicentre between 9° and 45°.

Teleseism - Typical signature of an earthquake with epicentre more than 45°.

Traces - Any recorded disperse waves or very weak unknown earthquake phases.

Local and Near earthquakes will be classified Regional, and Distant earthquakes will be grouped with Teleseisms if sheer waves and their reflections are unidentifiable.

(G.W. D'ADDARIO)

Vulcanologist-in-Charge.

			T sec	A mm	GM	Dist	H	Remarks
20th March, 1968								
Harbour Network Records - Nil Recorded								
Kerevat Records - No hour breaks								
RAB	eiPZ	052153	0.5	1.8	d			Regional
	iZ	59.0						
RAB	iPZ	082943.2	0.5	2.5	d	¾°		M_L= 3.2
	iSN	54.5					082928	
RAB	ePZ	100902½	0.3	1.4	d			Regional
RAB	eZ	1223	-	-	-			Traces
RAB	eZ/	132327	-	-	+			Traces
RAB	eiPZ	145722½	0.5	1.0	d	3½°		M_L= 5.0
	iZ	27.5					145630	
	iSE	5802.0						
RAB	eZ/	161153	-	-	-			Traces
RAB	eZ/	183932	-	-	+			Traces
RAB	eZ/	190918	-	-	..			Traces
21st March, 1968		Harbour Network Records - Nil Recorded						
RAB	ePZ	010822	0.8	1.5	d			Regional
	iZ	22.5						
RAB	ePZ	022301	0.5	1.5	d	3½°		M_L= 4.9
	iSN	43.0					022206	
RAB	iPZ	022624.0	0.5	2.5	d	4°		
	eSE	2711					022523	
RAB	iPZ	040946.0	0.5	3.0	d			Local
	iSN	48.0						
RAB	iPZ	065932.2	0.5	1.0	d	2¼°		M_L= 3.9
	iSE	58.5					065858	
RAB	ePZ	081814.0	0.3	2.0	d	3¾°		M_L= 4.8
	iSN	59.3					081615	
RAB	ePZ	104753	0.3	1.0	d	2°		M_L= 3.8
	iSE	4818.3					104720	
RAB	ePZ	121752	0.3	1.0	d	5°		
	eSE	1850½					121637	
KRT	ePZ	121753½	0.2	d	d			Near
RAB	eiPZ	205625½	0.5	1.0	u	2¼°		
	iZ	28.2					205550	
	iSN	52						

			T sec	A mm	GM	Dist	H	Remarks
22nd March, 1968								
RAB	iPZ	022129.0	0.4	7.0	u			Regional
WAN	iPZ	022128.8	-	-	u			
RAL	iPZ	022128.2	-	-	u			
KRT	ePZ eSE	022129 34½	-	-	-	¼°	022122	C.B.M.
RAB	iPZ	032217.8	0.4	8.0	u			Regional
WAN	iPZ	032217.6	-	-	u			
SUL	iPZ	032217.8	-	-	u			
RAB	iPZ	052252.0	0.4	7.0	u			Regional
WAN	iPZ	052251.5	-	-	u			
RAL	iPZ	052251.3	-	7.0	u			
RAB	ePZ iZ iSN/ iLqN/	091925 26.0 2308 19	0.8	1.0	d	20°		
RAB	ePZ	131052	0.7	1.5	u			Regional
KRT	iPZ	131054	0.4	1.0	d			
RAB	iPZ iSN	140415.0 39.0	0.5	2.0	d	2°	140343	M_L= 4.5
RAL	iPZ	140414.4	0.6	3.0	d			
KRT	ePZ eSE	140413½ 39	-	-	-	2¼°	140340	
RAB	eiPZ iZ	173227½ 29.0	0.3	1.0	u			Regional
KRT	e(P)Z	173223½	-	-	d			
RAB	iPZ	191841.7	0.5	13.0	u			fore shock
WAN	iPZ	191841.5	0.4	4.0	u			
RAL	iPZ	191841.8	-	-	u			
TAV	iPZ	191841.4	0.5	6.0	u			
VUL	iPZ	191843.0	0.8	7.0	u			
KRT	iPZ eSN	191844 53½	-	-	u	¾°	191831	
RAB	iPZ	191938.4	-	-	UNW			In coda Regional
RAB	iPZ eSE/	194428.5 36	0.4	18.0	u	½°	194417	
WAN	iPZ	194428.2	0.4	6.0	u			
RAL	iPZ	194428.6	-	-	u			
KRT	iPZ eSE	194431 38½	0.5	4.0	d	½°	194421	
RAB	iPZ e(S)E/	203023.4 36	-	-	u	(1°)	2030(06)	

			T sec	A mm	GM	Dist	H	Remarks
22nd March, 1968 (Cont.)								
WAN	iPZ	203023.4	-	-	u			
SUL	iPZ	203023.8	-	-	u			
TAV	iPZ	203023.2	-	-	u			
KRT	iPZ	203026	-	-	u			Regional
RAB	iPZ iZ iSN/	210141.1 43.6 50	0.3	2.0	u	½°	210129	
WAN	iPZ	210143.2	-	-	u			
SUL	iPZ	210143.8	-	3.0	u			
TAV	iPZ	210143.4	-	-	u			
RAB	iPZ eSE/	212353.6 2406	-	-	u	1°	212338	M_L= 3.1
WAN	iPZ	212353.6	0.4	13.0	u			
SUL	iPZ	212354.0	-	2.0	u			
RAL	iPZ	212354.0	-	-	u			
TAV	iPZ	212353.4	-	-	u			
RAB	iPZ eSN/	214132.0 38	0.4	13.0	u	¼°	214124	
WAN	iPZ	214131.2	0.8	2.0	u			
TAV	iPZ	214131.4	0.6	3.0	d			
RAB	iPZ iSN/	214442.0 48	-	-	u	¼°	214434	M_L= 3.1
WAN	iPZ	214442.0	0.6	3.0	u			
RAL	iPZ	214442.4	0.6	3.0	u			
RAB	iPZ eSN/	214708.0 14	-	-	u	¼°	214700	
WAN	iPZ	214707.2	-	-	u			
SUL	iPZ	214708.0	-	3.0	u			
RAB	iPZ eSN/	224530.0 37	-	-	u	½°	224521	
RAB	iPZ iSN/	225014.0 20	0.5	29.0	u	¼°	225006	
RAL	iPZ	225014.2	-	-	u			
TAV	iPZ	225013.8	-	-	u			
VUL	iPZ	225015.2	-	16.0	u			
KRT	EPZ iSE	225009 18	-	-	½°		224957	C.B,M.
RAB	iPZ eSE/	225214.2 18	0.5	47.0	u			Local
RAL	iPZ	225214.4	-	-	u			
TAV	iPZ	225214.2	-	-	u			
VUL	iPZ	225215.5	-	-	u			

			T sec	A mm	GM	Dist	H	Remarks
23rd March, 1968								
RAB	iPZ	011339.5	0.4	4.0	u			Regional
KRT	ePZ	011343	-	-	-			C.B.M.
RAB	iPZ	020237.3	0.3	16.0	u	½°		M_L= 3.4
	iSN	44.0					020228	
WAN	iPZ	020237.0	0.5	8.0	u			
TAV	iPZ	020237.0	-	6.0	u			
RAB	iPZ	034738.0	0.5	4.0	u	4°		M_L= 6.5
	iSN/	4826					034635	
WAN	iPZ	034738.0	-	1.5	u			
VUL	iPZ	034739.5	0.2	3.8	u			
RAB	iPZ	042524.6	0.4	4.8	u	¼°		
	iSN/	31					042517	
WAN	iPZ	042524.5	0.4	5.8	u			
RAL	iPZ	042524.0	0.5	2.2	u			
TAV	iPZ	042524.5	-	-	u			
KRT	ePZ	042528	-	-	u	¼°		C.B.M.
	eSE	33					042521	
RAB	iPZ	042727.0	0.5	5.0	u	¼°		M_L= 3.4 In coda of preceeding shock
	iSE	33.5					042719	
WAN	iPZ	042726.8	0.5	5.2	u			
RAB	iPZ	050906.5	0.4	11.0	u	½°		
	iSN	14.5					050855	
WAN	iPZ	050906.4	0.4	3.8	u			
RAL	iPZ	050907.0	0.5	1.8	u			
TAV	iPZ	050906.5	-	-	u			
KRT	iPZ	050909	-	-	u	½°		C.B.M.
	iSE	18					050858	
RAB	iPZ	083356.2	0.5	7.0	d			Regional
WAN	iPZ	083356.4	0.5	2.0	u			
KRT	ePZ	083358½	-	-	u			C.B.M.
RAB	iPZ	104434.0	0.5	86.0	u	¼°		M_L= 3.8
	iSN/	40					104426	
WAN	iPZ	104433.9	-	-	u			
SUL	iPZ	104434.2	0.5	8.0	u			
RAL	iPZ	104434.0	-	3.0	u			
TAV	iPZ	104433.5	-	-	u			
VUL	iPZ	104433.2	-	-	u			
KRT	iPZ	104437	-	-	u			C.B.M.
RAB	iPZ	105737.6	0.5	8.0	u	¼°		
	eSN/	44					105729	
KRT	ePZ	105740½	-	-	-	¼°		C.B.M.
	iSE	45½					105734	

			T sec	A mm	GM	Dist	H	Remarks
23rd March, 1968 (cont.)								
RAB	iPZ	110318.5	0.4	4.0	u	½°		
	eSN/	26					110307	
KRT	ePZ	110321½	-	-	u			C.B.M.
	eSE	25½						
RAB	iPZ	111130.2	0.5	41.0	d	½°		M_L= 4.0
	iSE	38.5					111119	
WAN	iPZ	111130.2	-	-	d			
RAL	iPZ	111130.9	-	10.1	u			
TAV	iPZ	111130.5	-	-	u			
VUL	iPZ	111132.0	-	-	u			
RAB	iPZ	111743.0	0.4	21.0	u	½°		
	iSE	50					111733	
WAN	iPZ	111743.0	-	-	u			
SUL	iPZ	111743.3	-	6.0	u			
RAL	iPZ	111743.2	-	-	u			
VUL	iPZ	111744.7	-	-	u			
KRT	iPZ	111746½	-	-	u			C.B.M.
RAB	ePZ	122111	0.5	3.0	d	½°		
	iSE	19.5					122100	
RAB	iPZ	131653.0	-	-	u	¼°		M_L= 4.1
	eSE/	59					131645	
WAN	iPZ	131652.8	-	-	u			
SUL	iPZ	131653.1	-	5.2	u			
RAL	iPZ	131653.1	-	-	u			
TAV	iPZ	131652.2	-	-	u			
VUL	iPZ	131654.2	-	-	u			
KRT	ePZ	131655½	-	-	u			C.B.M.
RAB	iPZ	135444.0	0.4	9.0	d	2°		
	iSN	5508.0					135412	
KRT	iPZ	135441	-	-	d	1¾°		Overlapping traces
	iSE	5503					135412	
RAB	iPZ	140609.3	0.4	2.0	d	1¾°		
	iSE	31.6					140540	
KRT	iPZ	140609½	0.2	2.0	d			
RAB	ePZ	153713	0.5	1.5	d	2¾°		M_L= 4.7
	iSN	46.0					153630	
KRT	iPZ	153713	0.6	3.0	u	2¾°		Overlapping traces
	e(S)E	44½					1536(32)	
RAB	iPZ	155520.3	0.4	8.0	u	½°		
	iSE	28.0					155509	
WAN	iPZ	155520.0	0.3	2.0	u			
TAV	iPZ	155520.0	0.4	1.5	u			
KRT	ePZ	155523	-	1.0	u	½		
	iSN	30½					155513	
RAB	eiPZ	180426	0.5	21.0	u	2°		M_L= 5.4
	iZ	28.0					180354	
	iZ	32.0						
	iSN	50.0						

			T sec	A mm	GM	Dist	H	Remarks
23rd March, 1968 (cont)								
KRT	iPZ	180429½	0.5	2.0	u	(1°)		Regional
	e(S)E	40½					1804(14)	
RAB	iPZ	180855.2	0.4	20.0	u	½°		M_L= 3.6
	iSE	0902.5					180846	
KRT	e(P)Z	180855½	0.8	4.0	u			In coda of preceding shock
RAB	iPZ	195435.0	0.4	1.0	u	1°		
	iSE	49.0					195416	
KRT	e(P)Z	195434½	-	..	1¼°			
	eSN	51½					195413	
RAB	iPZ	223931.0	0.5	14.0	u	¼°		
	iSE	37.0					223923	
RAB	eiPZ	235720	0.4	1.5	u	5½		
	iZ	21.4					235600	
	iZ	22.4						
	1SN/	5822						
24th March, 1968								
RAB	eiPZ	000652	0.5	6.5	u	½°		M_L= 4.2
	iZ	52.5					000642	
	iSE	59.0						
KRT	iPZ	000653½	0.5	3.5	u	½°		
	iSE	0702					000642	
RAB	eiPZ	003432½	0.4	1.0	u	½°		M_L= 3.4
	iZ	33.0					003423	
	iSN	39.0						
KRT	ePZ	003433½	-	-	-	½°		
	iSN	43.0					003421	
RAB	iPZ	010634.3	0.5	2.0	u	1½°		
	iSE	54.0					010608	
KRT	ePZ	010641	-	-	-			
	eSN	0700½	-	-	-	1½°	010615	
RAB	iPZ	024037.0	0.4	6.0	u	¼°		M_L= 3.4
	iSE	43.5					024029	
WAN	iPZ	024036.8	-	-	u			
TAV	iPZ	024036.4	-	-	u			
VUL	iPZ	024038.4	0.2	5.0	u			
RAB	iPZ	064749.2	0.4	6.0	u	½°		
	iSE	56.3					064739	
WAN	iPZ	064749½	0.4	1.5	u			
RAL	eZ/	073532	-	-	+			Traces
RAB	iPZ	075635.2	0.4	2.4	u	¼°		M_L= 3.5
	iSE	41.3					075627	
WAN	iPZ	075635.0	-	-	u			
RAL	iPZ	075635.2	-	-	u			
TAV	iPZ	075635.0	-	-	u			
VUL	iPZ	075636.5	0.2	4.0	u			
RAB	iPZ	075750.0	0.4	4.0	u	¼°		
	iSE	56.5					075742	

			T sec	A mm	GM	Dist	H	Remarks
24th March (cont)								
RAB	ePZ iSE	080651 0713.0	0.5	1.4	u	1¾°	080622	M_L= 4.5
RAB	ePZ eSE	093110½ 28½	0.5	4.0	d	1½	093046	
VUL	iPZ	093110.5	0.2	8.0	d			
KRT	iPZ iSE	093112 27	-	-	1¼°		093052	
RAB	iPZ	101619.6	0.3	3.0	d			Regional
KRT	ePZ eSN	101624 1725	-	-	-	5¼°	101505	
RAB	e(P)Z eSN/	160639½ 1258	1.0	1.0	u	44°		
RAB	eZ/	180336	-	-	+			Traces
25th March, 1968								
Harbour Network Records - Nil Recorded								
RAB	iPZ iZ e(S)N/	005811.1 18.2 5930	1.0	3.0	d	(7°)	0056(29)	
RAB	ePZ eSE/	030145 0550	0.4	1.2	d	22°		
RAB	iPZ iSN	111001.2 19.0	0.4	5.0	u	1½°	110937	
RAB	iPZ iSN	190545.5 0605.2	0.3	2.6	d	1½°	190519	
KRT	iPZ iSN	190542½ 0600	0.4	2.0	d	1½°	190519	
RAB	iPZ	204652.0	0.4	2.5	d			Regional
26th March, 1968								
Kerevat Records - No minute breals								
RAB	iPZ e(S)E/	004815.0 5318	0.5	9.0	d	(30°)		
VUL	iPZ iPZ iSN	004814.6 012100.6 22.0	0.3 0.5	7.0 2.0	u u	1½°	012033	M_L= 3.8
RAB	iPZ	045531.6	0.5	2.3	d			Distant
RAB	iPZ eSN/	054256 4326	0.6	4.0	u	2½°	054217	M_L= 5.2
RAL	iPZ	054255.5	0.5	2.9	u			
VUL	iPZ	054255.0	0.4	3.1	d			
RAB	iPZ iSN	173654 3708.2	0.5	0.8	d	1°	173635	M_L= 3.4
RAB	iPZ iSN	175542.2 58.8	0.5	3.2	u	1¼°	175519	M_L= 3.8

26th March, 1968			T sec	A mm	GM	Dist	H	Remarks
RAB	ePZ	194632½	0.5	1.0	u	28°		
	iZ	34.6						
	eSN/	5118						
RAB	iPZ	213829.0	0.4	3.8	d	1¼°		M_L= 4.1
	iSE	51.0					213800	

ESA'ALA

10th March, 1968

ESA	ePZ	020820½	-	-	-		
ESA	iPZ	023825	0.3	1.6	u		
ESA	iPZ	071826	1.2	5.8	u		
ESA	iPZ	091608½	0.3	1.4	d		
ESA	iPZ	095651½	0.4	1.8	d	¼°	
	iSE	58½					095642
ESA	iPZ	100437	-	-	d		
	iSE	38½					
ESA	iPZ	101808	0.4	1.6	-		

11th March, 1968

ESA	ePZ	065010½	0.6	0.6	u	6¼°	
	eSE	5120½					064840
ESA	ePZ	083317½	-	-	-		
ESA	ePZ	182634	0.6	0.8	u	4°	
	iSE	2720½					182534
ESA	iPZ	233437	-	-	u	4°	
	iSE	3520½					233340

12th March, 1968

ESA	iPZ	174734½	-	-	d		
ESA	iPZ	175422½	-	-	u	4½°	
	iSE	5516					175313
ESA	iPZ	212518	-	-	u	2¼°	
	iSE	46					212441
ESA	iPZ	215744½	-	-	u	4¼°	
	iSE	5836					215639

TABELE

11th - 18th March, 1968

11th	TBL	iPZ	065017½	-	24.9	u	Regional
12th	TBL	iPZ	16245	0.5	2.1	(d)	Regional
13th	TBL	Nil Recorded					
14th	TBL	ePZ	052303½	0.2	4.0	d	Local
15th	TBL	Nil Recorded					
16th	TBL	Nil Recorded					
17th	TBL	ePZ	191850	0.5	2.3	d	Teleseism
18th	TBL	Nil Recorded					

Central Observatory,
4th April, 1968.

(G.W. D'ADDARIO)
Volcanologist-in-Charge

30 APR 1968

PEA MAR.68 No.14--15.

TERRITORY OF PAPUA AND NEW GUINEA
GEOLOGICAL AND VULCANOLOGICAL BRANCH
VULCANOLOGICAL SECTION

PRELIMINARY EARTHQUAKE ANALYSIS
RABAUL CENTRAL OBSERVATORY
1968

Rabaul	RAB	From: MAR. 27. 1968 To: APR. 2. 1968	APR. 3. 1968 APR. 9. 1968
Keravat	KRT	From: MAR. 27. 1968 To: APR. 2. 1968	APR. 3. 1968 APR. 9. 1968
Esa'ala	ESA	From: To:	
Tabele	TBL	From: MAR. 20. 1968 To: MAR. 26. 1968	
Agenahambo	AGE	From: FEB. 12. 1968 To: MAR. 22. 1968	
Waris	WAA	Not operational	
Ulamona	ULA	Not operational	
Piva	PIV	Not operational	
C.Gloucester	LAG	Not operational	

STATION PERSONNEL

RAB Central Observatory, Rabaul

Volcanologist-in-Charge	G.W. D'Addario
Volcanologist	R.F. Heming
Seismologist	(Position Vacant)
Seismogram Readers	D.J. Cook : H.M. Carrick
Senior Technical Officer	N.O. Myers
Technical Officer	R.J. Conway
Volcanological Assistants	L. Topue : M. Gaiam
	V. Kaira
Technical Assistant	P. Daimbari
Trainee Volcanological Assistants	B. Talai: M. Salaiau,
	C. Matapit
Secretary	R. Scott

KRT Kerevat Outstation

Observer (part-time)	G.E. Chorick

TBL Tabele Observatory

Observer	E. Ravian

ESA Esa'ala Observatory

Observer	F. Dira

AGE Agenahambo Outstation

Observer (part-time)	Br. B. Hughes

The Rabaul Preliminary Earthquake Analysis (PEA) is produced by the staff under the direction of the Volcanologist-in-Charge from whom additional information and photocopies of seismogram records from all stations may be obtained on request.

Please address all communications to:-

Volcanologist-in-Charge
Central Observatory,
P.O. Box 386,
RABAUL. T.P. & N.G.

SEISMOGRAPH STATIONS

Station (NEW GUINEA)	Code	South Latitude	East Longitude	Elev. (m)	Foundation
Rabaul	RAB	04°11'28.6"	152°10'11.4"	183.5	Basalt Flow
Wanliss Street	WAN*	04°11'39.6"	152°10'32.5"	25.0	Basalt Flow
Sulphur Creek	SUL*	04°13'09.8"	152°10'33.3"	8.5	Unconsolidated Volcanic Ash
Rabalanakaia	RAL*	04°13'13.0"	152°12'07.0"	91.0	Unconsolidated Volcanic Ash
Tavurvur	TAV*	04°13'52.2"	152°13'12.9"	27.0	Andesite Flow
Taviliu	VUL*	04°16'58.2"	152°08'44.6"	332.3	Unconsolidated Volcanic Ash
Keravat	KRT	04°21'10.3"	152°03'06"	20.0	Alluvium
Ulamona	ULA	04°59'24.3"	151°16'30.0"	17.0	Lapilli Tuff
Tabele	TBL	04°06'04.07"	145°00'41.37"	179.5	Basalt Flow
Waris	WAA	04°07'33"	145°06'00"	48.0	Lapilli Tuff
Piva	PIV	06°12'00"	155°03'30"	60.0	Alluvium
Cape Gloucester (PAPUA)	LAG	04°27'20"	148°26'00"	24.0	Lapilli Tuff
Agenahambo	AGE	08°43'49"	148°05'56"	303.0	Unconsolidated Volcanic Ash
Esa'ala	ESA	09°44'18.2"	150°48'40.7"	46.4	Granite Gneiss

* Rabaul Harbour Network

STATION INSTRUMENTATION

Station & Instruments (NEW GUINEA)	Comp.	To	Tg	Trace Speed mm/min	Approximate relative Magnification	Approximate damping
Rabaul Central Observatory RAB						
World-Wide Standard	Z	1.0	0.74	60	12,500	Critical
	N,E	1.0	0.74	60	6,250	Critical
	Z/N/E/	15.0	100.0	15	750	Critical
Benioff VR 14.7Kg	Zh	1.0	0.02	180 +	4,000	Critical
Omori 15Kg	No	3.6	-	24	12	10.1(air)
Omori 15Kg	Eo	3.8	-	24	10	10.1(air)
Wood-Anderson Torsion	Na,Ea	0.8	-	60	2,800	Critical
Rabaul Harbour Network						
WAN° Benioff VR 14.7Kg	Z	1.0	0.02	60	5,240	Critical
SUL° Benioff VR 14.7Kg	Z	1.0	0.02	60	2,850	Critical
RAL° Benioff VR 14.7Kg	Z	1.0	0.02	60	8,075	Critical
TAV°° Benioff VR 14.7Kg	Z	1.0	0.02	60	20,900	Critical
VUL°° Benioff VR 14.7Kg	Z	1.0	0.02	60	5,000	Critical

+Recording is triggered by the onset of any earthquake with pre-determined minimum amplitude. Recorder is stopped automatically by hour break pulse.

Readings from the Harbour Network are entered in the BEA only for large earthquakes

STATION INSTRUMENTATION

Station & Instruments	Comp.	To	Tg	Trace speed mm/min	Approximate relative Magnification	Approx. damping
Rabaul Harbour Network (Cont.)						

o Signals from these stations are telemetered by land line to Helicorders (Geotech Mod. 2484) at the Central Observatory.

oo Signals from this station are telemetered via VHF to its Helicorder at the Central Observatory.

KRT - Keravat Outstation						
Benioff Mc 50 Kg	Z	1.2	0.2	15	20% sensitivity	Critical
Benioff MC 50Kg	N/E	1.2	0.2	15	10% sensitivity	Critical
ULA - Ulamona Field Station						
Willmore portable	Z	0.6	0.25	60	3,000	underdamped
PIV - Piva Field Station						
Willmore portable	Z	0.6	0.25	60	3,000	underdamped
WAA - Waria Field Station						
Willmore portable	Z	0.6	0.25	60	3,000	underdamped
LAG - Cape Gloucester Field Station						
Willmore portable	Z	0.6	0.25	60	3,000	underdamped

N.B. These field stations consist of a permanent building in which instruments are installed when necessary.

Details of emergency field stations, within the Territory will be listed when in operation.

TBL - Tabele Observatory						
Benioff VR 107.5Kg	Z	1.0	0.2	60	1,350	critical
(PAPUA)						
ESA - Esa'ala Observatory						
Benioff VR 107.5Kg	Z	1.0	0.2	15	36,000	critical
Benioff VR 107.5Kg	N,E	1.0	0.2	15	18,000	critical
Benioff VR 107.5Kg	Z/N/E	1.0	60.0	30	50% sensitivity	critical
AGE - Agenahambo Station						
Willmore portable	Z	0.6	0.25	60	3,000	underdamped

VR Variable Reluctance

MC Moving-coil

Relative magnification curves of seismograph systems installed in the stations controlled by the Rabaul Central Observatory are listed once a month on the P.E.A.

PRESENTATION OF DATA

(reviewed in November, 1967)

All times are reduced to Greenwich Mean Time (GMT), which is 10 hours behind Eastern Standard Time.

At RAB and Harbour Network, the time signal is marked every minute on each seismogram record from the Observatory crystal chronometer. Second marks from Radio signal VNG (Australia) are recorded on World-wide Standard System S.P.-N. component only according with the W.W.S.S. programme, at six hour intervals. Primary time is provided by W.W.S.S. equipment and secondary time by a Labtronic crystal chronometer with the accuracy of ± 5 ms per day compared with VNG (Australia) with the aid of a chronoscope.

At TBL and AGE, the time signal is derived from a spring driven chronometer (Mercer) and marked each minute on records. Time accuracy is determined by comparison with signals from WWVH daily. Linear correction is applied to the daily drift.

On all seismogram records time increases from left to right and time break is upward.

At RAB* and Harbour Network the recording drum of each seismograph is driven by a 110VAC 60Hz synchronous motor. The 110VAC is frequency regulated by a crystal chronometer.

* The Omori recording drum is driven by a nonregulated 50Hz frequency supply.

At ESA and KRT power for recorder motors is frequency regulated by a crystal chronometer at 50Hz. Power for AGE and TBL and field stations is supplied by a 50Hz free running oscillator.

Direction of Motion

Upward direction of ground motion corresponds to upward trace motion on vertical seismogram records. Direction of component of ground motion to North or East corresponds to upward trace motion on horizontal seismogram records.

Vertical trace motion from impulsive onset of longitudinal waves of compressional or dilatational ground movement is indicated by "u" or "d" accompanied by N,S,E, or W, as per trace motion amplitude on horizontal seismogram records, to represent vectorially the direction of ground motion. "+" or "-" indicates upward or downward motion of the ground respectively, from a wave not known to be of the longitudinal type.

Accuracy of Readings

When readings are given with a decimal figure, they are to 1/10 of a second, other readings have been made to the nearest half second.

Crustal Phases

Px, Sx Crustal phases, other than Pn and Sn for local and near earthquakes.

Felt Intensity

Information on maximum intensities of shocks reported felt is included. Intensities are given in Roman numerals based on the Modified Mercalli Scale, of 1931.

PRESENTATION OF DATA (CONT)

Determinations of Epicentres

Where no source is cited, the determination of epicentres origin time, focal depth and distance in central angle degrees from the pertinent station for local and regional earthquakes, are carried out at the Central Observatory, Rabaul.

Geographical Designation of Epicentres

The regional names which follow the co-ordinates of epicentres located at the Central Observatory are meant only to supplement the co-ordinates and normally follow well-known geographical rather than geological features. Use is made of the full degree blocks according to the method defined by E.A. Flinn and E.R. Engadhl in "A PROPOSED BASIS FOR GEOGRAPHICAL AND SEISMIC REGIONALIZATION", Seismic Data Laboratory Report No. 101, U.I.D. Inc., Alexandria, Virginia, 1964, adopted by the U.S.C.G.S. for computer requirements.

Magnitude Definition and Determination

M_L Local Magnitude (Richter, 1935) is calculated from the recorded trace amplitude of the Wood-Anderson torsion seismographs of stated physical constants (installed at the Observatory in November, 1967).

Maximum trace amplitude (0 to peak) expressed in millimetres and tenths is measured directly on both components. Magnitude is determined independently and the arithmetic mean taken. M_L values are given to the tenth of a unit.

The station correction factor is assumed to be zero until better known.

M_S Surface Wave Magnitude (Gutemberg and Richter, 1956) is calculated from the amplitude of surface waves of period near 20 seconds for shallow distant earthquakes.

M_B Body Wave Magnitude is calculated from the ratio of amplitude over period for body waves S.P.-Z of World-wide Seismograph System only when depth is known. The magnification factor for the standard seismograph is taken into account.

m Unified magnitude (Gutemberg & Richter, 1956) has the following relation to M_L, M_S, and M_B.

$$m = 1.7 + 0.8\ M_L - 0.01\ M^2_L$$

$$m = M_B \text{ (without correction)}$$

$$m = 2.5 + 0.63\ M_S$$

Local Magnitude of earthquakes recorded at RAB with a clear S-P interval is tabulated on a Day-Distance (in Central Angle Degrees) graph which is added to the PEA monthly.

Symbols

i	-	impulsive and sharply defined beginning of phase.
e	-	emergent and poorly defined beginning of a phase.
T	-	Period in seconds
A	-	Peak-to-Trough trace amplitude in millimetres.
GM	-	Ground Motion
Dist	-	Distance in central angle degrees
H	-	Origin Time
h	-	Focal depth in Kilometres
CBM	-	Confused by microseisms.

PRESENTATION OF DATA (CONT)

Remarks

Local - Typical signature of an earthquake with epicentre within 0.9°.

Near - Typical signature of an earthquake with epicentre between 0.9° and 9°.

Distant - Typical signature of an earthquake with epicentre between 9° and 45°.

Teleseism - Typical signature of an earthquake with epicentre more than 45°.

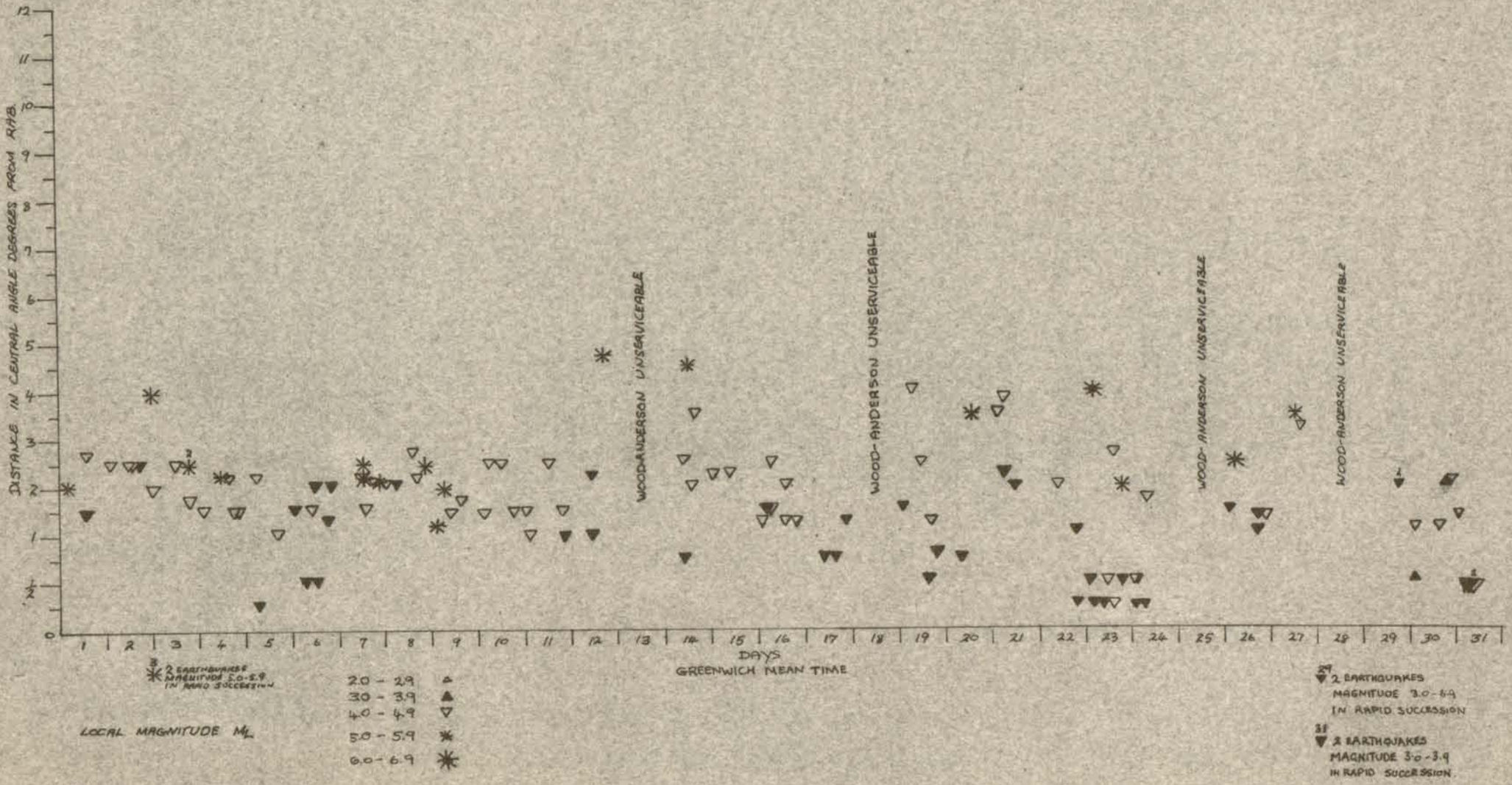
Traces - Any recorded disperse waves or very weak unknown earthquake phases.

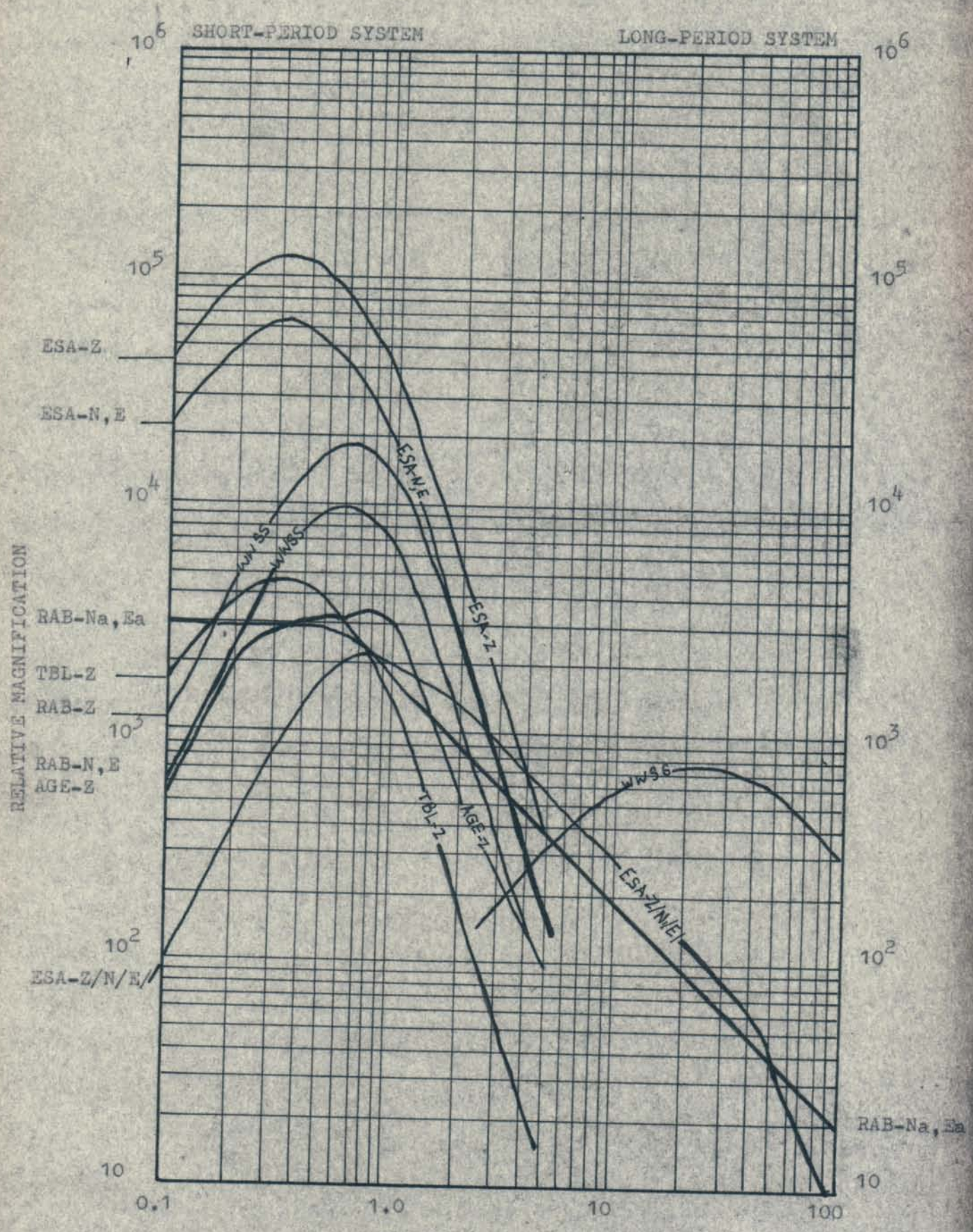
Local and Near earthquakes will be classified Regional, and Distant earthquakes will be grouped with Teleseisms if sheer waves and their reflections are unidentifiable.

(G.W. D'ADDARIO)

Vulcanologist-in-Charge.

MAGNITUDE OF REGIONAL EARTHQUAKES WITH A CLEAR S-P INTERVAL
MARCH 1968





FREQUENCY RESPONSE CURVES OF THE INSTRUMENTS

GWDA Nov.67

			T sec	A mm	GM	Dist	H	Remarks
RABAUL								
27th March, 1968. No minute breaks on KRT records.								
RAB	ePZ	050144½	0.4	1.8	d			Distant
RAB	ePZ iSN	123739 3819.5	0.5	1.0	d	3½°	123647	M_L= 5.0
VUL	iPZ	123738.2	0.4	2.0	d			
RAB	ePZ iSE	163404½ 42.5	0.4	1.0	d	3¼°	163315	M_L= 4.6
RAB	ePZ	190201	1.0	1.0	d			Regional
RAB	ePZ	211657½	0.4	1.0	d			(Regional)
RAB	ePZ	224101½	1.0	1.3	d			Distant Coda of shock not recorded due to record change.
28th March, 1968. Wood-Anderson unserviceable								
RAB	eiPZ iZ eSE/	054841 45.0 5208			u	18°		
RAB	eZ	133322			+			Traces
RAB	iPZ	170433.4	0.5	2.6	u			Regional
VUL	iPZ	170432.7	0.3	6.3	d			
RAB	eiPZ iZ	180833 34.0	1.0	1.0	u			Local
RAB	iPZ iSN/	225741.3 5809.0	0.5	41.0	d	2¼°	225706	
WAN	iPZ	225741.8						
SUL	iPZ	225741.3	0.3	4.8	d			
RAL	iPZ	225741.3	0.8	10.0	d			
TAV	iPZ	225741.0			d			
VUL	iPZ	225740.8			d			
29th March, 1968. No time breaks on KRT records								
RAB	iPZ iSN	163119.3 40.0	0.4	6.0	u	1½°	163051	
VUL	iPZ	163118.0	0.2	3.0	u			
RAB	iPZ iSN	171055.0 1112.4	0.5	10.5	d	1¼°	171032	
VUL	iPZ	171054.0	0.3	19.0	d			
RAB	iPZ	174626.0	0.5	4.0	d			Regional
RAB	iPZ iSN	182637.0 2700.6	0.4	2.0	d	2°	182605	M_L= 3.9
VUL	iPZ	182636.0	0.8	3.0	d			
RAB	ePZ eSN	183650 3713	0.5	2.0	u	2°	183620	M_L= 3.7
RAB	ePZ	192852	0.4	1.0	d			(Near)
RAB	ePZ	202145	0.4	1.0	u			Near

			T sec	A mm	GM	Dist	H	Remarks
30th March, 1968.			No time breaks on KRT records.					
RAB	iPZ iSE	002917.8 33.4	0.5		d	1¼°	002856	M_L= 4.9
WAN	iPZ	002917.8	0.4	6.0	d			
SUL	iPZ	002917.5			d			
RAL	iPZ	002916.5			d			
VUL	iPZ	002916.9			d			
RAB	ePZ eSN	020346.4 53.9	0.5	2.0	u	½°	020336	Local M_L= 3.0
RAB	iPZ	123214.9	0.6	4.0	u			
RAL	iPZ	123213.0		4.0	u			
RAB	iPZ iSN	163522.2 39.5	0.5	6.0	u	1¼°	163459	M_L= 4.2
RAL	iPZ	163522.4			u			
VUL	iPZ	163522.2			u			
RAB	iPZ iSN	200108.2 31.0	0.6	7.0	u	2°	200038	M_L= 3.9
RAB	ePZ iSN	215650 5714.6	1.0	1.0	u	2°	215617	M_L= 4.2
RAB	ePZ iSN	230446.5 0507.0	0.5	3.0	d	1½°	230419	
31st March, 1968.			L.P.Z. galvonometer was broken. No E/W Wood-Anderson record.					
RAB	iPZ iSE	003211.6 29.2	0.4	3.0	d	1½°	003148	M_L= 4.1
RAB	ePZ e(S)N/	003940½ 4322	0.4	1.0	d	(28°)		
RAB	ePZ eSN	012718 41	0.5	2.8	u	2°	012648	
RAB	ePZ eSN	052146 2213½	0.4	1.6	d	2¼°	052113	
VUL	iPZ	052147.8	0.5	4.0	d			
RAB	iPZ iSN	063103.3 10.5	0.5	14.0	u	½°	063054	M_L=3.8
VUL	iPZ	063104.0	0.2	10.0	u			
RAB	iPZ iSN	095534.0 41.4	0.5	44.0	u	½°	095525	M_L= 3.8
WAN	iPZ	095533.9	0.2		u			
SUL	iPZ	095534.5	0.2	4.3	u			
RAL	iPZ	095534.5	0.3		u			
VUL	iPZ	095535.2	0.3		u			
RAB	iPZ iSN	095752.2 59.4	0.5	11.5	u	½°	095743	M_L= 3.6
WAN	iPZ	095751.9						

			T sec	A mm	GM	Dist	H	Remarks
31st March, 1968 (cont'd).								
RAB	ePZ eSN	101719½ 30	0.4	2.0	d	¾°	101704	
RAB	iP!Z iSN	113436.0 43.0	0.4	118.0	u	½°	113426	M_L= 4.1
WAN	iPZ	113435.8	0.2		u			
SUL	iPZ	113436.3	0.3	12.0	u			
RAB	ePZ	135455	0.5	2.0	u			Regional
RAB	iPZ iSN	180640.8 57.4	0.4	2.5	u	1¼°	180620	
VUL	iPZ	180639.2	0.3	10.0	u			
1st April, 1968. Very strong microseismic activity all day. No Z.L.P. record. Wood-Anderson records unserviceable.								
RAB	iPZ iZ i(S)E/	001706.0 06.5 14	0.5	14.5	u	(½°)	0016(55)	C.B.M.
WAN	iPZ	001706.3						
RAL	iPZ	001706.5	0.8	8.0	d			
KRT	iPZ	001704.2			u			Distant
RAB	iPZ i(S)E/	004946.4 5553			d	(43°)		C.B.M.
RAB	iPZ iZ i(S)E/	021656.8 1700.0 34	0.5	18.5	d	(3°)	0216(08)	Overlapping C.B.M.
RAB	iPZ iZ	022526.6 27.6	0.5	4.0	u			C.B.M. Epicentre approx. 4½°S, 145°E Felt - Lae: Intensity III 6°40'S, 147°E. Long Island - 5°20'S, 147°E.
KRT	ePZ iSE	022525 37.4			u	1°	022508	C.B.M.
RAB	iPZ iZ iSN	021927.3 30.8 2003.5	0.4	4.5	u	3½°	021838	C.B.M.
RAB	iPZ i(S)E	032119.7 24.4	0.5	7.6	d	(¼°)	032113	C.B.M.
RAB	iPZ iSN/	035040.5 5118	0.5	3.8	u	3¼°	034951	C.B.M.
KRT	ePZ i(S)E	035039 5104			u	(2¼°)	0350(06)	C.B.M.
RAB	iPZ iSN/	042016.0 51	0.4	2.1	d	3°	041930	
RAB	iPZ eSE/	072059.0 2708	1.0	2.0	d	4:2°		

			T sec	A mm	GM	Dist	H	Remarks
1st April, 1968 (cont'd).								
RAB	iPZ iSN	151919.8 27.2	0.5	9.0	u	½°	151910	
WAN	iPZ	151920.0	0.2	18.0	u			
RAL	iPZ	151920.3	0.2	12.0	u			
KRT	iPZ eSE	151923 30½			u	½°	151913	
RAB	iPZ iSE/	153207.5 15	0.5	13.0	u	½	153157	
WAN	iPZ	153207.6	0.4	16.9	u			
SUL	iPZ	153208.0	0.3	1.8	u			
RAL	iPZ	153208.0			u			
VUL	iPZ	153209.0			u			
KRT	iPZ	153210			u			Overlapping traces distant
RAB	iPZ iZ iSN/	154012.8 13.9 21	0.4	12.5	u	½°	154002	
SUL	iPZ	154014.3	0.3	3.4	u			
RAL	iPZ	154014.3			u			
KRT	iPZ iSE	154016½ 20½			u			
RAB	iPZ	155619.4	0.5	3.5	d			C B.M.
RAB	iPZ iSN/	163548.2 54			u	¼°	163540	C.B.M.
KRT	iPZ	163551½			u			C.B.M.
RAB	iPZ iSE/	164716.8 44			u	2¼°	164641	C.B.M. Overlapping traces
KRT	ePZ	164720			u			
RAB	iPZ	165021.0	0.5	3.2	d			C.B.M.
RAB	iPZ iSN/	170648.4 56			d	½°	170637	
WAN	iPZ	170648.5		28.0	u			
SUL	iPZ	170649.1	0.4	4.9	u			
RAL	iPZ	170649.2			u			
KRT	iPZ eSE	170651½ 55			u			
2nd April, 1968. Strong microseismic activity throughout the whole day. Harbour Network records nil recorded.								
RAB	ePZ eSN	014845½ 4909	0.4	2.8	(d)	1¾°	014814	M_L= 4.5
RAB	ePZ iSNa	021428½ 53.1			d	2°	021356	M_L= 4.3
RAB	eZ/	024256				+		Traces

			T sec	A mm	GM	Dist	H	Remarks
2nd April, 1968 (cont'd).								
RAB	eZ/	053633			+			Traces
RAB	iPZ	065552.0	0.4		d			
RAB	eZ/	082002			-			Traces
RAB	eZ/	104535			+			Traces
RAB	eZ/	182052			+			Traces
TABELE								
20th March, 1968.								
TBL			NIL RECORDED					
21st March, 1968.								
TBL	ePZ	053030½	0.3	1.0	d			Regional
TBL	iPZ iSZ	164240½ 57½	0.4	3.0	d	1¼°	164215	
22nd March, 1968.								
TBL	ePZ	091920			d			Distant
TBL	ePZ	192136½	0.5	1.0	d			Near
TBL	ePZ	221239½			d			Regional
23rd March, 1968.								
TBL	ePZ	015848	0.3	2.0	d			Regional
TBL	iPZ iSZ	161134 1204	0.3	2.0	d	2½°	161055	
24th March, 1968.								
TBL			NIL RECORDED					
25th March, 1968.								
TBL	iPZ	005726	0.3	2.0	u			Near
TBL	iPZ	052543	0.4	3.0	u			Regional
26th March, 1968.								
TBL	iPZ iSZ	003549 3603	0.3	6.0	u	1°	003530	
TBL	ePZ	004705			d			Teleseism
AGENAHAMBO								
12th Feb., 1968.			NIL RECORDED - Not operational					
13th Feb.,1968.			0100 - 0806 Not operational					
AGE	iPZ i	112347 50½			u			

			T sec	A mm	GM	Dist	H	Remarks
13th Feb.,1968 (cont'd).								
AGE	eiPZ	140747.8	0.8	2.0	d			
	iPZ	48.0						
AGE	iPZ	140857.8	0.6	6.0	u			
AGE	iPZ	142147.0	0.8	1.0	d			
AGE	iPZ	190254.4	0.4	1.0	d			
	iSZ	57.2						
	i	0304.2						
AGE	iPZ	233528.6	0.2	1.5	u			
	i	51.6						

14th Feb., - 17th Feb.,1968 - Not operational

18th Feb.,1968. NIL RECORDED

0100 - 0848 Not operational

19th Feb.,1968. NIL RECORDED

20th Feb.,1968. 0100 - 0800 NIL RECORDED

AGE	iPZ	083612.4		2.0	d			
	iZ	19.2						
	i	25.4						
AGE	iPZ	230028.8						
	iZ	44.0						

21st Feb.,1968. NIL RECORDED to 0743 - Not operational until 0816 on 22nd Feb.

22nd Feb.,1968. NIL RECORDED

23rd Feb., 1968.

AGE	iPZ	013628.0						
	iZ	46.5			d			
	iSZ	50.0						

Not operational from 0801

24th Feb., 1968. Not operational

AGE station closed from 25th Feb. to 8th Mar.,1968.

9th March,1968.

AGE	iPZ	124841			d			
	iSZ	4904½						

10th March,1968.

AGE	iPZ	233527½	0.4	1.0	d			
	iZ	32½						
	iSZ	36½						

11th March, 1968.

AGE	ePZ	182703½			u			

12th March, 1968.

AGE	iPZ	202518			d			Distant

	T sec	A mm	GM	Dist	H	Remarks
13th March, 1968.	NIL RECORDED					

From 0810 on the 14/3/68 to 0806 on the 15/3/68 nil recorded - galvanometer out of adjustment.

15th March, 1968.

AGE	ePZ	121329	
	iSZ	55½	
AGE	iPZ	125024	d
	iSZ	5106	

16th March, 1968. NIL RECORDED

17th March, 1968. " "

18th March, 1968. " "

19th March, 1968. " "

20th March, 1968. RECORDS EXPOSED

21st March, 1968. NIL RECORDED

22nd March, 1968. " "

Rabaul Central Observatory,
17th April, 1968.

(G. W. D'ADDARIO)
Volcanologist-in-Charge

			T sec	A mm	GM	Dist	H	Remarks
RABAUL								
3rd April, 1968.								
RAB	ePZ iSNa	025407 37.0	3.0	3.2	d	2½°	025438	C.B.M. M_L= 5.0
WAN	iPZ	025407.0	0.5	10.9	d			
RAB	ePZ eN/	044013 59.8			u	5¼°	043912	C.B.M. M_L= 5.7
WAN	iPZ	044013.0	0.4	5.0	u			
RAL	iPZ	044013.5			u			
KRT	iPZ	044015			u			
RAB	(iP)Z iSNa	052649.0 27(29.9)			d	(3½°)	0525(55)	C.B.M. M_L= 5.6
WAN	iPZ	052649.0			u			
SUL	iPZ	052650.0	0.3		u			
RAL	iPZ	052649.4			u			
VUL	iPZ	052650.9			u			
RAB	ePZ eSE/	053905½ 40(50)			d	(5½°)	0538(03)	C.B.M. M_L= 5.6
WAN	iPZ	053905.5	0.2		u			
RAL	iPZ	053905.9			u			
VUL	iPZ	053907.2			u			
RAB	iPZ	0545(59.5)			u			C.B.M.
RAB	iPZ	081547.4	0.5	3.0	u			Local
RAL	iPZ	081546.5	0.2		u			
RAB	iPZ eSN	081702.4 28	0.4	3.1	d	2°	081728	M_L= 3.6
RAB	eZ/	110947			-			Traces
RAB	ePZ eSN	145321½ 43	0.5	3.0	d	1¾°	145252	M_L= 3.3
KRT	ePZ iSE	145319 42			d			
RAB	eZ/	164756			-			Traces
4th April, 1968.		Very strong microseismic activity all day Wood Anderson records unserviceable						
RAB	i(P)Z iSN/	023559.0 3632			(u)	2¾°	0235(16)	C.B.M.
RAL	iPZ	023559.0	0.6	2.5	d			
VUL	iPZ	023559.8	0.5		d			
KRT	i(P)Z	023559			(u)			C.B.M.
RAB	iPZ iSN/	063835.2 47			d	1°	063819	C.B.M.

			T sec	A mm	GM	Dist	H	Remarks
4th April, 1968 (cont'd)								
WAN	iPZ	063835.0	0.2		d			
SUL	iPZ	063835.0			u			
RAL	iPZ	063834.9	0.3		d			
VUL	iPZ	063835.8	0.4		d			
RAB	iPZ iSE/	064233.0 4306	0.5	5.2	d	2¾°	064150	C.B.M.
VUL	iPZ	064231.0	0.6	5.5	u			
RAB	iPZ	080639.0			u			C.B.M. Felt - Ulamona 15°S, 151'E Intensity II
RAB	iPZ iSN/	091248.5 1316			d	2¼°	091212	C.B.M.
WAN	iPZ	091248.0	0.7	6.6	d			
SUL	iPZ	091248.0	0.5	2.2	d			
RAL	iPZ	091248.0	0.6	6.5	d			
VUL	iPZ	091248.5			d			
KRT	iPZ	091248			d			C.B.M.
RAB	iPZ i(S)N	121141.5 1213.3	0.5	5.0	d	(2¾°)	1210(59)	C.B.M.
VUL	iPZ	121137.4	0.5	3.6	u			
KRT	iPZ	121137.4						
RAB	iPZ i(S)E/	203649.0 3726	0.5	20.0	d	3°	203603	C B.M.
WAN	iPZ	203648.8	0.4		u			
SUL	iPZ	203648.5	0.5	4.2	u			
RAL	iPZ	203648.2	0.4		u			
VUL	iPZ	203648.0			d			
KRT	iPZ	203645.8						
5th April, 1968.								
RAB	iPZ iSN	073600.5 12.0	0.5	4.0	u	¾°	073544	M_L= 3.9
KRT	ePZ eSE	073601½ 13			u	¾°	073546	
RAB	iPZ iSN	120225.6 50.6	0.5	2.8	d	2°	120153	
KRT	ePZ i(S)E	120225 45				1½°	120158	C B M.
RAB	iPZ iSE	154017.5 40.3	0.6	5.0	u	2°	153947	M_L= 4.6
KRT	iPZ i(S)E	154018 38		8.0	u	1½°	153951	
RAB	iPZ iSN/	161225.6 35	0.5	13.0	u	¾°	161213	M_L= 4.0

			T sec	A mm	GM	Dist	H	Remarks
5th April, 1968 (cont'd).								
WAN	iPZ	161225.5	0.4	7.8	u			
SUL	iPZ	161226.0	0.4	3.2	u			
RAL	iPZ	161226.0	0.4		u			
VUL	iPZ	161227.2			u			
KRT	iPZ	161229			u	½°	161221	
	eSE	35						
RAB	iPZ	194350.7	0.5	18.2	d	1¼°	194329	
	iSN	4407.0						
WAN	iPZ	194350.5	0.3	7.2	d			
SUL	iPZ	194350.3	0.3	3.2	d			
RAL	iPZ	194350.0	0.3		d			
VUL	iPZ	194351.0			d			
KRT	ePZ	194355				1¼°	194330	
	eSE	4410						
6th April, 1968.								
RAB	ePZ	010418	0.3	2.0	d	2¼°	010342	M_L= 4.3
	iSE	44.8						
RAB	ePZ	082109	0.3	2.7	u	1¼°	082045	M_L= 3.9
	iSE	27.3						
VUL	iPZ	082108.4	0.5	11.0	d			
RAB	eZ/	215206			+			Traces
7th April, 1968.								
RAB	iPZ	023731.8	0.5	4.5	d	½°	023720	M_L= 3.3
	iSN	40.5						
RAL	iPZ	023731.2			d			
RAB	iPZ	044649.0	0.5	2.0	d	2¼°	044613	M_L= 4.7
	iSN	4715.8						
VUL	iPZ	044637.1	0.5	4.0	d			
RAB	iPZ	093947.8	0.5	5.0	d			Regional
WAN	iPZ	093947.8	0.5	5.0	d			
RAL	iPZ	093947.9	0.5	10.0	d			
VUL	iPZ	093948.0	0.4		d			
KRT	iPZ	093948			d			
RAB	iPZ	125647.5	0.7	3.0	u	1¼°	125626	M_L= 3.2
	iSN	5703.5						
RAL	iPZ	125646.5	0.8	2.5	u			
VUL	iPZ	125646.8	0.4	8.5	u			
KRT	iPZ	125646½			u	1¼°	125624	
	iSN	5703						
RAB	iPZ	130139.0	0.5	6.0	u	2¾°	130056	M_L= 5.1
	iSN	0212.0						
VUL	iPZ	130137.0	0.5	4.0	d			
KRT	iPZ	130134½			u	2¾°	130052	
	iSN	0206½						

			T sec	A mm	GM	Dist	H	Remarks
7th April, 1968 (cont'd).								
RAB	iPZ	203727.6	0.5	37.0	d			Regional
WAN	iPZ	203727.0	0.5		d			
SUL	iPZ	203727.0	0.5	7.9	d			
RAL	iPZ	203727.1			d			
VUL	iPZ	203726.2			d			
KRT	iPZ	203725			d			Regional
8th April, 1968.								
RAB	iPZ	000805.2	0.4	2.0	u	2½°	000724	M_L= 4.9
	iSE	38.4						
RAB	iPZ	051102.0	0.5	2.3	d	2¼°	051019	C.B.M. M_L= 5.2
	iSN	35.2						
RAB	iPZ	081202.1	0.5	4.0	u	½°	081150	M_L= 3.6
	iSN	11.0						
RAB	iPZ	090459.0	0.4	1.5	u	2¼°	090425	
	iSE	0525.0						
KRT	ePZ	090456	0.6	2.0	u			
	eSE	0527						
RAB	eiPZ	145809	0.5	11.0	d	3¼°	145719	M_L= 5.4
	iZ	11.5						
	iSN	47.0						
KRT	iPZ	145807	0.4	1.5	d			
	eSE	48						
RAB	iPZ	153525.6	0.5	4.0	d	1¼°	153504	M_L= 4.1
	iSN	41.7						
VUL	iPZ	153524.9						
KRT	iPZ	153525½	0.6	4.0	d			
	eSE	39½						
RAB	iPZ	173526.5	0.5	9.0	u	½°	173514	M_L= 4.0
	iSN	35.3						
WAN	iPZ	173526.2						
RAL	iPZ	173526.0	0.3	7.8	u			
VUL	iPZ	173527.0	0.4	7.2	u			
KRT	iPZ	173529½			u			
	iSE	40½						
9th April, 1968.		Earthquake not recorded on L.P.Z. - drum not fully traversed.						
RAB	i(P)Z	024216.9	1.2	2.4	d	(100°)		Teleseism
	i(SKS)E/	5256						
	i(S)E/	5445						
	iE/	030004						
	i	0356						
	iN/	0934						

			T sec	A mm	GM	Dist	H	Remarks
9th April, 1968 (cont'd).								
RAB	iPZ	212846.1	0.5	6.2	u	1½°	214822	
	iSN	2900.2						
RAL	iPZ	212845.8						
VUL	iPZ	212846.2						
RAB	iPZ	223819.8	0.5	11.0	u	1¼°	223757	
	iSN/	36						

Rabaul Central Observatory,
18th April, 1968.

(G.W. D'ADDARIO)
Volcanologist-in-Charge

TERRITORY OF PAPUA AND NEW GUINEA
GEOLOGICAL AND VOLCANOLOGICAL BRANCH
VOLCANOLOGICAL SECTION

PRELIMINARY EARTHQUAKE ANALYSIS
RABAUL CENTRAL OBSERVATORY
1968

Rabaul	RAB	From: APR. 10. 1968 To: APR. 16. 1968
Rabaul Harbour Network	WAN SUL RAL TAV VUL	From: APR. 10. 1968 To: APR. 16. 1968
Keravat	KRT	From: APR. 10. 1968 To: APR. 16. 1968
Esa'ala	ESA	From: To:
Tabele	TBL	From: MAR. 26. 1968 To: APR. 1. 1968
Agenahambo	AGE	From: To:
Waris	WAA	Not Operational
Ulamona	ULA	Not Operational
Piva	PIV	Not Operational
Cape Gloucester	LAG	Not Operational

STATION PERSONNEL

RAB **Central Observatory, Rabaul**

Volcanologist-in-Charge	G.W. D'Addario
Volcanologist	R.F. Heming
Seismologist	(Position Vacant)
Seismogram Readers	D.J. Cook : H.M. Carrick
Senior Technical Officer	N.O. Myers
Technical Officer	R.J. Conway
Volcanological Assistants	L. Topue : M. Gaiam
	V. Kaita
Technical Assistant	P. Daimbari
Trainee Volcanological Assistants	B. Talai: M. Salaiau,
	C. Matapit
Secretary	R. Scott

KRT **Kerevat Outstation**

Observer (part-time) — G.E. Chorick

TBL **Tabele Observatory**

Observer — E. Ravian

ESA **Esa'ala Observatory**

Observer — F. Dira

AGE **Agenahambo Outstation**

Observer (part-time) — Br. B. Hughes

The Rabaul Preliminary Earthquake Analysis (PEA) is produced by the staff under the direction of the Volcanologist-in-Charge from whom additional information and photocopies of seismogram records from all stations may be obtained on request.

Please address all communications to:-

Volcanologist-in-Charge
Central Observatory,
P.O. Box 386,
RABAUL. T.P. & N.G.

SEISMOGRAPH STATIONS

Station (NEW GUINEA)	Code	South Latitude	East Longitude	Elev. (m)	Foundation
Rabaul	RAB	04°11'28.6"	152°10'11.4"	183.5	Basalt Flow
Wanliss Street	WAN*	04°11'39.6"	152°10'32.5"	25.0	Basalt Flow
Sulphur Creek	SUL*	04°13'09.8"	152°10'33.3"	8.5	Unconsolidated Volcanic Ash
Rabalanakaia	RAL*	04°13'13.0"	152°12'07.0"	91.0	Unconsolidated Volcanic Ash
Tavurvur	TAV*	04°13'52.2"	152°13'12.9"	27.0	Andesite Flow
Taviliu	VUL*	04°16'58.2"	152°08'44.6"	332.3	Unconsolidated Volcanic Ash
Keravat	KRT	04°21'10.5"	152°03'06"	20.0	Alluvium
Ulamona	ULA	04°59'24.6"	151°16'30.0"	17.0	Lapilli Tuff
Tabele	TBL	04°06'04.67"	145°00'41.37"	179.5	Basalt Flow
Waris	WAA	04°07'00"	145°06'00"	48.0	Lapilli Tuff
Piva	PIV	06°12'00"	155°03'30"	60.0	Alluvium
Cape Gloucester	LAG	04°27'20"	148°26'00"	24.0	Lapilli Tuff
(PAPUA)					
Agenahambo	AGE	08°43'49"	148°05'56"	303.0	Unconsolidated Volcanic Ash
Esa'ala	ESA	09°44'18.2"	150°48'40.7"	46.4	Granite Gneiss

* Rabaul Harbour Network

STATION INSTRUMENTATION

Station & Instruments (NEW GUINEA)	Comp.	To	Tg	Trace Speed mm/min	Approximate relative Magnification	Approximate damping
Rabaul Central Observatory RAB						
World-Wide Standard	Z	1.0	0.74	60	12,500	Critical
	N,E	1.0	0.74	60	6,250	Critical
	Z/N/E/	15.0	100.0	15	750	Critical
Benioff VR 14.7Kg	Zh	1.0	0.02	180 +	4,000	Critical

+Recording is triggered by the onset of any earthquake with predetermined minimum amplitude. Recorder is stopped automatically by hour break pulse.

Omori 15Kg	No	3.6	-	24	12	10.1(air)
Omori 15Kg	Eo	3.8	-	24	10	10.1(air)
Wood-Anderson Torsion	Na,Ea	0.8	-	60	2,800	Critical

Rabaul Harbour Network

Readings from the Harbour Network are entered in the BEA only for large earthquakes

WAN°	Benioff VR 14.7Kg	Z	1.0	0.02	60	5,240	Critical
SUL°	Benioff VR 14.7Kg	Z	1.0	0.02	60	2,850	Critical
RAL°	Benioff VR 14.7Kg	Z	1.0	0.02	60	8,075	Critical
TAV°°	Benioff VR 14.7Kg	Z	1.0	0.02	60	20,900	Critical
VUL°°	Benioff VR 14.7Kg	Z	1.0	0.02	60	5,000	Critical

STATION INSTRUMENTATION

Station & Instruments	Comp.	To	Tg	Trace speed mm/min	Approximate relative Magnification	Approx. damping
Rabaul Harbour Network (Cont.)						

o Signals from these stations are telemetered by land line to Helicorders (Geotech Mod. 2484) at the Central Observatory.

oo Signals from this station are telemetered via VHF to its Helicorder at the Central Observatory.

KRT - Keravat Outstation						
Benioff Mc 50 Kg	Z	1.2	0.2	15	20% sensitivity	Critical
Benioff MC 50Kg	N/E	1.2	0.2	15	10% sensitivity	Critical
ULA - Ulamona Field Station						
Willmore portable	Z	0.6	0.25	60	3,000	underdamped
PIV - Piva Field Station						
Willmore portable	Z	0.6	0.25	60	3,000	underdamped
WAA - Waris Field Station						
Willmore portable	Z	0.6	0.25	60	3,000	underdamped
LAG - Cape Gloucester Field Station						
Willmore portable	Z	0.6	0.25	60	3,000	underdamped

N.B. These field stations consist of a permanent building in which instruments are installed when necessary.

Details of emergency field stations, within the Territory will be listed when in operation.

TBL - Tabele Observatory						
Benioff VR 107.5Kg	Z	1.0	0.2	60	1,350	critical
(PAPUA)						
ESA - Esa'ala Observatory						
Benioff VR 107.5Kg	Z	1.0	0.2	15	36,000	critical
Benioff VR 107.5Kg	N,E	1.0	0.2	15	18,000	critical
Benioff VR 107.5Kg	Z/N/E	1.0	60.0	30	50% sensitivity	critical
AGE - Agenahambo Station						
Willmore portable	Z	0.6	0.25	60	3,000	underdamped

VR Variable Reluctance

MC Moving-coil

Relative magnification curves of seismograph systems installed in the stations controlled by the Rabaul Central Observatory are listed once a month on the P.E.A.

PRESENTATION OF DATA

(reviewed in November, 1967)

All times are reduced to Greenwich Mean Time (GMT), which is 10 hours behind Eastern Standard Time.

At RAB and Harbour Network, the time signal is marked every minute on each seismogram record from the Observatory crystal chronometer. Second marks from Radio signal VNG (Australia) are recorded on World-wide Standard System S.P.-N. component only according with the W.W.S.S. programme, at six hour intervals. Primary time is provided by W.W.S.S. equipment and secondary time by a Labtronic crystal chronometer with the accuracy of ± 5 ms per day compared with VNG (Australia) with the aid of a chronoscope.

At TBL and AGE, the time signal is derived from a spring driven chronometer (Mercer) and marked each minute on records. Time accuracy is determined by comparison with signals from WWVH daily. Linear correction is applied to the daily drift.

On all seismogram records time increases from left to right and time break is upward.

At RAB* and Harbour Network the recording drum of each seismograph is driven by a 110VAC 60Hz synchronous motor. The 110VAC is frequency regulated by a crystal chronometer.

* The Omori recording drum is driven by a nonregulated 50Hz frequency supply.

At ESA and KRT power for recorder motors is frequency regulated by a crystal chronometer at 50Hz. Power for AGE and TBL and field stations is supplied by a 50Hz free running oscillator.

Direction of Motion

Upward direction of ground motion corresponds to upward trace motion on vertical seismogram records. Direction of component of ground motion to North or East corresponds to upward trace motion on horizontal seismogram records.

Vertical trace motion from impulsive onset of longitudinal waves of compressional or dilatational ground movement is indicated by "u" or "d" accompanied by N,S,E, or W, as per trace motion amplitude on horizontal seismogram records, to represent vectorially the direction of ground motion. "+" or "-" indicates upward or downward motion of the ground respectively, from a wave not known to be of the longitudinal type.

Accuracy of Readings

When readings are given with a decimal figure, they are to 1/10 of a second, other readings have been made to the nearest half second.

Crustal Phases

Px, Sx Crustal phases, other than Pn and Sn for local and near earthquakes.

Felt Intensity

Information on maximum intensities of shocks reported felt is included. Intensities are given in Roman numerals based on the Modified Mercalli Scale, of 1931.

Epicentres

Where no source is cited, the determination of epicentres origin time, focal depth and distance in central angle degrees from the pertinent station for local and regional earthquakes, are carried out at the Central Observatory, Rabaul.

Geographical Designation of Epicentres

The regional names which follow the co-ordinates of epicentres located at the Central Observatory are meant only to supplement the co-ordinates and normally follow well-known geographical rather than geological features. Use is made of the full degree blocks according to the method defined by E.A. Flinn and E.R. Engadhl in "A PROPOSED BASIS FOR GEOGRAPHICAL AND SEISMIC REGIONALIZATION", Seismic Data Laboratory Report No. 101, U.I.D. Inc., Alexandria, Virginia, 1964, adopted by the U.S.C.G.S. for computer requirements.

Magnitude Definition and Determination

M_L Local Magnitude (Richter, 1935) is calculated from the recorded trace amplitude of the Wood-Anderson torsion seismographs of stated physical constants (installed at the Observatory in November, 1967).

Maximum trace amplitude (Zero peak) expressed in millimetres and tenths is measured directly on both components. Magnitude is determined independently and the arithmetic mean taken. M_L values are given to the tenth of a unit.

The station correction factor is assumed to be zero until better known.

M_S Surface Wave Magnitude (Gutemberg and Richter, 1956) is calculated from the amplitude of surface waves of period near 20 seconds for shallow distant earthquakes.

M_B Body Wave Magnitude is calculated from the ratio of amplitude over period for body waves S.P.-Z of World-wide Seismograph System only when depth is known. The magnification factor for the standard seismograph is taken into account.

m Unified magnitude (Gutemberg & Richter, 1956) has the following relation to M_L, M_S, and M_B.

$$m = 1.7 + 0.8\ M_L - 0.01\ M^2_L$$

$$m = M_B \text{ (without correction)}$$

$$m = 2.5 + 0.63\ M_S$$

Local Magnitude of earthquakes recorded at RAB with a clear S-P interval is tabulated on a Day-Distance (in Central Angle Degrees) graph which is added to the PEA monthly.

Symbols

i	-	impulsive and sharply defined beginning of phase.
e	-	emergent and poorly defined beginning of a phase.
T	-	Period in seconds
A	-	Peak-to-Trough trace amplitude in millimetres.
GM	-	Ground Motion
Dist	-	Distance in central angle degrees
H	-	Origin Time
h	-	Focal depth in Kilometres
CBM	-	Confused by microseisms.

PRESENTATION OF DATA (CONT)

Remarks

Local - Typical signature of an earthquake with epicentre within 0.9°.

Near - Typical signature of an earthquake with epicentre between 0.9° and 9°.

Distant - Typical signature of an earthquake with epicentre between 9° and 45°.

Teleseism - Typical signature of an earthquake with epicentre more than 45°.

Traces - Any recorded disperse waves or very weak unknown earthquake phases.

Local and Near earthquakes will be classified Regional, and Distant earthquakes will be grouped with Teleseisms if sheer waves and their reflections are unidentifiable.

(G.W. D'ADDARIO)

Vulcanologist-in-Charge.

			T sec	A mm	CM	Dist	H	Remarks
10th April, 1968								
RAB	iPZ	042605.6	0.5	9.8	d	1°		M_L= 4.2
	iSN/	20					042547	
VUL	iPZ	042605			d			
RAB	iPZ	080944.3	0.5	88.0	u	(1½°)		M_L= 5.6
	i(S)N/	1005					0809(17)	Felt Ulamona II
RAL	iPZ	080944			u			15°S 151°E
KRT	iPZ	080942						
RAB	iPZ	082400.3	0.5	5.0	d	1¾°		M_L= 4.2
	iSN	21.5					082333	
RAB	eiPZ	090158	0.5	6.5	u	2°		M_L= 4.3
	iZ	59.8					090126	
	iSN	0221.6						
RAL	iPZ	090159	0.5	3.0	d			
VUL	iPZ	090158.3		3.0	d			
KRT	eiPZ	090157			d	1½°		
	iSN	0216½					090131	
RAB	iPZ	091100.0	0.5	5.0	u	1¾°		
	iSN	21.3					091032	
RAL	iPZ	091059.1			d			
KRT	iPZ	091058			u	1½°		
	iSE	1116½					091033	
RAB	iPZ	101856.0	0.5	3.0	d	2°		M_L= 4.4
	iSN	1919.0					101826	
RAL	iPZ	101853	0.6	1.5	d			
KRT	iPZ	101854			d			
RAB	iPZ	183740.2	0.8	2.2	u	30°		
	eSN/	4229						
KRT	ePZ	183740½			d			Distant
RAB	iPZ	191303.8	0.5	8.2	d	5°		M_L= 6.0
	iSE/	1402					191148	
VUL	iPZ	191256.8	0.5	3.0	u			
KRT	ePZ	191257			u	(¾°)		~~Unusual delay in comparison with Rabaul records~~
	i(S)N	1309½					1912(37)	
RAB	iPZ	212459.3	0.5	6.2	d	¾°		M_L= 4.1
	iSE	2510.0					212444	
11th April, 1968								
RAB	ePZ	1807(35)	0.5	2.5	u			Regional
VUL	iPZ	33.2						
	i!	33.5						
KRT	iPZ	180738½			d			Overlapping traces
RAB	iP!Z	1922(35.0)	0.6	97.0	d			Regional
WAN	iPZ	34.8			d			
SUL	iPZ	34.8			d			
RAL	iPZ	34.4			d			
VUL	iPZ	35.0			d			
KRT	iPZ	192236			d			Overlapping traces

			T sec	mm	GM	Dist	H	Remarks
11th April, 1968 (cont.)								
RAB	ePZ	204156						
	iZ	4211.5						
12th April, 1968								
RAB	iPZ	091359.0	0.6	16.0	u			Regional
WAN	iPZ	091358.8		6.5	u			
RAL	iPZ	091358.8			u			
VUL	iPZ	58.1						
KRT	iPZ	091358			u	1¼°		
	iSN	1413					091338	
RAB	ePZ	130444½	0.6	0.6	d			Teleseism?
KRT	ePZ	130447	0.6	0.6				Teleseism
RAB	ePZ	164607	0.5	1.0	d			Teleseism?
KRT	ePZ	164609.4			d			Teleseism
13th April, 1968								
RAB	iPZ	173431.3	0.6	27.0	u			Deep
WAN	ePZ	31.3			u			
RAL	ePZ	31.7			u			
VUL	iPZ	31.0			u			
KRT	iPZ	173430	0.6	5.0	u			
RAB	iPZ	205840.0	0.3	15.5	u	1½°		M_L= 4.5
	iSE	58.0					201516	
WAN	iPZ	39.5			u			
SUL	iPZ	39.1			u			
RAL	iPZ	39.3			u			
VUL	iPZ	38.7			u			
KRT	iPZ	205838			d			
RAB	iPZ	211809.0	0.5	4.5	d			Deep?
KRT	iPZ	211807½	1.0	3.0	d			
RAB	iPZ	233135.6	0.5	13.0	d	1½°		M_L= 4.8
	iSE	54.5					233110	
SUL	iPZ	233135.6	0.6	7.0	u			
RAL	iPZ	233135		12.0	d			
VUL	iPZ	233134	0.5	12.0	d			
14th April, 1968								
RAB	iPZ	000741.0	0.5	46.0	d	1¼°		M_L= 4.6
	iSN	58					000718	
WAN	iPZ	000740.8		23.5	d			
RAL	iPZ	000740.2		15.8	d			
VUL	iPZ	000739.3			d			
KRT	iPZ	000739			d			
RAB	iPZ	040624.4	0.5	18.6	u	1½°		M_L= 4.4
	iSN	43.5					040559	
WAN	iPZ	040624		10.0	u			
SUL	iPZ	040624		12.0	u			
RAL	iPZ	040624		23.9	u			
VUL	iPZ	040622.8			d			

14th April, 1968 (cont)			T sec	A mm	GM	Dist	H	Remarks
KRT	iPZ	040622½						
RAB	iSN	063736.3	0.5	2.2	d	3¼°		M_L= 5.1
	iSN	3815.0					063635	
KRT	ePZ	063733½						
	iSE	3817						
RAB	eZ/	085533			+			Traces
RAB	iPZ	084325.8	0.5	4.5		2°		M_L= 4.6
	iZ	27.4					084255	
	iSN	48.4						
KRT	ePZ	084328						
	iSE	46½						
RAB	ePZ	131223.6						Teleseism
	eZ/	2330						
15th April, 1963								
RAB	eiPZ	030927.3	0.4	2.0				Multiple shocks
	iPZ	28.1						
VUL	iP	030927.2			u			
RAB	eZ/	084610			+			Traces
RAB	iPZ	154348.7	0.4	34.0	u			Local
	i!Z	56.4						
KRT	eiPZ	154350½			d			Local
	iPZ	51						
RAB	iPZ	174635.0			u			Local
WAN		34.9			u			
SUL		34.4			u			
RAL		34.2			u			
VUL		35.0						
KRT	iPZ	174636			u			Local
16th April, 1968								
RAB	iPZ	002407.3	0.5	2.5	d	3°		M_L= 5.1
	iSE	42.5					002321	
RAB	iPZ	025559.0	0.5	13.0	u	1¼°		M_L= 4.5
	iS!E	5615.0					025538	
KRT	e(P)Z	025559½						
RAB	iPZ	060830.0	0.5	5.0	d	1°		C.B.M.
	iSN	44.7					060810	M_L= 4.0
RAB	iPZ	184128.8	0.8	10.0	u			Deep
VUL	iP	28			u			
KRT	iPZ	184127	1.0	3.0	u			Deep

			T sec	A mm	GM	Dist	H	Remarks
TABELE								
26th March, 1968								
TBL	ePZ	194534	0.8	2.0	d			Teleseism
TBL	ePZ	214411						
TBL	ePZ	220949½						
27th March, 1968								
TBL	ePZ	223931	0.6		d			Teleseism
28th March, 1968								
TBL	e(P)Z	055006)						Teleseism
TBL	iPZ	101345	0.4	3.0	u			
TBL	iPZ	141144½	0.6	1.0	d			
TBL	ePZ	142423½	0.2		u			
TBL	ePZ	212257						
29th March, 1968								
Nil Recorded								
30th March, 1968								
Nil Recorded								
31st March, 1968								
TBL	ePZ	020207½						
TBL	iPZ	085704	0.4	1.5	u			Distant
TBL	ePZ	095350						
1st April, 1968								
TBL	ePZ	004932						
TBL	iPZ	022446½	0.6	1.0	d			Teleseism
								Regional

TERRITORY OF PAPUA AND NEW GUINEA
GEOLOGICAL AND VOLCANOLOGICAL BRANCH
VOLCANOLOGICAL SECTION

PRELIMINARY EARTHQUAKE ANALYSIS
RABAUL CENTRAL OBSERVATORY
1968

Rabaul	RAB	From: APR. 17. 1968 To: APR. 23. 1968
Rabaul Harbour Network	WAN SUL RAL TAV VUL	From: APR. 17. 1968 To: APR. 23. 1968
Keravat	KRT	From: APR. 17. 1968 To: APR. 23. 1968
Esa'ala	ESA	From: MAR. 13. 1968 To: APR. - 8. 1968
Tabele	TBL	From: APR. - 3. 1968 To: APR. - 9. 1968
Agenahambo	AGL	From: MAR. 30. 1968 To: APR. - 6. 1968
Waris	WAA	Not Operational
Ulamona	ULA	Not Operational
Piva	PIV	Not Operational
Cape Gloucester	LAG	Not Operational

STATION PERSONNEL

RAB Central Observatory, Rabaul

Volcanologist-in-Charge	G.W. D'Addario
Volcanologist	R.F. Heming
Seismologist	(Position vacant)
Seismogram Readers	D.J. Cook, H. Carrick
Senior Technical Officer	N.O. Myers
Technical Officer	R.J. Conway
Volcanological Assistants	L. Topue, M. Gaiam, V. Kaita.
Technical Assistant	P. Daimbari
Trainee Volcanological Assistants	B. Talai, M. Salaiau, C. Matapit
Secretary	

KRT Keravat Outstation

Observer (part-time)	G.E. Chorick

TBL Tabele Observatory

Observer	E. Ravian

ESA Esa'ala Observatory

Observer	F. Dira

AGE Agenahambo Outstation

Observer (part-time)	Br. B. Hughes

The Rabaul Preliminary Earthquake Analysis (PEA) is produced by the staff under the direction of the Volcanologist-in-Charge from whom additional information and photocopies of seismogram records from all stations may be obtained on request.

Please address all communications to:-

Volcanologist-in-Charge,
Central Observatory,
P.O. Box 386,
RABAUL, T.P. & N.G.

SEISMOGRAPH STATIONS

Station (NEW GUINEA)	Code	South Latitude	East Longitude	Elev. (m)	Foundation
Rabaul	RAB	04°11'28.6"	152°10'11.4"	183.5	Basalt Flow
Wanliss Street	WAN*	04°11'39.6"	152°10'32.5"	25.0	Basalt Flow
Sulphur Creek	SUL*	04°13'09.8"	152°10'33.3"	8.5	Unconsolidated volcanic ash
Rabalanakaia	RAL*	04°13'13.0"	152°12'07.0"	91.0	Unconsolidated volcanic ash
Tavurvur	TAV*	04°13'52.2"	152°13'12.9"	27.0	Andesite Flow
Taviliu	VUL*	04°16'58.2"	152°08'44.6"	332.3	Unconsolidated volcanic ash
Keravat	KRT	04°21'10.5"	152°03'06"	20.0	Alluvium
Tabele	TBL	04°06'04.67"	151°56'41.37"	179.5	Basalt Flow
Waris	WAA	04°07'00"	143°06'00"	48.0	Lapilli Tuff
Piva	PIV	06°32'00"	155°03'30"	60.0	Alluvium
Cape Gloucester	LAG	04°24'30"	148°25'00"	24.0	Lapilli Tuff
Ulamona (PAPUA)	ULA	04°59'2[illegible]"	151°16'30.0"	17.0	Lapilli Tuff
Agenahambo	AGE	08°48'49"	148°05'56"	303.0	Uncolsolidated volcanic ash
Esa'ala	ESA	09°44'18.2"	150°48'50.7"	46.4	Granite Gneiss

* Rabaul Harbour Network

STATION INSTRUMENTATION

Station & Instruments (NEW GUINEA)	Comp.	To	Tg	Trace Speed mm/min	Approximate relative Magnification	Approximate damping
Rabaul Central Observatory RAB						
World-wide Standard	Z	1.0	0.74	60	12,500	Critical
	N,E	1.0	0.74	60	6,250	Critical
	Z/N/E/	15.0	100.0	15	750	Critical
Benioff VR 14.7Kg	Zh	1.0	0.02	180+	4,000	Critical
+ Recording is triggered by the onset of any earthquake with pre-determined minimum amplitude. Recorder is stopped automatically by hour break pulse.						
Omori 15Kg	Nc	3.6	-	24	12	10.1 Air
Omori 15Kg	Ec	3.8	-	24	10	10.1 Air
Wood-Anderson Torsion	Na,Ea	0.8	-	60	2,800	Critical
Rabaul Harbour Netowrk						
Readings from the Harbour Network are entered in the PEA only for earthquakes, with impulsive and sharply defined onset of phases.						
WAN° Benioff VR 14.7Kg	Z	1.0	0.02	60	5,240	Critical
SUL° Benioff VR 14.7Kg	Z	1.0	0.02	60	2,850	Critical
RAL° Benioff VR 14.7Kg	Z	1.0	0.02	60	8,075	Critical
TAV° Benioff VR 14.7Kg	Z	1.0	0.02	60	20,900	Critical
VUL° Benioff VR 14.7Kg	Z	1.0	0.02	60	5,000	Critical

STATION INSTRUMENTATION

Station & Instruments	Comp.	To	Tg	Trace speed mm/min	Approximate relative Magnification	Approx. damping
Rabaul Harbour Network (Cont.)						
KRT - Keravat Outstation						
Benioff Mc 50 Kg	Z	1.2	0.2	15	20% sensitivity	Critical
Benioff MC 50Kg	N/E	1.2	0.2	15	10% sensitivity	Critical
ULA - Ulamona Field Station						
Willmore portable	Z	0.6	0.25	60	3,000	underdamped
PIV - Piva Field Station						
Willmore portable	Z	0.6	0.25	60	3,000	underdamped
WAA - Waris Field Station						
Willmore portable	Z	0.6	0.25	60	3,000	underdamped
LAG - Cape Gloucester Field Station						
Willmore portable	Z	0.6	0.25	60	3,000	underdamped

o Signals from these stations are telemetered by land line to Helicorders (Geotech Mod. 2484) at the Central Observatory.

oo Signals from this station are telemetered via VHF to its Helicorder at the Central Observatory.

N.B. These field stations consist of a permanent building in which instruments are installed when necessary.

Details of emergency field stations, within the Territory will be listed when in operation.

TBL - Tabele Observatory						
Benioff VR 107.5Kg	Z	1.0	0.2	60	1,350	critical
(PAPUA)						
ESA - Esa'ala Observatory						
Benioff VR 107.5Kg	Z	1.0	0.2	15	36,000	critical
Benioff VR 107.5Kg	N,E	1.0	0.2	15	18,000	critical
Benioff VR 107.5Kg	Z/N/E	1.0	60.0	30	50% sensitivity	critical
AGE - Agenahambo Station						
Willmore portable	Z	0.6	0.25	60	3,000	underdamped

VR Variable Reluctance

MC Moving-coil

Relative magnification curves of seismograph systems installed in the stations controlled by the Rabaul Central Observatory are listed once a month on the P.E.A.

PRESENTATION OF DATA

(reviewed in November, 1967)

All times are reduced to Greenwich Mean Time (GMT), which is 10 hours behind Eastern Standard Time.

At RAB and Harbour Network, the time signal is marked every minute on each seismogram record from the Observatory crystal chronometer. Second marks from Radio signal VNG (Australia) are recorded on World-wide Standard System S.P.-N. component only according with the W.W.S.S. programme, at six hour intervals. Primary time is provided by W.W.S.S. equipment and secondary time by a Labtronic crystal chronometer with the accuracy of ± 5 ms per day compared with VNG (Australia) with the aid of a chronoscope.

At TBL and AGE, the time signal is derived from a spring driven chronometer (Mercer) and marked each minute on records. Time accuracy is determined by comparison with signals from WWVH daily. Linear correction is applied to the daily drift.

On all seismogram records time increases from left to right and time break is upward.

At RAB* and Harbour Network the recording drum of each seismograph is driven by a 110VAC 60Hz synchronous motor. The 110VAC is frequency regulated by a crystal chronometer.

* The Omori recording drum is driven by a nonregulated 50Hz frequency supply.

At ESA and KRT power for recorder motors is frequency regulated by a crystal chronometer at 50Hz. Power for AGE and TBL and field stations is supplied by a 50Hz free running oscillator.

Direction of Motion

Upward direction of ground motion corresponds to upward trace motion on vertical seismogram records. Direction of component of ground motion to North or East corresponds to upward trace motion on horizontal seismogram records.

Vertical trace motion from impulsive onset of longitudinal waves of compressional or dilatational ground movement is indicated by "u" or "d" accompanied by N,S,E, or W, as per trace motion amplitude on horizontal seismogram records, to represent vectorially the direction of ground motion. "+" or "-" indicates upward or downward motion of the ground respectively, from a wave not known to be of the longitudinal type.

Accuracy of Readings

When readings are given with a decimal figure, they are to 1/10 of a second, other readings have been made to the nearest half second.

Crustal Phases

Px, Sx Crustal phases, other than Pn and Sn for local and near earthquakes.

Felt Intensity

Information on maximum intensities of shocks reported felt is included. Intensities are given in Roman numerals based on the Modified Mercalli Scale, of 1931.

Determination of Epicentre

Where no source is cited, the epicentral distance in central angle degrees from the pertinent station and origin time for local and regional earthquakes, are carried out at the Central Observatory, Rabaul from the S-P travel times assuming a normal depth of the focus.

Geographical Designation of Epicentre

The regional names which follow the co-ordinates of epicentres located at the Central Observatory are meant only to supplement the co-ordinates and normally follow well known geographical rather than geological features. Use is made of the full degree blocks according to the method defined by E.A. Flinn and E.R. Engadhl in "A PROPOSED BASIS FOR GEOGRAPHICAL AND SEISMIC REGIONALIZATION", Seismic Data Laboratory Report No. 101, U.I.D. Inc., Alexandria, Virginia, 1964, adopted by the U.S.C.G.S. for computer requirements.

Magnitude Definition and Determination

M_L - Local Magnitude (Richter 1935) is calculated from the recorded trace amplitude of the Wood-Anderson torsion seismographs of stated physical constants installed at the Observatory in November, 1967)

Maximum trace amplitude (0 to peak) expressed in millimetres and tenths is measured directly on both components. Magnitude is determined independently and arithmetic mean taken. M_L values are given to the tenth of a unit.

The station correction factor is assumed to be zero until better known.

M_S - Surface Wave Magnitude (Gutemberg & Richter, 1956) is calculated from the amplitude of surface waves of period near 20 seconds for shallow distant earthquakes.

M_B - Body Wage Magnitude is calculated from the ratio of amplitude over period for body waves on S.P. Z of World-Wide Seismograph System only when depth is known. The magnification factor for the standard seismograph is taken into account.

m - Unified magnitude (Gutemberg & Richter, 1956) has the following relation to M_L, M_S, and M_B.

$$m = 1.7 + 0.8\ M_L - 0.01M^2_L$$
$$m = M_B \text{ (without correction)}$$
$$m = 2.5 + 0.63\ M_S$$

Local Magnitude of earthquakes recorded at RAB with a clear S-P interval is tabulated on a Day-Distance (in Central Angle Degrees) graph which is added to the PEA monthly.

Symbols

i - impulsive and sharply defined beginning of a phase.

e - emergent and poorly defined beginning of phase.

T - Period in seconds

A - Peak-to-Trough trace amplitude in millimetres.

GM - Ground Motion.

Dist- Distance in central degrees

H - Origin time

h - Focal depth in Kilometres

CBM - Confused by microseisms

PRESENTATION OF DATA (CONT.)

Remarks

Local	-	Typical signature of an earthquake with epicentre within 0.9°.
Near	-	Typical signature of an earthquake with epicentre between 0.9° and 9°.
Distant	-	Typical signature of an earthquake with epicentre between 9° and 45°.
Teleseism	-	Typical signature of an earthquake with epicentre more than 45°.
Traces	-	Any recorded disperse waves or very weak unknown earthquake phases.

Local and Near earthquakes will be classified Regional, and Distant earthquakes will be grouped with teleseisms if sheer waves and their reflections are unidentifiable.

G. D'ADDARIO,
Volcanologist in Charge

			T sec	A mm	GM	Dist	H	Remarks
17th April, 1968								
RAB	iPZ	022038.1	0.5	5.2	u	1½°	022012	C.B.M. M_L= 4.8
	iSN	58.5						
RAB	ePZ	084547.9	0.3	5.8	(d)	1¼°	084527	M_L= 4.3
	iZ	4604.0						
	eSN	5603½						
RAB	ePZ	121404.6	0.5	3.2	u	¼°	121358	M_L= 5.9
	eSN	1509½						
WAN	iPZ	121404.5			u			
SUL	iPZ	121404.4			u			
RAL	iPZ	121404.6			u			
VUL	iPZ	121403.9			u			
KRT	iPZ	121442	0.8	1.2	u			Regional
RAB	ePZ	145233	0.5	3.0	d	1½°	145207	M_L= 4.2
	iSN	52.9						
KRT	iPZ	145234			d	1½°	145208	
	eSN	53						
RAB	ePZ	151838			d			Teleseism
	eZ/	152046						
RAB	ePZ	195845	1.0	1.5	u			Bismark Sea
	LZ/	200014						
	MN/	0123						
WAN	ePZ	195845			u			
RAL	ePZ	195845½			u			
VUL	ePZ	195844			u			
18/4/68 RAB	iPZ	065802.2	0.5	13.0	d	1¾°	065733	M_L= 4.9
	iSN	24.6						
SUL	iPZ	065801.7			d			
RAL	iPZ	065801.9	0.2	10.7	d			
VUL	iPZ	065801.5			d			
RAB	eZ/	122139			+			Traces
RAB	iPZ	125044.0	0.5	2.0	u	4¾°	124931	M_L= 5.1
	iSN	5140.0						
KRT	ePZ	125042				4½°	124933	
	iSN	5135						
RAB	ePZ	165330	1.0	1.0	d			Teleseism
RAB	ePZ	181416			u			Teleseism
RAB	iPZ	203250.0	1.0	3.0	u	6½°	203113	M_L= 6.2
	iSN/	3405.0						
RAB	iPZ	215809.4	0.4	2.0	d	1¼°	215747	M_L= 4.0
	iSE	26.2						
KRT	iPZ	215807					215745	
	iSN	23½						
19th April, 1968								
RAB	ePZ	070620.0	0.5	4.0	u	½°	070606	M_L= 3.6
	iSE	30.0						
	iZ	41.0						
VUL	iPZ	014330.0	0.4		d			

		T sec	A mm	GM	Dist	H	Remarks
21st April, 1968 cont							
RAB iPZ	023849.5	0.5	2.6	u			Local
iSN	023854						
WAN iPZ	023849.2		2.0	u			
RAL iPZ	023849.0	0.2	6.0	u			
VUL iPZ	023849.1						
RAB ePZ	033039	0.4	1.0	d	1¼°	033015	
iSN	57.0						
eZ/	062952			+			Traces
RAB ePZ/	084204			u	(4½°)		Teleseism
RAB ePZ	101629			u	1¼°	101606	
eSE	46						
RAB iPZ	112519.5	0.4	5.0	u	1½°	112452	Epicentre approx 6°S. 152.5°E
iSN/	40						
WAN iPZ	112519	0.8	8.8	u			
RAL iPZ	112519.2	0.7	5.8	u			
VUL iPZ	112518.2		18.7	u			
KRT iPZ	112516			d			
RAB iPZ	124052.5	0.3	1.1	u			Regional
KRT ePZ	124054			u			Regional
RAB ePZ	144403½			(d)			(Regional)
KRT ePZ	144404.2			d			Regional
RAB ePZ	144949½	0.3	0.7	u			(Regional)
KRT iPZ	144949½	0.6	3.0				Regional
RAB ePZ	165227½			u			Teleseism
KRT ePZ	165225½			u			Teleseism
22nd April, 1968							
RAB eZ/	090049			-			Traces
RAB i(P)Z	142758.4			d			Distant
KRT iPZ	142804						Distant
23rd April, 1968							
RAB iPZ	095707.3	0.5	3.0	u	1¼°	095647	M_L= 4.1
iSE	22.5						
KRT iPZ	095705½						
RAB eiPZ	150033½	1.0	0.8	u			Distant
iZ	41.1						
KRT iPZ	150037	1.2	1.8	u			Distant
RAB iPZ	151526.2	0.5	2.5	d	1¾°	151458	M_L= 4.2
iSN	47.4						
KRT iPZ	151525½			u	1¼°	151502	
iSN	43½						

		T sec	A mm	GM	Dist	H	Remarks
23rd April, 1968 cont							
RAB iPZ	160040.0	1.0	2.0	d			Distant
KRT ePZ	160011			d			
RAB eZ/	165923			-			Traces
RAB iPZ	192121.8	0.5	2.0	u			Regional
KET iPZ	192120.2			u		192050	
iSE	43						
RAB eiPZ	204108½	1.0	1.5	d	76°		(Aleutian Islands)
iZ	09.3						
ePPZ/	4403						
eSN/	5056						
ePSN/	5118						
ePPSN/	27						
eSSN/	5543						
eSSSE/	5856						
e(Lq)N/	210058						
eMZ/	1133						
ESA'ALA							
13th March, 1968							
ESA e(P)Z	023827	0.3	0.5	d	14°	023816	
iSE	32						
ESA ePZ	033257	0.5	0.8	u			
ESA iPZ	100303	0.8	1.0	d			
ESA iPZ	120939	0.5	1.0	d			
ESA iPZ	203117½	0.4	0.4	u			
14/3/68 ESA iPZ	011532	0.4	0.4	d			
ESA iPZ	082007	0.3	0.8	d			
ESA iPZ	095318	0.3	4.0	d			
ESA iPZ	114012	0.4	0.5	d			
ESA iPZ	122322	0.3	0.6	d			
15th March, 1968							
No records due to maintenance							
16th March, 1968							
ESA i(P)Z	165506	0.4	0.3	d			
17th March, 1968							
ESA ePZ	171435½	0.4	0.2	u			
18th March, 1968							
ESA Willmore record unreadable							
L/P records motor failure							
19th March, 1968							
ESA iPZ	141446	0.3	1.5	u			
ESA ePZ	182750½	0.8	0.8	d			
20th March, 1968							
Nil recorded							

		T sec	A mm	CM	Dist	H	Remarks
21st March, 1968							
ESA ePZ	085957½			d			
ESA iPZ	095341	0.6	0.5	u			
ESA iPZ	200644			u			Distant
22nd March, 1968							
ESA ePZ	102016½						Distant
ESA iPZ	183431		0.6	d			
ESA ePZ	202105½						
ESA ePZ	214322						
23rd March, 1968							
Nil Recorded							
24th March, 1968							
ESA ePZ	090951½						
ESA ePZ	160714½						
25th March, 1968							
ESA iPZ	123806½	0.4	0.5	u			
ESA iPZ	163356½	0.6	-	d			
26th March, 1968							
ESA iPZ	194646½			u			
27th March, 1968							
ESA ePZ	055856½						Regional
ESA ePZ	144320						Distant
ESA ePZ	180836	0.6	2.0	d			Local
28th March, 1968							
ESA ePZ	204535½	0.8	2.0	d			
29th March, 1968							
ESA iPZ	131739½			u			Local
30th March, 1968							
ESA ePZ	080647						Regional
31st March, 1968							
ESA ePZ	080720½						Regional
1st April, 1968							
ESA iPZ	021711½	0.7	0.7	u			Near
ESA iPZ	022526½						Regional
ESA iPZ	032132½	1.0	2.0	d			Regional
ESA iPZ	035054½	1.0					
ESA iPZ	072134½	1.0		d			Distant
2nd April, 1968							
ESA ePZ	094513	0.8	0.5	d			
ESA iPZ	121336						Local
3rd April, 1968							
Nil recorded							
4th April, 1968							
ESA iPZ	091330½	0.5		u			Regional

5th April, 1968		T sec	A mm	GM	Dist	H	Remarks
ESA iPZ	043317			d			
ESA iPZ	045505	0.8	1.0	u			
6th April, 1968							
ESA iPZ	153243½	0.2	0.2				
7th April, 1968							
ESA iPZ	022218½	1.0	1.0	d			
ESA iPZ	053751½	1.0	1.0	d			
8th April, 1968							
ESA iPZ	135824½	0.6	0.6	d			
ESA iPZ	155455½	0.5	2.0	d			
ESA iPZ	155856½	0.8	1.0	d			
ESA e(P)Z	172539½		0.9				
TABELE							
3rd April, 1968							
	Nil Recorded						
4th April, 1968							
TBL ePZ	064250						Distant
5th April, 1968							
	Nil recorded						
6th April, 1968							
TBL ePZ	175739						Distant
7th April, 1968							
	Nil recorded						
8th April, 1968							
	Nil Recorded						
9th April, 1968							
	Instrument not switched on.						
AGENAHAMBO							
30th March, 1968							
AGE	Nil Recorded						
31st March, 1968							
AGE ePZ	002503						
AGE ePZ	080652½						
AGE eiPZ	231730½			u	3½°	231634	
iSZ	1813½						
1st April, 1968							
AGE iPZ	012453			u			
AGE ePZ	022144			u	3½°	022050	
eSZ	2225						
2nd April, 1968							
AGE iPZ	065711½			u			
3rd April, 1968							
	Nil Recorded						

		T sec	A mm	GM	Dist	H	Remarks
4th April, 1968							
AGE iPZ	064250				2¾°	064205	
iSZ	4324½						
AGE iPZ	091350			d			Regional
5th April, 1968							
AGE i(P)Z	153224				2¾°	153137	
iSZ	3259½						
AGE i(P)Z	225805½	0.5	2.0	u	3¼°	225716	
iSZ	43						
6th April, 1968 (from 0001 - 0304)							
AGE e(P)Z	045[illegible]52						

Central Observatory, Rabaul

G.W. D'ADDARIO,
Volcanologist-in-Charge

30th April, 1968.

TERRITORY OF PAPUA AND NEW GUINEA
GEOLOGICAL AND VOLCANOLOGICAL BRANCH
VOLCANOLOGICAL SECTION

PRELIMINARY EARTHQUAKE ANALYSIS
RABAUL CENTRAL OBSERVATORY
1968

Rabaul	RAB	From: APR. 24. 1968 To: APR. 30. 1968
Rabaul Harbour Network	WAN SUL RAL TAV VUL	From: APR. 24. 1968 To: APR. 30. 1968
Keravat	KRT	From: APR. 24. 1968 To: APR. 30. 1968
Esa'ala	ESA	From: To:
Tabele	TBL	From: APR. 9. 1968 To: APR. 16. 1968
Agenahambo	AGE	From: APR. 6. 1968 To: APR. 20 1968
Waris	WAA	Not Operational
Ulamona	ULA	Not Operational
Piva	PIV	Not Operational
Cape Gloucester	LAG	Not Operational

STATION PERSONNEL

RAB Central Observatory, Rabaul

Volcanologist-in-Charge	G.W. D'Addario
Volcanologist	R.F. Heming
Seismologist	(Position vacant)
Seismogram Readers	D.J. Cook, H. Carrick
Senior Technical Officer	N.O. Myers
Technical Officer	R.J. Conway
Volcanological Assistants	L. Topue, M. Gaiam, V. Kaita.
Technical Assistant	F. Daimbari
Trainee Volcanological Assistants	B. Talai, M. Salaiau, C. Matapit
Secretary	

KRT Keravat Outstation

Observer (part-time)	G.E. Chorick

TBL Tabele Observatory

Observer	E. Ravian

ESA Esa'ala Observatory

Observer	F. Dira

AGE Agenahambo Outstation

Observer (part-time)	Br. B. Hughes

The Rabaul Preliminary Earthquake Analysis (PEA) is produced by the staff under the direction of the Volcanologist-in-Charge from whom additional information and photocopies of seismogram records from all stations may be obtained on request.

Please address all communications to:-

Volcanologist-in-Charge,
Central Observatory,
P.O. Box 386,
RABAUL, T.P. & N.G.

SEISMOGRAPH STATIONS

Station (NEW GUINEA)	Code	South Latitude	East Longitude	Elev. (m)	Foundation
Rabaul	RAB	04°11'28.6"	152°10'11.4"	183.5	Basalt Flow
Wanliss Street	WAN*	04°11'39.6"	152°10'32.5"	25.0	Basalt Flow
Sulphur Creek	SUL*	04°13'09.8"	152°10'33.3"	8.5	Unconsolidated volcanic ash
Rabalanakaia	RAL*	04°13'13.0"	152°12'07.0"	91.0	Unconsolidated volcanic ash
Tavurvur	TAV*	04°13'52.2"	152°13'12.9"	27.0	Andesite Flow
Taviliu	VUL*	04°16'58.2"	152°08'44.6"	332.3	Unconsolidated volcanic ash
Keravat	KRT	04°21'10.5"	152°03'06"	20.0	Alluvium
Tabele	TBL	04°06'04.67"	145°00'41.37"	179.5	Basalt Flow
Waris	WAA	04°07'00"	145°06'00"	48.0	Lapilli Tuff
Piva	PIV	06°12'00"	155°03'30"	60.0	Alluvium
Cape Gloucester	LAG	04°27'20"	148°26'00"	24.0	Lapilli Tuff
Ulamona (PAPUA)	ULA	04°59'24.0"	151°16'30.0"	17.0	Lapilli Tuff
Agenahambo	AGE	08°48'49"	148°05'56"	303.0	Uncolsolidated volcanic ash
Esa'ala	ESA	09°44'18.2"	150°48'50.7"	46.4	Granite Gneiss

* Rabaul Harbour Network

STATION INSTRUMENTATION

Station & Instruments (NEW GUINEA)	Comp.	To	Tg	Trace Speed m/min	Approximate relative Magnification	Approximate damping
Rabaul Central Observatory RAB						
World-wide Standard	Z	1.0	0.74	60	12,500	Critical
	N,E	1.0	0.74	60	6,250	Critical
	Z/N/E/	15.0	100.0	15	750	Critical
Benioff VR 14.7Kg	Zh	1.0	0.02	180+	4,000	Critical
+ Recording is triggered by the onset of any earthquake with pre-determined minimum amplitude. Recorder is stopped automatically by hour break pulse.						
Omori 15Kg	Nc	3.6	-	24	12	10.1 Air
Omori 15Kg	Ec	3.8	-	24	10	10.1 Air
Wood-Anderson Torsion	Na,Ea	0.8	-	60	2,800	Critical
Rabaul Harbour Netowrk						
Readings from the Harbour Network are entered in the PEA only for earthquakes, with impulsive and sharply defined onset of phases.						
WAN°	Benioff VR 14.7Kg Z	1.0	0.02	60	5,240	Critical
SUL°	Benioff VR 14.7Kg Z	1.0	0.02	60	2,850	Critical
RAL°	Benioff VR 14.7Kg Z	1.0	0.02	60	8,075	Critical
TAV°	Benioff VR 14.7Kg Z	1.0	0.02	60	20,900	Critical
VUL°	Benioff VR 14.7Kg Z	1.0	0.02	60	5,000	Critical

STATION INSTRUMENTATION

Station & Instruments	Comp.	To	Tg	Trace speed mm/min	Approximate relative Magnification	Approx. damping
Rabaul Harbour Network (Cont.)						
KRT - Keravat Outstation						
Benioff Mc 50 Kg	Z	1.2	0.2	15	20% sensitivity	Critical
Benioff MC 50Kg	N/E	1.2	0.2	15	10% sensitivity	Critical
ULA - Ulamona Field Station						
Willmore portable	Z	0.6	0.25	60	3,000	underdamped
PIV - Piva Field Station						
Willmore portable	Z	0.6	0.25	60	3,000	underdamped
WAA - Waris Field Station						
Willmore portable	Z	0.6	0.25	60	3,000	underdamped
LAG - Cape Gloucester Field Station						
Willmore portable	Z	0.6	0.25	60	3,000	underdamped

o Signals from these stations are telemetered by land line to Helicorders (Geotech Mod. 2484) at the Central Observatory.

oo Signals from this station are telemetered via VHF to its Helicorder at the Central Observatory.

N.B. These field stations consist of a permanent building in which instruments are installed when necessary.

Details of emergency field stations, within the Territory will be listed when in operation.

TBL - Tabele Observatory						
Benioff VR 107.5Kg	Z	1.0	0.2	60	1,350	critical
(PAPUA)						
ESA - Esa'ala Observatory						
Benioff VR 107.5Kg	Z	1.0	0.2	15	36,000	critical
Benioff VR 107.5Kg	N,E	1.0	0.2	15	18,000	critical
Benioff VR 107.5Kg	Z/N/E	1.0	60.0	30	50% sensitivity	critical
AGE - Agenahambo Station						
Willmore portable	Z	0.6	0.25	60	3,000	underdamped

VR Variable Reluctance

MC Moving-coil

Relative magnification curves of seismograph systems installed in the stations controlled by the Rabaul Central Observatory are listed once a month on the P.E.A.

PRESENTATION OF DATA

(reviewed in November, 1967)

All times are reduced to Greenwich Mean Time (GMT), which is 10 hours behind Eastern Standard Time.

At RAB and Harbour Network, the time signal is marked every minute on each seismogram record from the Observatory crystal chronometer. Second marks from Radio signal VNG (Australia) are recorded on World-wide Standard System S.P.-N. component only according with the W.W.S.S. programme, at six hour intervals. Primary time is provided by W.W.S.S. equipment and secondary time by a Labtronic crystal chronometer with the accuracy of ± 5 ms per day compared with VNG (Australia) with the aid of a chronoscope.

At TBL and AGE, the time signal is derived from a spring driven chronometer (Mercer) and marked each minute on records. Time accuracy is determined by comparison with signals from WWVH daily. Linear correction is applied to the daily drift.

On all seismogram records time increases from left to right and time break is upward.

At RAB* and Harbour Network the recording drum of each seismograph is driven by a 110VAC 60Hz synchronous motor. The 110VAC is frequency regulated by a crystal chronometer.

* The Omori recording drum is driven by a nonregulated 50Hz frequency supply.

At ESA and KRT power for recorder motors is frequency regulated by a crystal chronometer at 50Hz. Power for AGE and TBL and field stations is supplied by a 50Hz free running oscillator.

Direction of Motion

Upward direction of ground motion corresponds to upward trace motion on vertical seismogram records. Direction of component of ground motion to North or East corresponds to upward trace motion on horizontal seismogram records.

Vertical trace motion from impulsive onset of longitudinal waves of compressional or dilatational ground movement is indicated by "u" or "d" accompanied by N,S,E, or W, as per trace motion amplitude on horizontal seismogram records, to represent vectorially the direction of ground motion. "+" or "-" indicates upward or downward motion of the ground respectively, from a wave not known to be of the longitudinal type.

Accuracy of Readings

When readings are given with a decimal figure, they are to 1/10 of a second, other readings have been made to the nearest half second.

Crustal Phases

Px, Sx Crustal phases, other than Pn and Sn for local and near earthquakes.

Felt Intensity

Information on maximum intensities of shocks reported felt is included. Intensities are given in Roman numerals based on the Modified Mercalli Scale, of 1931.

Determination of Epicentre

Where no source is cited, the epicentral distance in central angle degrees from the pertinent station and origin time for local and regional earthquakes, are carried out at the Central Observatory, Rabaul from the S-P travel times assuming a normal depth of the focus.

Geographical Designation of Epicentre

The regional names which follow the co-ordinates of epicentres located at the Central Observatory are meant only to supplement the co-ordinates and normally follow well-known geographical rather than geological features. Use is made of the full degree blocks according to the method defined by E.A. Flinn and E.R. Engadhl in "A PROPOSED BASIS FOR GEOGRAPHICAL AND SEISMIC REGIONALIZATION", Seismic Data Laboratory Report No. 101, U.I.D. Inc., Alexandria, Virginia, 1964, adopted by the U.S.C.G.S. for computer requirements.

Magnitude Definition and Determination

M_L - Local Magnitude (Richter 1935) is calculated from the recorded trace amplitude of the Wood-Anderson torsion seismographs of stated physical constants (installed at the Observatory in November, 1967)

Maximum trace amplitude (0 to peak) expressed in millimetres and tenths is measured directly on both components. Magnitude is determined independently and arithmetic mean taken. M_L values are given to the tenth of a unit.

The station correction factor is assumed to be zero until better known.

M_S - Surface Wave Magnitude (Gutemberg & Richter, 1956) is calculated from the amplitude of surface waves of period near 20 seconds for shallow distant earthquakes.

M_B - Body Wege Magnitude is calculated from the ratio of amplitude over period for body waves on S.P.-Z of World-Wide Seismograph System only when depth is known. The magnification factor for the standard seismograph is taken into account.

m - Unified magnitude (Gutemberg & Richter, 1956) has the following relation to M_L, M_S, and M_B.

$$m = 1.7 + 0.8\ M_L - 0.01M^2_L$$

$$m = M_B \text{ (without correction)}$$

$$m = 2.5 + 0.63\ M_S$$

Local Magnitude of earthquakes recorded at RAB with a clear S-P interval is tabulated on a Day-Distance (in Central Angle Degrees) graph which is added to the PEA monthly.

Symbols

i - impulsive and sharply defined beginning of a phase.

e - emergent and poorly defined beginning of phase.

T - Period in seconds

A - Peak-to-Trough trace amplitude in millimetres.

GM - Ground Motion.

Dist- Distance in central degrees

H - Origin time

h - Focal depth in Kilometres

CBM - Confused by microseisms

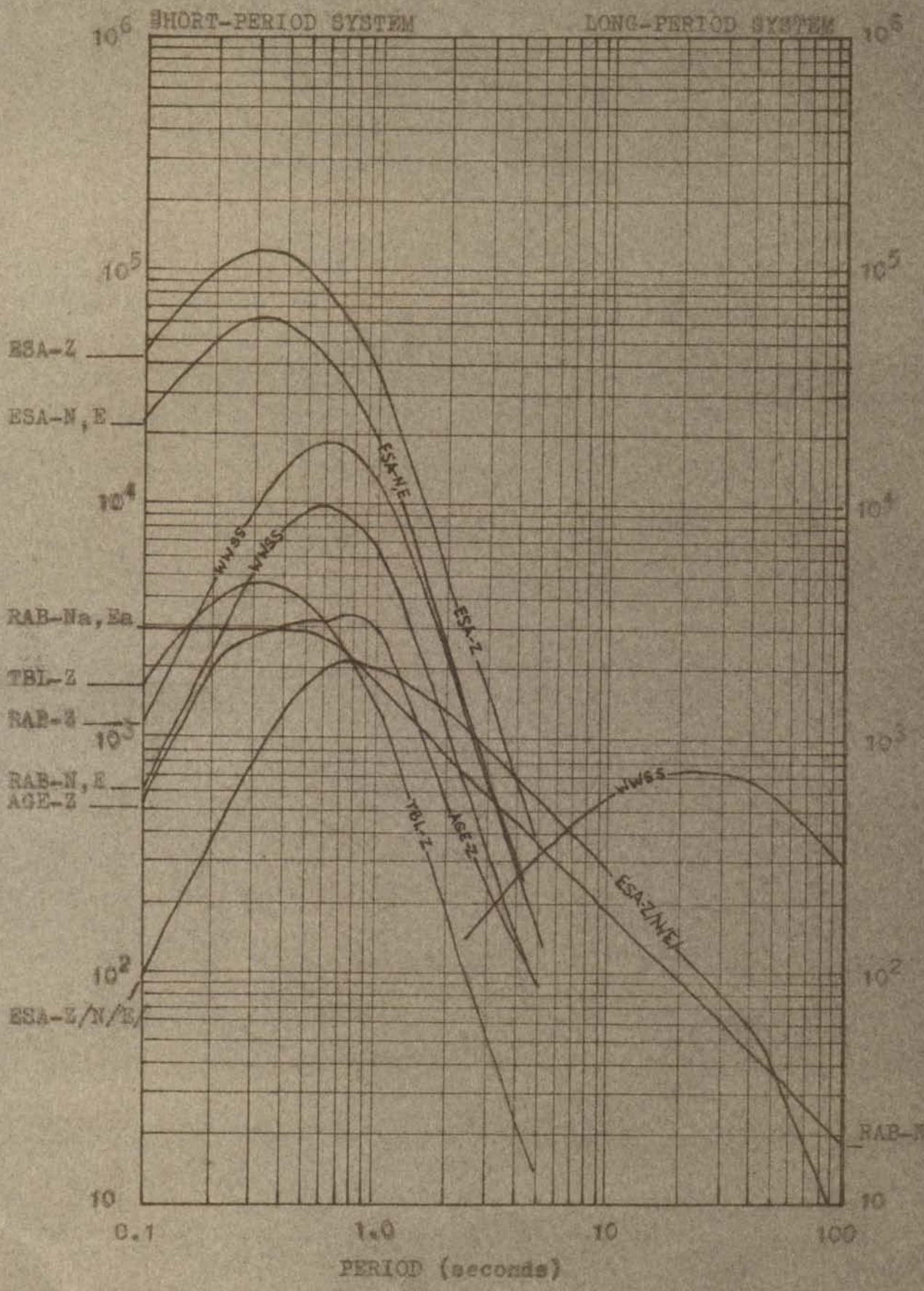
PRESENTATION OF DATA (CONT.)

Remarks

Local	-	Typical signature of an earthquake with epicentre within 0.9°.
Near	-	Typical signature of an earthquake with epicentre between 0.9° and 9°.
Distant	-	Typical signature of an earthquake with epicentre between 9° and 45°.
Teleseism	-	Typical signature of an earthquake with epicentre more than 45°.
Traces	-	Any recorded disperse waves or very weak unknown earthquake phases.

Local and Near earthquakes will be classified Regional, and Distant earthquakes will be grouped with Teleseisms if sheep waves and their reflections are unidentifiable.

G. D'ADDARIO,
Volcanologist in Charge

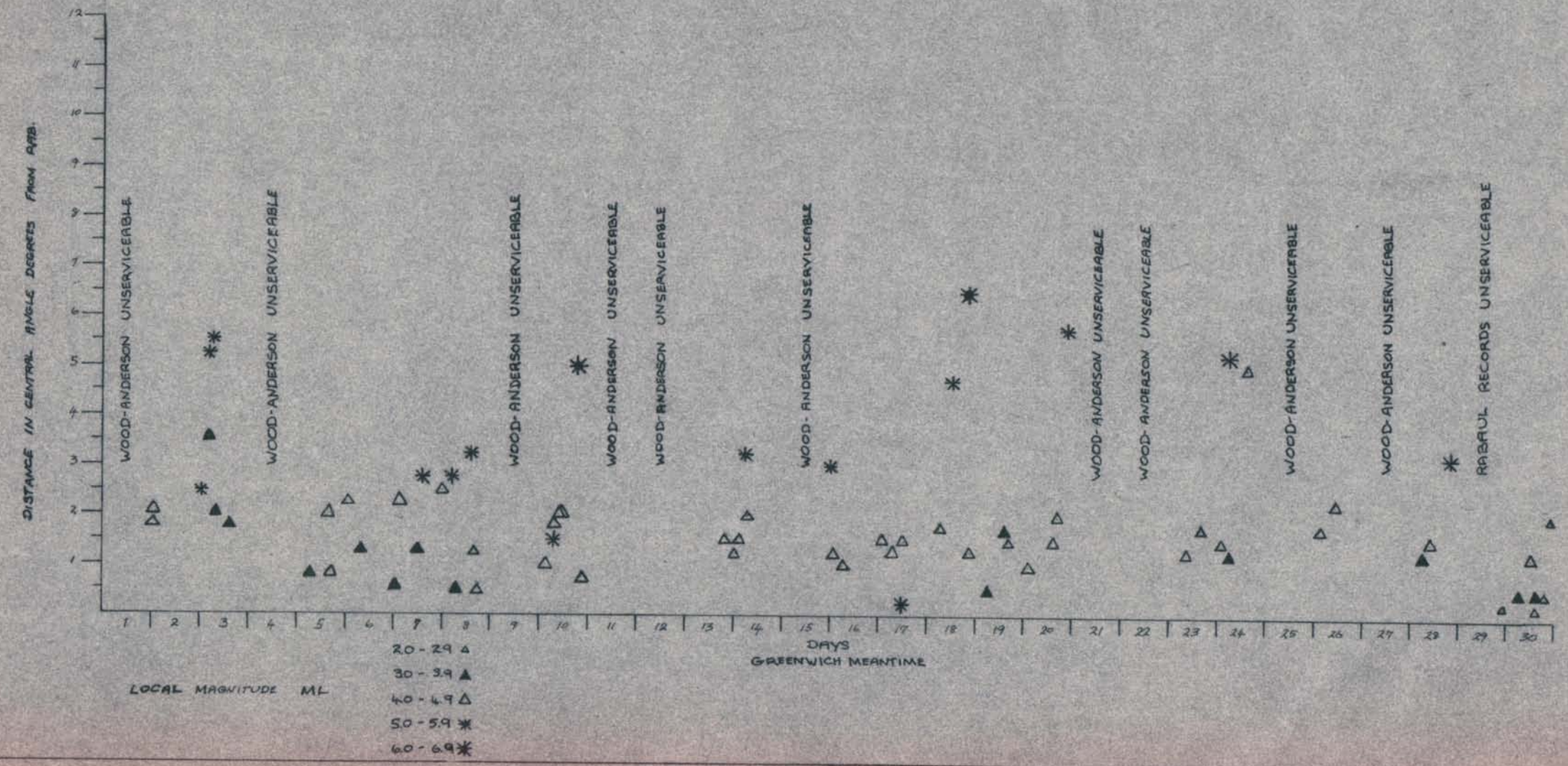


FREQUENCY RESPONSE CURVES OF THE INSTRUMENTS

GSDA Rpt. 67

MAGNITUDE OF REGIONAL EARTHQUAKES WITH A CLEAR S-P INTERVAL

APRIL 1968



			T sec	A mm	GM	Dist	H	Remarks
24th April, 1968								
RAB	ePZ	003020½			u			(Regional)
RAB	iPZ iSN	022424.0 45.3	0.3	2.0	d	1½°	022356	M_L= 4.0
VUL	iPZ	22.9	0.3	13.7	u			
RAB	eZ/	052439			u	(1¾°)		
RAB	iPZ iSE	060520.0 0620.9	1.0		u	5½°	060401	M_L= 5.7
RAB	iPZ iSN	062443.0 58.9	0.3	1.1	d	1¼°	062422	M_L= 3.8
RAB	eZ/	092843			+			Traces
RAB	ePZ	121428			d			(Distant shock)
RAB	ePZ eSN	140030½ 0130	0.4	(38)	d	5°	135930	M_L= 4.9
WAN	iPZ	30.5	0.3	13.7	u			
RAL	iPZ	30.8	0.7	17.0	u			
VUL	iPZ	30.5			u			
KRT	iPZ e(S)E	140029½ 0126½			u	(5°)	1400(15)	C.B.M.
RAB	ePZ	160644			d			Teleseism
RAB	eZ/	170024			-			Traces
RAB	ePZ	170237			d			Local
25th April, 1968								
RAB	iPZ iSE	093126.6 51.5	0.5	2.3	d	2°	093153	
RAB	iPZ iSN	170634.7 56.8	0.5	5.0	u	1¾°	170606	
RAL	iPZ	34.8		5.2	u			
VUL	iPZ	33.5			u			
KRT	iPZ	170634		11.0	u			Regional
RAB	eiPZ iZ iSN/	171548 49.0 1654.0	0.5	4.0	u	5¾°	171423	
VUL	iPZ	48.1	0.3		u			
KRT	eiPZ iPZ e(S)N	171548 49 1700	0.8		u	(6¼°)	1714(15)	
RAB	iPZ iSN/	174319.6 4415.0	0.5	12.0	d	4¾°	174208	
WAN	iPZ	19.9	0.2	7.1	d			
VUL	iPZ	20.0	0.3	5.2	d			
KRT	iPZ eSN	174321 4415½	0.8	6.0	d	4¾°	174210	
RAB	iPZ iSN	193502.1 22.0	0.5	6.0	d	1½°	193436	

25th April, 1968 cont			T sec	A mm	GM	Dist	H	Remarks
VUL	iPZ	01.0			d			
KRT	iPZ	193459½			d	(1¼°)	1934(37)	
	e(S)N	3516½						
RAB	ePZ	213235			u	39°		
	eSE/	3823						
26th April, 1968								
RAB	e(P)Z	003012½	0.5	2.5	d	1¼°	002948	
	iSE	31.0						
KRT	ePZ	003007½						C.B.M.
	eSN	29½						
RAB	ePZ/	004932			u	(38°)		
	ePPZ/	5058						
	e(S)E/	5524						
	eLQN/	5808						
	eMZ/	010246						
RAB	iPZ	034633.0	0.5	7.0	u	1¾°	034604	M_L= 4.8
	iSN/	55.0						
WAN	iPZ	33.0		4.5	u			
RAL	iPZ	33.0		8.8	d			
VUL	iPZ	32.2			u			
KRT	iPZ	034634.6						
RAB	iPZ	112022.2	0.5	3.5	u	2¼°	111945	M_L= 4.4
	iSE	50.0						
WAN	iPZ	22.0	0.4	1.5	u			
VUL	iPZ	21.5	0.4	11.0	u			
KRT	iPZ	112022.6	0.6	2.6	u	2°	111950	
	iSN	46.0						
RAB	eZ/	133852			-			Traces
RAB	eZ/	143628			+			Traces
RAB	iPZ	151317.0	1.0	3.0	u			Distant
KRT	iPZ	151321.6	1.4	3.0	d			Distant
RAB	eZ/	154338			+			Traces
RAB	iPZ	180610.5	0.6	1.2	u			Regional
VUL	iPZ	10.0	0.5	2.0	u			
KRT	iPZ	180616.4	0.6	2.6	u			Regional
RAB	eZ/	183642			+			Traces
27th April, 1968								
RAB	ePZ	011123	0.4	1.0	(u)			Local
RAB	ePZ	014430	0.5	2.0	d			Regional
RAB	iPZ	055338.8	0.3	1.0	d	1¼°	055315	
	eSN	56½						

27th April, 1968 cont			T sec	A mm	GM	Dist	H	Remarks
RAB	ePZ eSN	060629½ 0702	0.3	5.0	d	2¾°	060546	
RAL	iPZ	29.0	0.2	5.0	u			
VUL	iPZ	30.0	0.2	5.1	u			
RAB	eZ/	110138	0.5	1.5	d			Teleseism?
RAB	ePZ eSN	142243½ 2305½	0.3	0.5	u	1¾°	142214	
KRT	iPZ e(S)N	142240½ 2305			u	(2°)	1422(08)	
RAB	iPZ	142612.8	0.5	1.0	d			Teleseism
KRT	ePZ	142614			d			Teleseism
RAB	ePZ iSN	173818 32.2	0.4	2.0	d	1°	173759	
VUL	iPZ	17.6		7.7	d			
KRT	iPZ i(S)N	173819 37			u	(1½°)	1737(55)	
RAB	iPZ iSN	233451.9 3514.9	0.5	6.0	d	1¾°	233422	M_L= 4.9
WAN	iPZ	233451.8			d			
RAL	iPZ	233451.8	0.8	1.2	d			
VUL	iPZ	233451.0		7.2	d			
28th April, 1968								
RAB	iPZ	042727.8	1.0	3.6	d			(Distant)
RAB	iPZ iSN	064537.0 54.5	0.5	4.0	d	1¼°	064514	M_L= 3.9
VUL	iPZ	064536.4			d			
RAB	iPZ eSN	105539.3 5601	0.4	2.3	d	1½°	105512	M_L= 4.5
VUL	iPZ	105539.0	0.3	6.4	d			
RAB	ePZ iSN	192300 39.0	0.5	5.2	d	3¼°	192209	M_L= 5.9
VUL	iPZ	192300.4			d			
KRT	eiPZ	192301	1.0	4.0	d			Regional
RAB	iPZ iSN	192714.2 33.6	0.6	2.0	u	1½°	192649	In coda of preceeding shock
KRT	iPZ eSN	192710½ 27			u	1¼°	192648	
RAB	ePZ iSN	202333 50.7	0.4	2.2	u	1¼°	202310	

29th April, 1968.			T sec	A mm	GM	Dist		H	Remarks
RAB	iPZ iPPZ/ iPPPZ/ eSN/	004732.1 54 4804 5114	1.0	8.9	d	20°			
WAN	iPZ	4732.3	1.0	4.5	d				
RAL	iPZ	4732.5	1.0	5.8	d				
VUL	iPZ	4733.4	0.5	16.2	d				
No S.P. records between 0454 and 2300									
VUL	iPZ	015830.5	0.5	2.0	u				
WAN	iPZ	085006.0			d				
VUL	iPZ	5004.9	0.4		d				
VUL	iPZ	085634.9	0.3	2.0	d				
VUL	iPZ	100940.8							
VUL	iPZ	102305.9	0.3	6.8	u				
RAL	iPZ	173432.8			d				
RAB	eZ/	182038			+				Traces
RAB	iPZ iSN	230037.2 42.8	0.4	4.0	u	¼°		230019	M_L= 2.8
30th April, 1968.									
RAB	iPZ eSN	063524.0 32½			d	½°		063512	M_L= 3.5
RAB	ePZ iSN	124800.5 18.7	0.8	1.6	d	1¼°		124737	M_L= 4.7
WAN	iPZ	02.0		18.2	u				
SUL	iPZ	01.5	0.2	9.4	u				
VUL	iPZ	01.0			d				
KRT	iPZ	124801½			d				Regional
RAB	ePZ	132129½	0.3	3.1	u				Local
KRT	ePZ	132133							C.B.M.
RAB	iPZ iSE	141611.2 19.8	0.4	6.7	u	½°		141559	M_L= 3.7
WAN	iPZ	11.8		3.3	u				
VUL	iPZ	13.7	0.3	5.4	u				
KRT	iPZ e(S)N	141615 24½	0.4	3.0	u	(¾°)		1416(02)	
RAB	ePZ iSE	155305 11.3	0.4	3.1	u	¼°		155257	M_L= 2.2
KRT	ePZ	155308½			u				C.B.M.Local
RAB	ePZ iSE	181622 29.8	0.4	3.0	u	½°		181611	M_L= 2.7
KRT	ePZ	181625			u				Local

			T sec	A mm	GM	Dist	H	Remarks
30th April, 1968 (cont'd)								
RAB	eZ/	182332			-			Traces
	eZ/	5206			-			Traces
RAB	ePZ	214001½	0.3	6.0	u	2°	213928	M_L = 4.6
	iSE	26.0						
VUL	iPZ	03.7	0.4	5.2	u			
TABELE								
9th April, 1968.								
TBL			NIL RECORDED					
10th April, 1968.								
TBL	iPZ	224830½	0.6	11.0	u			Local
11th April, 1968.								
TBL	ePZ	105335½			d			Distant
TBL	ePZ	122836½						Distant
TBL	iPZ	204036	0.5	17.5	d			Local
12th April, 1968.								
TBL			NIL RECORDED					
13th April, 1968.								
TBL	iPZ	173400½	0.5	9.0	d			Regional
TBL	iPZ	211914½	0.4	42.0	u			Local
14th April, 1968.								
TBL	e(P)Z	014826						Distant
TBL	iPZ	054504½	1.0	2.0	d	¼°	054554	
	iSZ	13½						
TBL	ePZ	074006½			d			
15th April, 1968.								
TBL	iPZ	074552	0.5	2.0	d	½°	074540	
	iSZ	4702						

Very strong microseismic activity between 15/1300 - 16/1400 hrs.

16th April, 1968.								
TBL	ePZ	065606						Distant
AGENAHAMBO								
6th April, 1968.								
AGE	i(P)Z	083600			u			Deep
7th April, 1968.								
AGE	iPZ	203815	0.5	1.2	u			Local

			T sec	A mm	GM	Dist	H	Remarks
7th April, 1968 (cont'd).								
AGE	eiPZ	203909	0.6	1.0	d			
AGE	iPZ	232412½	0.5	1.8	d	2½°	232331	
	iSZ	44						
8th April, 1968.								
AGE	ePZ	140013½						Local
9th April, 1968.								
AGE	iPZ	223912	0.6	0.8	u			Local
AGE	ePZ	223954½	0.5	1.2				In coda of preceding shock
10th April, 1968.								
AGE	ePZ	042805½	0.2	1.2	u			
	iSZ	08						
AGE	iPZ	081035	0.6	1.5	d	4¾°	080922	
	iSZ	1131						
AGE	iPZ	224842½				3¼°	224750	
	iSZ	4923						
11th April, 1968.								
Nil recorded from 0001 to 0816								
Records unserviceable from 0816 to 2400								
12th April, 1968.								
AGE			Nil recorded					
13th April, 1968.								
AGE	iPZ	173407½	0.6	2.0	d			Deep
	iZ	50½						
14th April, 1968.								
AGE	ePZ	004711½						Regional
AGE	iPZ	040821	0.4	1.5	d			
15th April, 1968.								
AGE	ePZ	030947½						C.B.M.
AGE	ePZ	125928½						
AGE	iPZ	174743			d			
AGE	ePZ	174842½				¾°	174827	In coda of preceding shock
	eSZ	53½						
16th April, 1968.								
AGE	iPZ	084256			d			
AGE	iPZ	184107½			u			C.B.M.
17th April, 1968.								
AGE	ePZ	121532½	0.5	0.5	d			Regional
18th April, 1968.								
AGE			Nil recorded					

PEA APR.68 No. 18

	T sec	A mm	GM	Dist	H	Remarks

19th April, 1968.

AGE Nil recorded

20th April, 1968.

AGE ePZ 034741

C.B.M.
Regional

Rabaul Central Observatory,
6th May, 1968.

(G.W. D'ADDARIO)
Volcanologist-in-Charge

TERRITORY OF PAPUA AND NEW GUINEA
GEOLOGICAL AND VOLCANOLOGICAL BRANCH
VOLCANOLOGICAL SECTION

PRELIMINARY EARTHQUAKE ANALYSIS
RABAUL CENTRAL OBSERVATORY
1968

Rabaul	RAB	From: 1ST.MAY,1968 To: 7TH.MAY,1968
Rabaul Harbour Network	WAN SUL RAL TAV VUL	From: 1ST.MAY,1968 To: 7TH.MAY,1968
Keravat	KRT	From: 1ST.MAY,1968 To: 7TH.MAY,1968
Esa'ala	ESA	From: 23RD.APRIL,1968 To: 30TH.APRIL,1968
Tabele	TBL	From: 17TH.APRIL,1968 To: 23RD.APRIL,1968
Agenahambo	AGE	From: 20TH.APRIL,1968 To: 26TH.APRIL,1968
Waris	WAA	Not operational
Ulamona	ULA	Not operational
Piva	PIV	Not operational
Cape Gloucester	LAG	Not operational

SEISMOGRAPH STATIONS

Station (NEW GUINEA)	Code	South Latitude	East Longitude	Elev. (m)	Foundation
Rabaul	RAB	04°11'28.6"	152°10'11.4"	183.5	Basalt Flow
Wanliss Street	WAN*	04°11'39.6"	152°10'32.5"	25.0	Basalt Flow
Sulphur Creek	SUL*	04°13'09.8"	152°10'33.3"	8.5	Unconsolidated volcanic ash
Rabalanakaia	RAL*	04°13'13.0"	152°12'07.0"	91.0	Unconsolidated volcanic ash
Tavurvur	TAV*	04°13'52.2"	152°13'12.9"	27.0	Andesite Flow
Taviliu	VUL*	04°16'58.2"	152°08'44.6"	332.3	Unconsolidated volcanic ash
Keravat	KRT	04°21'10.5"	152°03'06"	20.0	Alluvium
Tabele	TBL	04°06'04.67"	145°00'41.37"	179.5	Basalt Flow
Waris	WAA	04°07'00"	145°06'00"	48.0	Lapilli Tuff
Piva	PIV	06°12'00"	155°03'30"	60.0	Alluvium
Cape Gloucester	LAG	04°27'20"	148°26'00"	24.0	Lapilli Tuff
Ulamona (PAPUA)	ULA	04°59'24.0"	151°16'30.0"	17.0	Lapilli Tuff
Agenahambo	AGE	08°48'49"	148°05'56"	303.0	Uncolsolidated volcanic ash
Esa'ala	ESA	09°44'16.2"	150°48'50.7"	46.4	Granite Gneiss

* Rabaul Harbour Network

STATION INSTRUMENTATION

Station & Instruments (NEW GUINEA)	Comp.	To	Tg	Trace Speed mm/min	Approximate relative Magnification	Approximate damping
Rabaul Central Observatory RAB						
World-wide Standard	Z	1.0	0.74	60	12,500	Critical
	N,E	1.0	0.74	60	6,250	Critical
	Z/N/E/	15.0	100.0	15	750	Critical
Benioff VR 14.7Kg	Zh	1.0	0.02	180+	4,000	Critical
+ Recording is triggered by the onset of any earthquake with pre-determined minimum amplitude. Recorder is stopped automatically by hour break pulse.						
Omori 15Kg	Nc	3.6	-	24	12	10.1 Air
Omori 15Kg	Ec	3.8	-	24	10	10.1 Air
Wood-Anderson Torsion	Na,Ea	0.8	-	60	2,800	Critical
Rabaul Harbour Netowrk						
Readings from the Harbour Network are entered in the PEA only for earthquakes, with impulsive and sharply defined onset of phases.						
WAN°	Benioff VR 14.7Kg	Z	1.0	0.02	60	5,240	Critical
SUL°	Benioff VR 14.7Kg	Z	1.0	0.02	60	2,850	Critical
RAL°	Benioff VR 14.7Kg	Z	1.0	0.02	60	8,075	Critical
TAV°	Benioff VR 14.7Kg	Z	1.0	0.02	60	20,900	Critical
VUL°	Benioff VR 14.7Kg	Z	1.0	0.02	60	5,000	Critical

STATION INSTRUMENTATION

Station & Instruments	Comp.	To	Tg	Trace speed mm/min	Approximate relative Magnification	Approx. damping
Rabaul Harbour Network (Cont.)						
KRT - Keravat Outstation						
Benioff Mc 50 Kg	Z	1.2	0.2	15	20% sensitivity	Critical
Benioff MC 50Kg	N/E	1.2	0.2	15	10% sensitivity	Critical
ULA - Ulamona Field Station						
Willmore portable	Z	0.6	0.25	60	3,000	underdamped
PIV - Piva Field Station						
Willmore portable	Z	0.6	0.25	60	3,000	underdamped
WAA - Waris Field Station						
Willmore portable	Z	0.6	0.25	60	3,000	underdamped
LAG - Cape Gloucester Field Station						
Willmore portable	Z	0.6	0.25	60	3,000	underdamped

o Signals from these stations are telemetered by land line to Helicorders (Geotech Mod. 2484) at the Central Observatory.

oo Signals from this station are telemetered via VHF to its Helicorder at the Central Observatory.

N.B. These field stations consist of a permanent building in which instruments are installed when necessary.

Details of emergency field stations, within the Territory will be listed when in operation.

TBL - Tabele Observatory						
Benioff VR 107.5Kg	Z	1.0	0.2	60	1,350	critical
(PAPUA)						
ESA - Esa'ala Observatory						
Benioff VR 107.5Kg	Z	1.0	0.2	15	36,000	critical
Benioff VR 107.5Kg	N,E	1.0	0.2	15	18,000	critical
Benioff VR 107.5Kg	Z/N/E	1.0	60.0	30	50% sensitivity	critical
AGE - Agenahambo Station						
Willmore portable	Z	0.6	0.25	60	3,000	underdamped

VR Variable Reluctance

MC Moving-coil

Relative magnification curves of seismograph systems installed in the stations controlled by the Rabaul Central Observatory are listed once a month on the P.E.A.

PRESENTATION OF DATA

(reviewed in November, 1967)

All times are reduced to Greenwich Mean Time (GMT), which is 10 hours behind Eastern Standard Time.

At RAB and Harbour Network, the time signal is marked every minute on each seismogram record from the Observatory crystal chronometer. Second marks from Radio signal VNG (Australia) are recorded on World-wide Standard System S.P.-N. component only according with the W.W.S.S. programme, at six hour intervals. Primary time is provided by W.W.S.S. equipment and secondary time by a Labtronic crystal chronometer with the accuracy of ± 5 ms per day compared with VNG (Australia) with the aid of a chronoscope.

At TBL and AGE, the time signal is derived from a spring driven chronometer (Mercer) and marked each minute on records. Time accuracy is determined by comparison with signals from WWVH daily. Linear correction is applied to the daily drift.

On all seismogram records time increases from left to right and time break is upward.

At RAB* and Harbour Network the recording drum of each seismograph is driven by a 110VAC 60Hz synchronous motor. The 110VAC is frequency regulated by a crystal chronometer.

* The Omori recording drum is driven by a nonregulated 50Hz frequency supply.

At ESA and KRT power for recorder motors is frequency regulated by a crystal chronometer at 50Hz. Power for AGE and TBL and field stations is supplied by a 50Hz free running oscillator.

Direction of Motion

Upward direction of ground motion corresponds to upward trace motion on vertical seismogram records. Direction of component of ground motion to North or East corresponds to upward trace motion on horizontal seismogram records.

Vertical trace motion from impulsive onset of longitudinal waves of compressional or dilatational ground movement is indicated by "u" or "d" accompanied by N,S,E, or W, as per trace motion amplitude on horizontal seismogram records, to represent vectorially the direction of ground motion. "+" or "-" indicates upward or downward motion of the ground respectively, from a wave not known to be of the longitudinal type.

Accuracy of Readings

When readings are given with a decimal figure, they are to 1/10 of a second, other readings have been made to the nearest half second.

Crustal Phases

Px, Sx Crustal phases, other than Pn and Sn for local and near earthquakes.

Felt Intensity

Information on maximum intensities of shocks reported felt is included. Intensities are given in Roman numerals based on the Modified Mercalli Scale, of 1931.

Determination of Epicentre

Where no source is cited, the epicentral distance in central angle degrees from the pertinent station and origin time for local and regional earthquakes, are carried out at the Central Observatory, Rabaul from the S-P travel times assuming a normal depth of the focus.

Geographical Designation of Epicentre

The regional names which follow the co-ordinates of epicentres located at the Central Observatory are meant only to supplement the co-ordinates and normally follow well-known geographical rather than geological features. Use is made of the full degree blocks according to the method defined by E.A. Flinn and E.R. Engadhl in "A PROPOSED BASIS FOR GEOGRAPHICAL AND SEISMIC REGIONALIZATION", Seismic Data Laboratory Report No. 101, U.I.D. Inc., Alexandria, Virginia, 1964, adopted by the U.S.C.G.S. for computer requirements.

Magnitude Definition and Determination

M_L - Local Magnitude (Richter 1935) is calculated from the recorded trace amplitude of the Wood-Anderson torsion seismographs of stated physical constants (installed at the Observatory in November, 1967)

Maximum trace amplitude (0 to peak) expressed in millimetres and tenths is measured directly on both components. Magnitude is determined independently and arithmetic mean taken. M_L values are given to the tenth of a unit.

The station correction factor is assumed to be zero until better known.

M_S - Surface Wave Magnitude (Gutemberg & Richter, 1956) is calculated from the amplitude of surface waves of period near 20 seconds for shallow distant earthquakes.

M_B - Body Wage Magnitude is calculated from the ratio of amplitude over period for body waves on S.P.-Z of World-Wide Seismograph System only when depth is known. The magnification factor for the standard seismograph is taken into account.

m - Unified magnitude (Gutemberg & Richter, 1956) has the following relation to M_L, M_S, and M_B.

$$m = 1.7 + 0.8\ M_L - 0.01M^2_L$$

$$m = M_B \text{ (without correction)}$$

$$m = 2.5 + 0.63\ M_S$$

Local Magnitude of earthquakes recorded at RAB with a clear S-P interval is tabulated on a Day-Distance (in Central Angle Degrees) graph which is added to the PEA monthly.

Symbols

i - impulsive and sharply defined beginning of a phase.

e - emergent and poorly defined beginning of phase.

T - Period in seconds

A - Peak-to-Trough trace amplitude in millimetres.

GM - Ground Motion.

Dist- Distance in central degrees

H - Origin time

h - Focal depth in Kilometres

CBM - Confused by microseisms

PRESENTATION OF DATA (CONT.)

Remarks

Local	-	Typical signature of an earthquake with epicentre within 0.9°.
Near	-	Typical signature of an earthquake with epicentre between 0.9° and 9°.
Distant	-	Typical signature of an earthquake with epicentre between 9° and 45°.
Teleseism	-	Typical signature of an earthquake with epicentre more than 45°.
Traces	-	Any recorded disperse waves or very weak unknown earthquake phases.

Local and Near earthquakes will be classified Regional, and Distant earthquakes will be grouped with Teleseisms if sheep waves and their reflections are unidentifiable.

G. D'ADDARIO,
Volcanologist in Charge

			T sec	A mm	GM	Dist	H	Remarks
1st May, 1968.								
RAB	eZ/	004842			+			Traces
RAB	eZ/	030526			+			Traces
RAB	iPZ eSN/ MZ/	043626.0 4044 4525	1.0	6.2	u	29°		
WAN	iPZ	26.0	0.6	11.0	u			
VUL	iPZ	25.4	0.7	7.6	u			
RAB	iPZ	065852.5	0.5	2.6	d			Regional
RAB	iPZ	083341.3	0.4	2.0	d			Regional
VUL	iPZ	40.7			d			
RAB	iPZ eSN/	085158.0 5816			u	46°		
RAB	iPZ iSN	111240.5 55.3	0.5	2.8	d	1¼°	111220	M_L = 4.0
RAB	eZ/	193146			+			Traces
RAB	iZ	203549.0	0.4	1.0	u			
KRT records unreadable due to bad microseismic activity.								
2nd May, 1968.								
RAB	iPZ iSN	053828.0 51.0	0.5	3.1	u	2°	053758	M_L = 4.3
RAB	iPZ iSN	105901.9 27.9	0.5	2.0	u	2¼°	105827	M_L = 4.3
WAN	iPZ	01.4	0.5	2.0	d			
VUL	iPZ	5859.9	0.5	2.0	d			
RAB	iPZ iSN/	114530.0 59	0.5	20.2	d	2½°	114452	M_L = 5.5
WAN	iPZ	30.0	0.8	2.0	d			
VUL	iPZ	29.9	0.4	6.0	d			
KRT	iPZ	114530			d			Regional
RAB	iPZ iSN	181038.2 48.6			u	¾°	181024	M_L = 3.7
KRT	iPZ	181040½			d			Local
RAB	iPZ iSN/	233051.0 3511	1.0	5.0	d	33°		
WAN	iPZ	51.2	0.6	6.6	d			
VUL	iPZ	51.4	0.6	4.8	d			
3rd May, 1968.								
KRT records unreadable due to bad microseismic activity.								
RAB	iZ	053730.1	0.5	1.0	u			

			T sec	A mm	GM	Dist	H	Remarks
3rd May, 1968 (cont'd).								
RAB	iPZ eSE/	054009.7 4604	1.0	2.0	u	39°		
RAB	iPZ i(S)N	110259.9 0309.8	0.5	3.1	u	¾°	110246	M_L= 3.5
RAB	iPZ iSN	220612.4 29.0	0.5	7.0	u	1¼°	220550	M_L= 4.0
WAN	iPZ	12.2			u			
RAL	iPZ	12.0			u			
TAV	iPZ	12.2			u			
VUL	iPZ	11.8	0.3	16.6	u			
4th May, 1968.								
RAB	iPZ eSN/	031314.0 1724	1.0	1.0	u	24°		
RAB	iPZ	113519.0	0.5	1.8	u			Regional
RAB	iPZ iSN	140452.6 0528.9			u	3°	140405	M_L= 4.5
KRT	ePZ iSN	140450½ 0529½				3¼°	140359	
RAB	eZ/	183536			+			Traces
RAB	iPZ iSN	185206.5 26.0	0.5	5.0	u	1½°	185140	M_L= 4.2
WAN	iPZ	06.5	0.5	2.8	u			
RAL	iPZ	06.0		1.2	u			
TAV	iPZ	06.5			u			
VUL	iPZ	05.2	0.3		u			
KRT	iPZ iSN	04½ 21½			d			
RAB	iPZ iSN	232531.4 44.6	0.3	5.4	u	¾°	232414	
VUL	iPZ	32.1	0.3	7.0	u			
5th May, 1968.								
RAB	e(P)Z eSN	045013.0 56.0	0.4	3.6	d	1¼°	044949	
RAB	ePZ	061405.4	0.4	2.0	d			Regional
RAB	iPZ i(S)N	081059.8 1120.4	0.4	4.6	d	1½°	081023	
RAB	ePZ iSN	091314.3 44.2	0.6	9.4	u	2¼°	091236	
WAN	iPZ	14.1	0.6	8.4	u			
RAB	iPZ i(S)N	130748.0 0836.0	0.7	8.0	d	4¼°	130645	
WAN	iPZ	48.0	0.7	5.3	d			

			T sec	A mm	GM	Dist	H	Remarks
5th May, 1968 (cont'd).								
KRT	ePZ	130743½			d			Near
RAB	iPZ	035402.9	1.0	4.0	u			Regional
VUL	iPZ	03.6			d			
6th May, 1968.		Wood-Anderson records unserviceable						
RAB	ePZ	082957.6	0.4	2.7	u	4¼°	082855	
	iSN	3046.0						
VUL	iPZ	2957.0	0.3		d			
RAB	iPZ	094209.5	0.5		d	3½°	094215	
	iSN	51.4						
WAN	iPZ	09.2		23.0	d			
RAL	iPZ	09.3	0.2	18.0	d			
VUL	iPZ	09.7	0.3		d			
KRT	iPZ	11			d	3¾°	094215	
	iSN	54						
RAB	ePZ	125048	0.4	2.1	u	6½°	124933	
	e(S)N	5146						
KRT	ePZ	5028			u	6¾°	124848	
	iSN	5145½						
RAB	iPZ/	175414.0			u	2½°	175404	
	iSE/	44.0						
RAB	iPZ	194920.2	0.3	3.0	u	¾°	194904	
	eSN	33						
7th May, 1968.								
RAB	iPZ	053456.1	0.5	4.3	u	1¾°	053427	M_L= 4.6
	eSN/	3518						
WAN	iPZ	55.6		16.0	u			
VUL	iPZ	54.5		9.8	u			
RAB	iPZ	092246.0	1.0	1.0	d			Distant
RAB	iPZ	154611.0	0.5	8.0	u			Regional
WAN	iPZ	10.6	0.5	11.0	u			
SUL	iPZ	11.0	0.6	1.5	u			
RAL	iPZ	11.0	0.2	10.8	u			
VUL	iPZ	12.5		6.8	u			
KRT	iPZ	154615			u			Regional
RAB	iPZ	162110.2	0.5	14.0	u	¼°	162102	M_L= 3.4
	iSE/	16						
WAN	iPZ	09.9	0.2	12.2	u			
SUL	iPZ	10.0	0.6	2.0	u			
RAL	iPZ	10.0			u			
VUL	iPZ	11.5	0.5	13.0	u			
KRT	iPZ	13½			d			Local

			T sec	A mm	GM	Dist	H	Remarks
7th May, 1968 (cont'd).								
RAB	iPZ iSN	162628.1 34.2	0.4	3.8	u	¼°	162620	
KRT	iPZ eSE	162631½ 40½		3.0	d	½°	162619	
RAB	ePZ eSN/	183455½ 3807	1.0	1.0	u	24°		
RAB	ePZ eSN/	190848 0950			d	5½°	190728	
KRT	ePZ	190839½			d			Near
RAB	iPZ	201218.0	0.5	4.0	d			Regional
KRT	ePZ	201222			d			C.B.M. Regional
RAB	iPZ iSE/	202628.0 2742	0.5	2.5	d	1°	202808	
VUL	iPZ	27.5	0.5	4.0	d			
RAB	iPZ eSE/	214943.0 5052	0.5	2.0	d	½°	214932	M_L= 3.4
RAB	iPZ iSN	222923.3 47.8	0.4	2.1	d	2°	222851	M_L= 4.1

			T sec	A mm	GM	Dist	H	Remarks
ESA'ALA								
23rd April, 1968.								
ESA	ePZ	104630½	0.5	2.0	u			
ESA	iPZ	144307	0.6	0.2	u			Distant
ESA	iPZ	150139	0.6	0.3	d			
ESA	ePZ	192226½						Distant
ESA	iPZ	200131½	0.9	0.7	d			Distant
ESA	iPZ	204239½	1.0	0.6	d			Distant
ESA	iPZ	205338	0.3	1.8	d	½°	205337	
	iSZ	46½						
24th April, 1968.								
ESA	ePZ	060725½	0.6	1.1	u			Regional
ESA	iPZ	072419½			u	¼°	072414	
	eSZ	24½						
ESA	ePZ	075530½			d			Distant
ESA	iPZ	140148½			d	¾°	140135	
	eSZ	58½						
ESA	iPZ	152153	1.0	7.1	d			Local
ESA	ePZ	235022	0.8	2.1	u			
25th April, 1968.								
ESA	iPZ	130242½		3.6	u			Local
ESA	iPZ	171700½	0.1	8.0	d			Distant
ESA	iPZ	174453½	0.5	3.9	d			
26th April, 1968.								
ESA	iPZ	112143	0.5	1.8	u			
ESA	iPZ	163443½	0.7	2.0	u			
ESA	iPZ	220418½			u			Near
27th April, 1968.								
ESA	ePZ	142702½			u			Teleseism
ESA	ePZ	233516			d			Regional
28th April, 1968.								
ESA	ePZ	000840	0.7	1.6	d			Local
ESA	iPZ	042818	1.0	3.0	u			Distant
ESA	iPZ	192338½			u			Near

			T sec	A mm	GM	Dist	H	Remarks
29th April, 1968.								
ESA	ePZ	002108½	0.6	1.2	u			Regional
ESA	iPZ	004819	0.8	4.0	d			Distant
30th April, 1968.								
ESA	iPZ	073607		5.7	u			Local
ESA	ePZ	113931						Regional
ESA	ePZ	142342						Distant

			T sec	A mm	GM	Dist	H	Remarks
TABELE								
17th April, 1968.								
TBL	ePZ	131353						Local
TBL	iPZ	195047	0.4	4.0				Distant
TBL	iPZ	195722	0.5	3.5	d	1½°	055658	
	iSZ	43						
18th April, 1968.		Nil recorded						
19th April, 1968.		Nil recorded						
20th April, 1968.								
TBL	ePZ	034817						Distant
21st April, 1968.								
TBL	ePZ	124026						Distant
22nd April, 1968.								
TBL	iPZ	015301½	0.3	8.0	u			Local
23rd April, 1968.								
TBL	iPZ	145907½	0.5	22.0	u			Local
TBL	ePZ	151026½						Local
TBL	iPZ	184545½	0.3	3.0	u			Local
AGENAHAMBO								
20th April, 1968.								
From 0800 - 2400 -		Nil recorded						
21st April, 1968.								
AGE	iPZ	124009	0.4	0.8	u			
22nd April, 1968.		Nil recorded						
23rd April, 1968.								
AGE	e(P)Z	095857½						Shallow
AGE	iPZ	150008						Distant
AGE	iPZ	205232½				¾°	205226	
	eSZ	47						
24th April, 1968.								
AGE	iPZ	060623	0.4	1.2	d	3¼°	060538	
	iZ	0704						
	iSZ	0706½						
AGE	iPZ	140042				½°	140030	
	iSZ	0151						

			T sec	A mm	GM	Dist	H	Remarks
25th May, 1968.								
AGE	ePZ	094024						Shallow
26th May, 1968.								
AGE	iPZ	112044			u	3½°	111949	
	iSZ	2126						
ACE	iPZ	163339½			u	3½°	163246	
	iSZ	3420½						

Rabaul Central Observatory,
9th May, 1968.

(G. W. D'ADDARIO)
Volcanologist-in-Charge

TERRITORY OF PAPUA AND NEW GUINEA
GEOLOGICAL AND VOLCANOLOGICAL BRANCH
VOLCANOLOGICAL SECTION

PRELIMINARY EARTHQUAKE ANALYSIS
RABAUL CENTRAL OBSERVATORY
1968

Rabaul	RAB	From: 3TH. MAY 1968. To: 14TH. MAY 1968.
Rabaul Harbour Network	WAN SUL RAL TAV VUL	From: 3TH. MAY 1968. To: 14TH. MAY 1968.
Keravat	KRT	From: 3TH. MAY 1968. To: 14TH. MAY 1968.
Esa'ala	ESA	From: To:
Tabele	TBL	From: 24TH. APRIL 1968. To: 30TH. APRIL 1968.
Agenahambo	AGE	From: 27TH. APRIL 1968. To: 3RD. MAY 1968.
Waris	WAA	Not operational
Ulamona	ULA	Not operational
Piva	PIV	Not operational
Cape Gloucester	LAG	Not operational

STATION PERSONNEL

RAB Central Observatory, Rabaul

Volcanologist-in-Charge	G.W. D'Addario
Volcanologist	R.F. Heming
Seismologist	(Position vacant)
Seismogram Readers	D.J. Cook, H. Carrick
Senior Technical Officer	N.O. Myers
Technical Officer	R.J. Conway
Volcanological Assistants	L. Topue, M. Gaiam, V. Kaita.
Technical Assistant	P. Daimbari
Trainee Volcanological Assistants	B. Talai, M. Salaiau, C. Matapit
Secretary	

KRT Keravat Outstation

Observer (part-time)	G.E. Chorick

TBL Tabele Observatory

Observer	E. Ravian

ESA Esa'ala Observatory

Observer	F. Dira

AGE Agenahambo Outstation

Observer (part-time)	Br. B. Hughes

The Rabaul Preliminary Earthquake Analysis (PEA) is produced by the staff under the direction of the Volcanologist-in-Charge from whom additional information and photocopies of seismogram records from all stations may be obtained on request.

Please address all communications to:-

Volcanologist-in-Charge,
Central Observatory,
P.O. Box 386,
RABAUL, T.P. & N.G.

SEISMOGRAPH STATIONS

Station (NEW GUINEA)	Code	South Latitude	East Longitude	Elev. (m)	Foundation
Rabaul	RAB	04°11'28.6"	152°10'11.4"	183.5	Basalt Flow
Wanliss Street	WAN*	04°11'39.6"	152°10'32.5"	25.0	Basalt Flow
Sulphur Creek	SUL*	04°13'09.8"	152°10'33.3"	8.5	Unconsolidated volcanic ash
Rabalanakaia	RAL*	04°13'13.0"	152°12'07.0"	91.0	Unconsolidated volcanic ash
Tavurvur	TAV*	04°13'52.2"	152°13'12.9"	27.0	Andesite Flow
Taviliu	VUL*	04°16'58.2"	152°08'44.6"	332.3	Unconsolidated volcanic ash
Keravat	KRT	04°21'10.5"	152°03'06"	20.0	Alluvium
Tabele	TBL	04°06'04.67"	145°00'41.37"	179.5	Basalt Flow
Waris	WAA	04°07'00"	145°06'00"	48.0	Lapilli Tuff
Piva	PIV	06°12'00"	155°03'30"	60.0	Alluvium
Cape Gloucester	LAG	04°27'20"	148°26'00"	24.0	Lapilli Tuff
Ulamona	ULA	04°59'24.0"	151°16'30.0"	17.0	Lapilli Tuff
(PAPUA)					
Agenahambo	AGE	08°48'49"	148°05'56"	303.0	Uncolsolidated volcanic ash
Esa'ala	ESA	09°44'18.2"	150°48'50.7"	46.4	Granite Gneiss

* Rabaul Harbour Network

STATION INSTRUMENTATION

Station & Instruments	Comp.	To	T_c	Trace Speed mm/min	Approximate relative Magnification	Approximate damping
(NEW GUINEA)						
Rabaul Central Observatory RAB						
World-wide Standard	Z	1.0	0.74	60	12,500	Critical
	N,E	1.0	0.74	60	6,250	Critical
	Z/N/E/	15.0	100.0	15	750	Critical
Benioff VR 14.7Kg	Zh	1.0	0.02	180+	4,000	Critical
+ Recording is triggered by the onset of any earthquake with pre-determined minimum amplitude. Recorder is stopped automatically by hour break pulse.						
Omori 15Kg	No	3.6	-	24	12	10.1 Air
Omori 15Kg	Eo	3.8	-	24	10	10.1 Air
Wood-Anderson Torsion	Na,Ea	0.8	-	60	2,800	Critical
Rabaul Harbour Netowrk						
Readings from the Harbour Netwcrk are entered in the PEA only for earthquakes, with impulsive and sharply defined onset of phases.						
WAN°	Benioff VR 14.7Kg	Z	1.0	0.02	60	5,240	Critical
SUL°	Benioff VR 14.7Kg	Z	1.0	0.02	60	2,850	Critical
RAL°	Benioff VR 14.7Kg	Z	1.0	0.02	60	8,075	Critical
TAV°	Benioff VR 14.7Kg	Z	1.0	0.02	60	20,900	Critical
VUL°	Benioff VR 14.7Kg	Z	1.0	0.02	60	5,000	Critical

STATION INSTRUMENTATION

Station & Instruments	Comp.	To	Tg	Trace speed mm/min	Approximate relative Magnification	Approx. damping
Rabaul Harbour Network (Cont.)						
KRT - Keravat Outstation						
Benioff Mc 50 Kg	Z	1.2	0.2	15	20% sensitivity	Critical
Benioff MC 50Kg	N/E	1.2	0.2	15	10% sensitivity	Critical
ULA - Ulamona Field Station						
Willmore portable	Z	0.6	0.25	60	3,000	underdamped
PIV - Piva Field Station						
Willmore portable	Z	0.6	0.25	60	3,000	underdamped
WAA - Waris Field Station						
Willmore portable	Z	0.6	0.25	60	3,000	underdamped
LAG - Cape Gloucester Field Station						
Willmore portable	Z	0.6	0.25	60	3,000	underdamped

o Signals from these stations are telemetered by land line to Helicorders (Geotech Mod, 2484) at the Central Observatory.

oo Signals from this station are telemetered via VHF to its Helicorder at the Central Observatory.

N.B. These field stations consist of a permanent building in which instruments are installed when necessary.

Details of emergency field stations, within the Territory will be listed when in operation.

TBL - Tabele Observatory						
Benioff VR 107.5Kg	Z	1.0	0.2	60	1,350	critical
(PAPUA)						
ESA - Esa'ala Observatory						
Benioff VR 107.5Kg	Z	1.0	0.2	15	36,000	critical
Benioff VR 107.5Kg	N,E	1.0	0.2	15	18,000	critical
Benioff VR 107.5Kg	Z/N/E	1.0	60.0	30	50% sensitivity	critical
AGE - Agenahambo Station						
Willmore portable	Z	0.6	0.25	60	3,000	underdamped

VR Variable Reluctance

MC Moving-coil

Relative magnification curves of seismograph systems installed in the stations controlled by the Rabaul Central Observatory are listed once a month on the P.E.A.

PRESENTATION OF DATA

(reviewed in November, 1967)

All times are reduced to Greenwich Mean Time (GMT), which is 10 hours behind Eastern Standard Time.

At RAB and Harbour Network, the time signal is marked every minute on each seismogram record from the Observatory crystal chronometer. Second marks from Radio signal VNG (Australia) are recorded on World-wide Standard System S.P.-N. component only according with the W.W.S.S. programme, at six hour intervals. Primary time is provided by W.W.S.S. equipment and secondary time by a Labtronic crystal chronometer with the accuracy of ± 5 ms per day compared with VNG (Australia) with the aid of a chronoscope.

At TBL and AGE, the time signal is derived from a spring driven chronometer (Mercer) and marked each minute on records. Time accuracy is determined by comparison with signals from WWVH daily. Linear correction is applied to the daily drift.

On all seismogram records time increases from left to right and time break is upward.

At RAB* and Harbour Network the recording drum of each seismograph is driven by a 110VAC 60Hz synchronous motor. The 110VAC is frequency regulated by a crystal chronometer.

* The Omori recording drum is driven by a nonregulated 50Hz frequency supply.

At ESA and KRT power for recorder motors is frequency regulated by a crystal chronometer at 50Hz. Power for AGE and TBL and field stations is supplied by a 50Hz free running oscillator.

Direction of Motion

Upward direction of ground motion corresponds to upward trace motion on vertical seismogram records. Direction of component of ground motion to North or East corresponds to upward trace motion on horizontal seismogram records.

Vertical trace motion from impulsive onset of longitudinal waves of compressional or dilatational ground movement is indicated by "u" or "d" accompanied by N,S,E, or W, as per trace motion amplitude on horizontal seismogram records, to represent vectorially the direction of ground motion. "+" or "-" indicates upward or downward motion of the ground respectively, from a wave not known to be of the longitudinal type.

Accuracy of Readings

When readings are given with a decimal figure, they are to 1/10 of a second, other readings have been made to the nearest half second.

Crustal Phases

Px, Sx Crustal phases, other than Pn and Sn for local and near earthquakes.

Felt Intensity

Information on maximum intensities of shocks reported felt is included. Intensities are given in Roman numerals based on the Modified Mercalli Scale, of 1931.

Determination of Epicentre

Where no source is cited, the epicentral distance in central angle degrees from the pertinent station and origin time for local and regional earthquakes, are carried out at the Central Observatory, Rabaul from the S-P travel times assuming a normal depth of the focus.

Geographical Designation of Epicentre

The regional names which follow the co-ordinates of epicentres located at the Central Observatory are meant only to supplement the co-ordinates and normally follow well-known geographical rather than geological features. Use is made of the full degree blocks according to the method defined by E.A. Flinn and E.R. Engadhl in "A PROPOSED BASIS FOR GEOGRAPHICAL AND SEISMIC REGIONALIZATION", Seismic Data Laboratory Report No. 101, U.I.D. Inc., Alexandria, Virginia, 1964, adopted by the U.S.C.G.S. for computer requirements.

Magnitude Definition and Determination

M_L - Local Magnitude (Richter 1935) is calculated from the recorded trace amplitude of the Wood-Anderson torsion seismographs of stated phusical constants (installed at the Observatory in November, 1967)

Maximum trace amplitude (0 to peak) expressed in millimetres and tenths is measured directly on both components. Magnitude is determined independently and arithmetic mean taken. M_L values are given to the tenth of a unit.

The station correction factor is assumed to be zero until better known.

M_S - Surface Wave Magnitude (Gutemberg & Richter, 1956) is calculated from the amplitude of surface waves of period near 20 seconds for shallow distant earthquakes.

M_B - Body Wage Magnitude is calculated from the ratio of amplitude over period for body waves on S.P.-Z of World-Wide Seismograph System only when depth is known. The magnification factor for the standard seismograph is taken into account.

m - Unified magnitude (Gutemberg & Richter, 1956) has the following relation to M_L, M_S, and M_B.

$$m = 1.7 + 0.8\ M_L - 0.01M^2_L$$

$$m = M_B \text{ (without correction)}$$

$$m = 2.5 + 0.63\ M_S$$

Local Magnitude of earthquakes recorded at RAB with a clear S-P interval is tabulated on a Day-Distance (in Central Angle Degrees) graph which is added to the PEA monthly.

Symbols

i - impulsive and sharply defined beginning of a phase.

e - emergent and poorly defined beginning of phase.

T - Period in seconds

A - Peak-to-Trough trace amplitude in millimetres.

GM - Ground Motion.

Dist- Distance in central degrees

H - Origin time

h - Focal depth in Kilometres

CBM - Confused by microseisms

PRESENTATION OF DATA (CONT.)

Remarks

Local	-	Typical signature of an earthquake with epicentre within 0.9°.
Near	-	Typical signature of an earthquake with epicentre between 0.9° and 9°.
Distant	-	Typical signature of an earthquake with epicentre between 9° and 45°.
Teleseism	-	Typical signature of an earthquake with epicentre more than 45°.
Traces	-	Any recorded disperse waves or very weak unknown earthquake phases.

Local and Near earthquakes will be classified Regional, and Distant earthquakes will be grouped with teleseisms if sheep waves and their reflections are unidentifiable.

G. D'ADDARIO,
Volcanologist in Charge

RABAUL			T sec	A mm	GM	Dist	H	Remarks
8th May, 1968. S.P. records were exposed. Shocks read from Rabaul Harbour Network.								
WAN	iPZ	023502.9	0.3	5.0	d			
RAL	iPZ	03.0			d			
WAN	iPZ	054610.9			u			
RAL	iPZ	11.0			u			
VUL	iPZ	12.5	0.3	16.2	u			
WAN	iPZ	105048.9	0.2	8.0	u			
SUL	iPZ	50.0	0.3	11.8	u			
RAL	iPZ	49.0	0.2	7.4	u			
VUL	iPZ	50.7	0.2	17.4	u			
KRT	iPZ	52½			d			Regional
RAB	iPZ/	110928.0				56°		
	eSN/	1703						
VUL	iPZ	121725.0	0.4	8.0	u			
KRT	iPZ	121724½	0.6	5.0	u	(1½°)	1216(55)	
	e(S)E	47						
RAB	ePZ/	122948				86°		Teleseism
	ePPZ/	3312						
	eSN/	4014						
	ePSE/	4118						
	ePPSE/	36						
	eSSE/	4604						
	e(Lq)N/	5246						
	e(Lr)N/	5703						
KRT	iPZ	122950	2.0	1.0	d			Teleseism
RAB	eZ/	221814				+		Traces
RAB	eZ/	223110				+		Traces
9th May, 1968.								
RAB	eZ/	000142				-		Traces
RAB	eZ/	034118				-		Traces
RAB	iPZ	041756.0	0.5	48.5	d	1½°	041732	M_L= 5.3
	iSN/	1814						
WAN	iPZ	1755.5			d			
RAL	iPZ	55.4			d			
VUL	iPZ	55.0			d			
KRT	ePZ	53½			d			C.B.M. Near
RAB	eZ/	073608				-		Traces
RAB	eZ/	094519				+		Traces
RAB	eZ/	104317				+		Traces
RAB	ePZ	123603	1.0	1.0	u			Distant

			T sec	A mm	GM	Dist	H	Remarks
9th May, 1968 (cont'd).								
RAB	eZ/	134342			+			Traces
RAB	eZ/	143606			+			Traces
RAB	ePZ eSE/	172701 2803	0.4	1.5	u	5½°	172541	M_L= 5.6
KRT	e(P)Z iSE	172702 2801				(5¼°)	1725(45)	
RAB	iPZ iSN	173208.3 3309.7	0.4	1.0	u	5¼°	173049	M_L= 5.6
KRT	ePZ eSE	173206 3304	0.2	1.0	u	5°	173051	
10th May, 1968.								
RAB	iPZ iSN	000715.0 41.5	0.7	35.0	u	2¼°	000641	
WAN	iPZ	15.4	0.7	22.0	u			
VUL	iPZ	14.9		27.4	u			
KRT	ePZ eSN	13 40½				2¼	000637	C.B.M.
RAB	ePZ e(S)N	061412 27	0.5	11.0	d	1¼°	061354	C.B.M.
RAL	iPZ	12.0			u			
VUL	iPZ	12.5		5.5	u			
RAB	ePZ	093115.5	0.8	3.9	d			Teleseism
KRT	iPZ	16½	1.0	2.0	d			
RAB	ePZ eSN	151704.0 25.5	0.7	3.6	d	1½°	151636	
KRT	ePZ	151704½	1.0	1.5	d			
RAB	ePZ eSN	204157 4223½	0.5	4.0	d	2¼°	204123	
RAB	e(P)Z iSN	215647 5712.5	0.5	2.3	d	(2¼°)	2156(14)	
11th May, 1968.								
RAB	iPZ iZ iSE/	085005.8 06.3 24	0.5	43.0	d	1½°	084942	M_L= 4.6
WAN	iPZ	05.5	0.3	18.8	d			
SUL	iPZ	06.0			d			
RAL	iPZ	06.0		5.0	u			
VUL	iPZ	04.7		4.0	d			
KRT	iPZ	04			d			
RAB	iPZ iN iSN/	153459.7 3524.0 3601.0	0.5	40.8	d	5¼°	153340	M_L= 6.0

Felt Mumeng 146°35'E 7°S Int. IV
Siassi 148°E 6¼°S Int. IV to V
VL8KU Kilengi 148°20'E 5°30'S Int.III
Lae 147°E 6°43'S Int. V
Epicentre in Vitiaz Straight approx.148°E 6½°S Normal depth

			T sec	A mm	GM	Dist	H	Remarks
11th May, 1968 (cont'd).								
WAN	iPZ	153459.6	0.4	5.5	d			
VUL	iPZ	153459.2	0.6	11.8	d			
KRT	iPZ	153457½	1.0	1.5	d			Near
RAB	iPZ iSE	212654.4 2720.3	0.5	1.8	u	2¼°	212620	M_L= 4.3
12th May, 1968.								
RAB	iPZ iSE	024229.3 43.8	0.5	22.0	d	1¼°	024209	M_L= 4.5
WAN	iPZ	29.0	0.5	10.0	d			
SUL	iPZ	28.9	0.4	4.5	d			
RAL	iPZ	28.9	0.5	14.3	d			
VUL	iPZ	29.4			d			
KRT	iPZ	31			d			Near
RAB	iPZ iSE	165242.2 56.4	0.5	4.0	d	1°	165223	M_L= 3.6
KRT	iPZ iSe	165245 5301	0.6	2.0	d			
RAB	ePZ eSN/	184410 4907	1.0	1.2	d	3½°		
KRT	iPZ	184417	0.4	1.0	d			
RAB	iPZ iSN/	221049.5 1108	0.5	62.0	u	1½°	221024	M_L= 5.8 +
WAN	iPZ	49.2			u			
SUL	iPZ	49.4	0.5		u			
RAL	iPZ	49.1			u			
VUL	iPZ	48.5			u			
KRT	iPZ	47			d			Felt Ulamona 151°15'S 5°E Int. III Near
13th May,1968.								
RAB	iPZ iSN/	011622.8 36	0.5	37.5	d	1°	011605	M_L= 4.7
WAN	iPZ	22.5		23.5	d			
RAL	iPZ	23.0		10.0	d			
TAV	iPZ	22.4		5.1	d			
VUL	iPZ	23.2		33.7	d			
KRT	iPZ	24			d			Near
RAB	iPZ iSN/	050147.9 0202	0.5	28.8	d	1°	050129	M_L= 4.8
WAN	iPZ	48.0			d			
TAV	iPZ	48.1			d			
VUL	iPZ	48.9		12.2	d			

			T sec	A mm	GM	Dist	H	Remarks
13th May, 1968 (cont'd).								
RAB	iPZ iZ iSE/	125619.5 20.8 45	0.4	23.2	u	2°	125545	M_L= 5.1
WAN	iPZ	20.4	0.3	13.0	d			
SUL	iPZ	20.3	0.5	8.9	u			
RAL	iPZ	20.1	0.3	8.0	u			
TAV	iPZ	20.4			u			
VUL	iPZ	18.2		13.0	u			
KRT	iPZ e(S)N	18 39½			d	(1¾°)	1255(40)	
RAB	iPZ iSN	131138.0 1202.3	0.4	5.0	d	2°	131106	M_L= 4.5
KRT	iPZ iSN	131135½ 57½		2.0	d	1¾°	131106	
RAB	iPZ iSN/	131547.4 1611	0.4	18.2	d	2°	131516	M_L= 5.0
WAN	iPZ	47.4		11.8	d			
SUL	iPZ	47.5	0.5	6.3	d			
RAL	iPZ	47.4		5.7	d			
TAV	iPZ	47.5		6.0	d			
VUL	iPZ	45.2		7.7	d			
KRT	iPZ iSN	1545 1608½		4.0	d	2°	131514	
RAB	iPZ iSN/	173450.2 3544	0.5	2.0	u	4½°	173340	
KRT	ePZ e(S)N	173447 3541				(4¾°)	1733(37)	
RAB	iPZ iSN/	210959.1 1012	0.5	55.0	u	1°	210942	M_L= 4.6
WAN	iPZ	59.0		25.0	u			
TAV	iPZ	59.2		5.0	u			
VUL	iPZ	59.5			u			
RAB	iPZ eSE/	215225.8 36	0.5	2.1	u	¾°	215211	M_L= 3.8
KRT	ePZ	23	0.6	3.0	u			
RAB	iPZ iSN/	221042.8 56	0.5		d	1°	221025	
WAN	iPZ	42.5	0.3	4.0	d			
RAB	iPZ iSN	221630.0 47.8	0.5	10.0	d	1¼°	221606	M_L= 4.5
14th May, 1968.								
RAB	iPZ iSE	011300.5 14.2	0.5	7.0	u	1°	011246	M_L= 4.3
WAN	iPZ	00.4	0.5	8.2	u			
VUL	iPZ	00.2	0.5	7.0	u			

			T sec	A mm	GM	Dist	H	Remarks
14th May, 1968 (cont'd).								
RAB	iPZ iSN/	013415.0 28	0.5	12.0	u	1°	013357	M_L= 4.2
WAN	iPZ	14.8	0.5	7.0	u			
RAL	iPZ	15.2			u			
VUL	iPZ	13.8		6.4	u			
RAB	iPZ iSE	025228.0 44.3	0.5	5.0	d	1¼°	025207	M_L= 4.2
WAN	iPZ	27.5	0.5	7.0	u			
RAL	iPZ	27.4		5.3	u			
VUL	iPZ	26.8	0.4	13.0	u			
RAB	iPZ iSE	134433.0 58.9	0.5	1.1	d	2¼°	134359	M_L= 4.4
KRT	iPZ eSN	134435 58	0.4	1.0	d	2°	134405	
RAB	iPZ iSN/ iLqE/ eLrN/	141228.0 1828 2132 2324	1.0	2.3	d	41°		
WAN	iPZ	28.5	0.8	11.5	u			
VUL	iPZ	29.2	0.7	13.4	u			
KRT	iPZ	30	1.0	2.0	d			Distant
RAB	eiPZ iZ iSN	170455 56.3 0513.0	0.5	3.0	d	3½°	170431	M_L= 3.4
VUL	iPZ	0455.3	0.2	19.7	d			
KRT	iPZ iSN	56 0511½		3.0	d	1¼°	170435	
RAB	iPZ iSN	204204.4 15.7	0.5	2.1	u	½°	204152	M_L= 3.3
RAB	iPZ iSN/	220617.7 40	0.5	5.8	u	1¾°	220548	M_L= 4.5
RAL	iPZ	17.0	0.4	10.5	u			
VUL	iPZ	16.5	0.3	19.0	u			
RAB	iPZ eSN/	221129.0 50	0.5	9.2	u	1½°	221101	M_L= 4.3
RAL	iPZ	28.7	0.6	14.2	d			
VUL	iPZ	28.0	0.5	24.2	d			
KRT	iPZ eSN	28½ 51		16.0	u	1¾°	221059	

			T sec	A mm	GM	Dist	H	Remarks
TABELE								
24th April, 1968.								
TBL	iPZ	140046½	1.0	12.0	u			Near
25th April, 1968.								
TBL	ePZ	171709						Teleseism
26th April, 1968.								
		NIL RECORDED						
27th April, 1968.								
TBL	ePZ	015439						
TBL	ePZ	102516						Regional
TBL	ePZ	142540½						Teleseism
28th April, 1968.								
TBL	iPZ	023834½	0.7	11.0	d	1°	023817	
	iSZ	47½						
29th April, 1968.								
		RECORDS EXPOSED						
30th April, 1968.								
TBL	ePZ	152243			(d)	1°	152213	
	iSZ	2306						
AGENAHAMBO								
27th April, 1968.								
AGE	ePZ	102526½	0.2	0.5	u			Regional
AGE	ePZ	142529½						
AGE	iPZ	233632						
28th April, 1968.								
		NIL RECORDED						
29th April, 1968.								
		NIL RECORDED						
30th April, 1968.								
AGE	iPZ	113914½			d			Regional
1st May, 1968.								
AGE	From 1900 to 2400 Harmonic tremors							
2nd May, 1968.								
AGE	eiPZ	064148½	0.5	1.0	d			
	iSZ	51						
AGE	ePZ	195230½				3½°	195138	
	iSZ	5310½						
	From 1900 to 2400 Harmonic Tremors							

			T sec	A mm	GM	Dist	H	Remarks
3rd May, 1968.								
AGE	iPZ	104628½	0.5	0.8	u			Distant
AGE	ePZ	104737						Distant
								In coda of preceding shock
AGE	ePZ	223012						Distant
AGE	ePZ iSZ	223313½ 24½	0.5	1.0	u	¾°	223258	

Rabaul Central Observatory,
16th May, 1968.

(G.W. D'ADDARIO)
Volcanologist-in-Charge

TERRITORY OF PAPUA AND NEW GUINEA
GEOLOGICAL AND VOLCANOLOGICAL BRANCH
VOLCANOLOGICAL SECTION

PRELIMINARY EARTHQUAKE ANALYSIS
RABAUL CENTRAL OBSERVATORY
1968

Rabaul	RAB	From: MAY. 15.1968 To: MAY. 21. 1968
Rabaul Harbour Network	RAN SUL RAL TAV VUL	From: MAY. 15.1968 To: MAY. 21. 1968
Keravat	KRT	From: MAY. 15.1968 To: MAY. 21. 1968
Esa'ala	ESA	From: MAY. 8. 1968 To: MAY. 14. 1968
Tabele	TBL	From: MAY. 1. 1968 To: MAY. 7. 1968
Agenahambo	AGE	From: To:
Waris	WAA	Not operational
Ulamona	ULA	Not operational
Piva	PIV	Not operational
Cape Gloucester	LAG	Not operational

STATION PERSONNEL

RAB Central Observatory, Rabaul.

Volcanologist-in-Charge	G.W. D'Addario
Volcanologist	R.F. Heming
Seismologist	(Position vacant)
Seismogram Readers	D.J.Cock, H. Carrick
Senior Technical Officer	N.C. Myers
Technical Officer	R.J. Conway
Volcanological Assistants	L.Topue, M. Gaiam V. Kaita.
Technical Assistant	P. Daimbari
Trainee Volcanological Assistants	B. Talai, M. Salaiau, C. Matapit
Secretary	H. James.

KRT Keravat Outstation:

Observer (part-time)	G.E.Cherick

TBL Tabele Observatory

Observer	E. Bavian

ESA Esa'ala Observatory

Observer	F. Dira

AGE Agenahambo Outstation

Observer (Part-Time)	Br. B. Hughes

The Rabaul Preliminary Earthquake Analysis (PEA) is produced by the staff under the direction of the Volcanologist-in-Charge from whom additional information and photocopies of seismogram records from all stations may be obtained on request.

Please address all communications to:-

Volcanologist-in-Charge,
Central Observatory
P.O. Box 386,
RABAUL. T.P. & N. G.

SEISMOGRAPH STATIONS

Station (NEW GUINEA)	Code	South Latitude	East Longitude	Elev. (m)	Foundation
Rabaul	RAB	04°11'28.6"	152°10'11.4"	183.5	Basalt Flow
Wanliss Street	WAN*	04°11'39.6"	152°10'32.5"	25.0	Basalt Flow
Sulphur Creek	SUL*	04°13'09.8"	152°10'33.3"	8.5	Unconsolidated volcanic ash
Rabalanakaia	RAL*	04°13'13.0"	152°12'07.0"	91.0	Unconsolidated volcanic ash
Tavurvur	TAV*	04°13'52.2"	152°13'12.9"	27.0	Andesite Flow
Tavilius	VUL*	04°16'56.2"	152°08'44.6"	332.3	Unconsolidated volcanic ash
Keravat	KRT	04°21'10.5"	152°03'[illegible]"	20.0	Alluvium
Ulamona	ULA	04°59'24.0"	151°16'30.0"	17.0	Lapilli Tuff
Tabele	TBL	05°06'04.[illegible]"	145°00'41.37"	179.5	Basalt Flow
Waris	WAA	04°07'00"	145°[illegible]'[illegible]"	48.0	Lapilli Tuff
Piva	PIV	06°12'00"	155°03'30"	60.0	Alluvium
Cape Gloucester	LAG	04°27'20"	148°16'00"	24.0	Lapilli Tuff
(PAPUA)					
Agenahambo	AGE	08°48'49"	148°[illegible]'[illegible]"	503.0	Unconsolidated volcanic ash
Esa'ala	ESA	09°44'18.2"	150°48'50.7"	46.4	Granite Gneiss

* Rabaul Harbour Network

STATION INSTRUMENTATION

Station & Instruments	Comp.	To	Tg	Trace Speed mm/min	Approximate relative Magnification	Approximate damping
(NEW GUINEA)						
Rabaul Central Observatory RAB						
World-Wide Standard	Z	1.0	0.74	60	12,500	critical
	N,E	1.0	0.74	60	6,250	critical
	Z/N/E/	15.0	100.0	15	750	critical
Benioff VR 14.7Kg	Zh	1.0	0.02	180+	4,000	critical
Omori 15Kg	Nc	3.6	-	24	12	10.1 air
Omori 15Kg	Eo	3.8	-	24	10	10.1 air
Wood-Anderson Torsion	Na,Ea	0.8	-	60	2,800	critical

\+ Recording is triggered by the onset of any earthquake with pre-determined minimum amplitude. Recorder is stopped automatically by hour break pulse.

Rabaul Harbour Network

Readings from the Harbour Network are entered in the PEA only for large earthquakes, with impulsive and sharply defined onset of phases.

WAN°	Benioff VR 14.7Kg	Z	1.0	0.02	60	5,240	critical
SUL°	Benioff VR 14.7Kg	Z	1.0	0.02	60	2,850	critical
	MO2 Accelerograph						
RAL°	Benioff VR 14.7Kg	Z	1.0	0.02	60	8,075	critical
TAV°	Benioff VR 14.7Kg	Z	1.0	0.02	60	20,900	critical
VUL°	Benioff VR 14.7Kg	Z	1.0	0.02	60	5,000	critical

STATION INSTRUMENTATION

Station & Instruments	Comp.	To	Tg	Trace speed mm/min	Approximate relative Magnification	Approx. damping
Rabaul Harbour Network (cont'd).						
° Signals from these stations are telemetered by land line to Helicorders (Geotech Mod. 2484) at the Central Observatory.						
°° Signals from this station are telemetered via VHF to its Helicorder at the Central Observatory.						
KRT - Keravat Outstation						
Benioff MC 50 Kg	Z	1.2	0.2	15	20% sensitivity	critical
Benioff MC 50Kg	N/E	1.2	0.2	15	10% sensitivity	critical
ULA - Ulamona Field Station						
Willmore portable	Z	0.6	0.25	60	3,000	underdamped
PIV - Piva Field Station						
Willmore portable	Z	0.6	0.25	60	3,000	underdamped
WAA - Waris Field Station						
Willmore portable	Z	0.6	0.25	60	3,000	underdamped
LAG - Cape Gloucester Field Station						
Willmore portable	Z	0.6	0.25	60	3,000	underdamped

N.B. These field stations consist of a permanent building in which instruments are installed when necessary.

Details of emergency field stations, within the Territory will be listed when in operation.

TBL - Tabele Observatory						
Benioff VR 107.5Kg	Z	1.0	0.2	60	1,550	critical
(PAPUA)						
ESA - Esa'ala Observatory						
Benioff VR 107.5Kg	Z	1.0	0.2	15	36,000	critical
Benioff VR 107.5Kg	N,E	1.0	0.2	15	18,000	critical
Benioff VR 107.5Kg	Z/N/E	1.0	60.0	30	50% sensitivity	critical
AGE - Agerahambo Station						
Willmore portable	Z	0.6	0.25	60	3,000	underdamped

VR Variable Reluctance

MC Moving-coil

Relative magnification curves of seismograph systems installed in the stations controlled by the Rabaul Central Observatory are listed once a month on the P.E.A.

PRESENTATION OF DATA

(reviewed in November, 1967).

All times are reduced to Greenwich Mean Time (GMT), which is 10 hours behind Eastern Standard Time.

At RABAUL and Harbour Network, the time signal is marked every minute on each seismogram record from the Observatory crystal chronometer. Second marks from Radio signal VNG (Australia) are recorded on World-wide Standard System S.P.-N. component only according with the W.W.S.S. programme, at six hour intervals. Primary time is provided by W.W.S.S. equipment and secondary time by a Labtronic crystal chronometer with the accuracy of ± 5 ms per day compared with VNG (Australia) with the aid of a chronoscope.

At TBL and AGE, the time signal is derived from a spring driven chronometer (Mercer) and marked each minute on records. Time accuracy is determined by comparison with signals from WWVH daily. Linear correction is applied to the daily drift.

On all seismogram records time increases from left to right and time break is upward.

At RAB* and Harbour Network the recording drum of each seismograph is driven by a 110VAC 60 H_z synchronous motor. The 110VAC is frequently regulated by a crystal chronometer.

* The Omori recording drum is driven by a nonregulated 50 Hz frequency supply.

At ESA and KRT power for recorder motors is frequency regulated by a crystal chronometer at 50 Hz. Power for AGE and TBL and field stations is supplied by a 50 Hz free running oscillator.

Direction of Motion.

Upward direction of ground motion corresponds to upward trace motion on vertical seismogram records. Direction of component of ground motion to North or East corresponds to upward trace motion on horizontal seismogram records.

Vertical trace motion from impulsive onset of longitudinal waves of compressional or dilatational ground movement is indicated by "u" or "d" accompanied by N.S.E. or W. as per trace motion amplitude on horizontal seismogram records, to represent vectorially the direction of ground motion. "+" or "-" indicates upward or downward motion of the ground respectively, from a wave not known to be of the longitudinal type.

Accuracy of Readings:

When readings are given with a decimal figure, they are to 1/10 of a second, other readings have been made to the nearest half second.

Crustal Phases

Px, Sx Crustal phases, other than Pn and Sn for local and near earthquakes.

Felt Intensity.

Information on maximum intensities of shocks reported felt is included. Intensities are given in Roman numerals based on the Modified Mercalli Scale, of 1931.

Determination of Epicentre.

Where no source is cited, the determination of epicentral distance and origin time for local and regional earthquakes, is carried out at the Central Observatory, Rabaul, from the S-P travel times assuming a normal depth of the focus.

Geographical Designation of Epicentre.

The regional names which follow the co-ordinates of epicentres located at the Central Observatory are meant only to supplement the co-ordinates and normally follow well-known geographical rather than geological features. Use is made of the full degree blocks according to the method defined by E.A.Flinn and E.R. Engadal in - " A PROPOSED BASIS FOR GEOGRAPHICAL AND SEISMIC REGIONALIZATION", Seismic Data Laboratory Report No. 191, U.I.D. Inc, Alexandria, Virginia, 1964, adopted by the U.S.C.G.S. for computer requirements.

Magnitude Definition and Determination.

M_L - Local Magnitude (Richter, 1935) is calculated from the recorded trace amplitude of the Wood-Anderson torsion seismographs of stated physical constants (installed at the Observatory in November, 1967).

Maximum trace amplitude (0 to peak) expressed in millimetres and tenths is measured directly on both components. Magnitude is determined independently and the arithmetic mean taken. M_L values are given to the tenth of a unit.

The station correction factor is assumed to be zero until better known.

M_S - Surface Wave Magnitude (Gutemberg & Richter, 1956) is calculated from the amplitude of surface waves of period near 20 seconds for shallow distant earthquakes.

M_B - Body Wave Magnitude is calculated from the ratio of amplitude over period for body waves on S.P.-Z of World-wide Seismograph System only when depth is known. The magnification factor for the standard seismograph is taken into account.

m. - Unified magnitude (Gutemberg & Richter, 1956) has the following relation to M_L , M_S , and M_B.

$$m = 1.7 + 0.8\ M_L - 0.01\ M_L^2$$

$$m = M_B \text{ (without correction).}$$

$$m = 2.5 + 0.63\ M_S$$

Local Magnitude of earthquakes recorded at RAB with a clear S-P interval is tabulated on a Day-Distance (in Central Angle Degrees) graph which is added to the PEA monthly.

Symbols.

i. - impulsive and sharply defined beginning of a phase.

e. - emergent and poorly defined beginning of phase.

T. - Period in seconds.

A. - Peak-to-Trough trace amplitude in millimetres.

GM - Ground Motion.

Dist. - Epicentral Distance in central angle degrees.

H. - Origin Time

h. - Focal depth in Kilometres

CBM - Confused by microseisms.

PRESENTATION OF DATA(CONTINUED.)

Remarks:

Local - Typical signature of an earthquake with epicentre within 0.9^{o}

Near - Typical signature of an earthquake with epicentre between 0.9^{o} and 9^{o}.

Distant - Typical signature of an earthquake with epicentre between 9^{o} and 45^{o}.

Teleseism - Typical signature of an earthquake with epicentre more than 45^{o}.

Traces - Any recorded disperse waves or very weak unknown earthquake phases.

Local and Near earthquakes will be classified Regional, and Distant earthquakes will be grouped with Teleseisms if shear waves and their reflections are unidentifiable.

G.W. D'ADDARIO
Vulcanologict-in-Charge.

			T sec	A mm	GM	Dist	H	Remarks
RABAUL								
15th May, 1968.								
RAB	eZ/	083146						Traces
RAB	eZ/	111449			+			Traces
RAB	ePZ	124121			d	15°		
	eSN/	4407						
KRT	iPZ	124126½	2.0	3.0	d			Distant
RAB	ePZ	150738	1.0	2.0	u	41°		
	ePPZ/	0908						
	iSN/	1336						
	eLqN/	1650						
	eLrZ/	1850						
	eMZ/	2050						
KRT	ePZ	150739½	1.8	2.0	u			Teleseism
RAB	iPZ	154812.0	0.5	8.0	u	¾°	154757	M_L = 4.3
	iSN	22.9						
RAL	iPZ	11.6		6.0	d			
VUL	iPZ	12.4	0.3	6.0	d			
KRT	iPZ	154814½	0.4	5.0	d	1°	154756	
	iSE	27						
16th May, 1968.								
RAB	iPZ	005719.2	1.0	3.5	d	3½°	105626	M_L = 5.4
	i(S)N	59.8						
RAB	e(P)Z	081800				22°		
	eSE/	2205						
RAB	iPZ	090638.0	1.0	6.0	d	48°		
	eSE/	1322						
KRT	ePZ	39½			d			
RAB	iPnZ	104725.5	1.0	16.0	u	1°	104709	
	iPZ	28.0						
	iSN	37.2						
KRT	iPnZ	28½			u			
	iPZ	30						
RAB	iPZ	162158.6			u	47°		
	ePPZ/	2337						
	eSN/	2830						
	eScSE/	3136						
	eLqE/	3234						
	eLrZ/	3432						
	eMZ/	3928						
KRT	ePZ	162157	0.8	1.6	u			
RAB	iPZ	192509.2	1.0	4.2	u	47°		
	eSE/	3152						
KRT	e(P)Z	250 7½						
RAB	iPZ	202219.1	0.5	3.6	d	1¾°	202150	M_L = 4.6
	iSN	41.0						
RAL	iPZ	20.5		5.8	u			
VUL	iPZ	19.0	0.5	7.5	u			

			T sec	A mm	GM	Dist	H	Remarks
16th May, 1968 (cont'd).								
RAB	iPZ	203038.7	1.0	3.4	d	48°		
	eSE/	3725						
KRT	e(P)Z	3042½						
RAB	ePZ	231303½	0.4	1.0	d	45°		
	eSN/	1911						
	eLqN/	2321						
	eLrZ/	2532						
	AMZ/	2920						
17th May, 1968.								
RAB	ePZ	033141	0.5	2.0	u	1½°	033117	M_L = 4.0
	iSN	57.0						
VUL	iPZ	40.1	0.3	7.4	u			
RAB	e(P)Z	063233			d	(½°)	0632(22)	M_L = 3.8
	iSN	41.4						
RAB	ePZ	080254	0.5	1.2	u	31°		
	eSN/	0746						
	LrZ/	1102½						
RAB	ePZ/	105054.0			d	47°		
	eSN/	5724						
RAB	iPZ	110625.0	0.3	1.3	d	1½°	110559	M_L = 3.5
	eSN	45						
RAL	iPZ	24.7	0.3	7.0	u			
VUL	iPZ	23.9	0.3	5.8	u			
RAB	e(P)Z	130909			d	(30°)		
	eSN/	1405						
RAB	e(P)Z	150120	0.5	1.0	d			(Regional)
RAB	ePZ/	161041			u	(47°)		
	eZ/	1206						
	e(S)N/	1722						
RAB	ePZ	173622	1.0	1.3	u			(Distant)
RAB	iPZ	173739.3	0.4	3.0	u	¾°	173723	M_L = 3.7
VUL	iPZ	39.6		4.0	u			(In coda of preceding shock)
KRT	iPZ	41			d	1°	173722	
	iSN	55						
RAB	e(P)Z	182507			d	(7½°)	1823(19)	
	eSN	2629½						
RAL	ePZ	210426			d			(Regional)
RAB	ePZ	212514	0.4		d	4°	212410	
	eSE	2602½						
RAB	ePZ	224431			u			Regional
KRT	eZ/	5116			-			Traces

			T sec	A mm	GM	Dist	H	Remarks
18th May, 1968.								
RAB	iPZ	000053.6	0.5	5.0	d			Regional
RAB	eZ/	014610			-			Traces
RAB	ePZ i(S)N	032547.0 2653.0	0.5	3.0	d	5¾°	032422	C.B.M.
KRT	iPZ iSN	2545 2653½	0.4	2.6	d	6°	032417	
RAB	iPZ iSN	124928.9 47.0	0.4	4.0	d	1¼°	124905	M_L= 3.9
WAN	iPZ	28.8	0.6	3.1	d			
SUL	iPZ	28.4	0.6	2.8	d			
RAL	iPZ	28.5	0.7	6.0	d			
KRT	iPZ iSN	27½ 42½		8.4	u	1¼°	124907	
RAB	ePZ iSN	162132.0 2205.3	0.3	3.0	u	2¾°	162049	M_L= 4.7
KRT	iPZ iSN	2131 2257½	0.2	3.8	u	2¼°	162056	
RAB	ePZ iSN	164035 4109.0	0.5	1.9	u	2¾°	163950	
RAB	iPZ iSN	171314.0 33.5	0.4	17.3	d	1½°	171249	M_L= 4.2
WAN	iPZ	13.8		2.8	d			
SUL	iPZ	13.9	0.4	2.6	d			
RAL	iPZ	13.9		5.0	d			
KRT	iPZ	12½			d			
RAB	e(P)Z iSE	171608 41.0	0.5	2.0	d	2¾°	171525	In coda of preceding shock
KRT	ePZ iSE	06½ 36	0.4	2.6	d	2½°	171527	
RAB	iPZ i(S)N	195930.5 6009.0	0.5	34.1	d	3¼°	195841	C.B.M. M_L= 5.2
WAN	iPZ	30.3	0.5	3.6	d			
SUL	iPZ	30.7	0.5	3.1	d			
RAL	iPZ	30.4		5.0	d			
KRT	eiPZ iSE	26 57½			d	2½°	195844	
RAB	ePZ iSN	211842 1904.5	0.5	2.0	u	1¾°	211813	
KRT	ePZ iSE	1842 1900			u	1¼°	211818	
19th May, 1968.								
RAB	e(P)Z eSN/	041922 2625			d	43°		
KRT	iPZ	041921			d			Distant

			T sec	A mm	GM	Dist	H	Remarks
19th May, 1968 (cont'd).								
RAB	iPZ iSN/	104101.6 19	0.5	58.0	u	1½°	104038	M_L = 5.4 Felt Rab: Int.II - III
WAN	iPZ	01.4			u			
SUL	iPZ	01.5	0.4		u			
RAL	iPZ	00.7			u			
KRT	ePZ	03½			u			C.B.M. Regional
RAB	iPZ iSN	173118.0 38.4	0.5	4.3	d	1½°	173052	M_L = 4.3
WAN	iPZ	18.1		4.5	u			
RAL	iPZ	18.0	0.3	2.1	u			
KRT	iPZ iSN	15 33	0.4	0.6	d	1½°	173051	
RAB	ePZ eSN/	214001 4410	1.0	1.2	d	24°		
RAB	ePZ eSN/	222506 3143			u	47°		Distant
20th May, 1963.								
RAB	iPZ eSE/	032433.2 3114	1.0	3.2	d	47°		
RAB	iPZ eSN/	070150.0 0830	0.8	1.5	d	48°		
RAB	iPZ ePcPZ/ eSN/ e(ScS)E/ eLqE/ eLrZ/ eMZ/	072026.0 2156 2638 3010 35 3238 3717	1.0	2.0	d	44°		
KRT	ePZ	2026½	1.5	10.0	d			C.B.M. Distant
RAB	iPZ iSE	094216.0 40.0	0.5	3.5	u	2°	094144	M_L = 4.5
KRT	iPZ eSE	094218 41½			d	2°	094147	
RAB	iPZ iSE	103744.5 3817.0	0.5	3.0	u	2¾°	103701	M_L = 4.7
RAB	iPZ eSN/ eLqE/ eLrN/ eMZ/	104330.0 5056 5512 5907 110444	1.0	3.0	u	54°		
KRT	iPZ	104332	1.5	1.5	u			Teleseism
RAB	iPZ	120331.5	1.0	1.2	d			Distant
RAB	iPZ iSE/	172045.7 2104	0.5	128.0	d	1½°	172022	

			T sec	A mm	GM	Dist	H	Remarks
20th May, 1968.								
WAN	iPZ	172045.0			d			
SUL	iPZ	44.9			d			
RAL	iPZ	44.7			d			
KRT	iPZ	45..			d			Near
RAB	iPZ	173558..	0.5	22.0	d	1½°	173535	M_L= 4.9
	iSE	3616.7						
KRT	iPZ	3559	0.8	7.0	d	1½°	173534	
	eSE	3618						
RAB	iPZ	184557.1	0.5	16.0	d	1½°	184533	M_L= 4.6
	iSE	4616.0						
WAN	iPZ	4557.0		6.0	d			
SUL	iPZ	57.3	0.3	3.0	d			
RAL	iPZ	56.9			d			
KRT	iPZ	184557	0.5	8.0	d	3½°	184534	
	iSE	4614½						
RAB	iPZ	191330.5	0.5	5.0	d	3°	191244	M_L= 5.2
	iSE	1405.0						
WAN	iPZ	1330.3			d			
RAL	iPZ	31.5			d			
KRT	iPZ	191331	0.6	7.0	d	(3½°)	1912(54)	
	i(S)E	59						
RAB	ePZ	201308	1.0	2.0	d	4½°		
	ePPZ/	1442						
	eSN/	1910						
	eLqE/	2218						
	eLrZ/	2418						
	eMZ/	2900						
WAN	iPZ	1308			u			
KRT	iPZ	1309	0.8	6.0	d			Distant
RAB	iPZ	211829.2	1.0	4.0	d	5½°		
	ePPZ/	2026						
	eSN/	2536						
	eLqN/	3037						
	eLrZ/	3248						
RAB	iPZ	233546.0	0.5	11.7	d	1½°	233521	M_L= 4.7
	iSE	3604.7						
WAN	iPZ	3546.2						
SUL	iPZ	46.0	0.5	3.2	d			
RAL	iPZ	45.8		11.2	d			
KRT	iPZ	3547			d	1½°	233521	
	iSN	3607						
21st May, 1968.								
RAB	ePZ	002817½	0.5	1.0	u			Teleseism
RAB	iPZ	041945.7	0.9	3.3	d			Distant

			T sec	A mm	GM	Dist	H	Remarks
21st May, 1968 (cont'd).								
RAB	ePZ/	082844			u	50°		
	ePPPZ/	3131						
	eSN/	3547						
	eSSE/	3932						
	eLqZ/	4045						
	eLrE/	4316						
	eMZ/	4816						
KRT	e(P)N	(43)						C B.H.
RAB	ePZ	110927½			u			Distant
RAB	i(P)Z	111228.5	0.5	1.0	i			Distant
RAB	ePZ	151859		1.2	u			Distant
KRT	ePZ	151841	0.6	0.8	d			Distant
RAB	ePZ	153620	1.0	2.0	d			Regional
KRT	ePZ	153622½	1.4	0	u	52°	153500	
	iZ	3727						
RAB	ePZ	164441	0.5	1.0	u	74°	164329	M_L = 4.3
	iSE	19.0						
KRT	iPZ	164443½	0.3	2.2	u			
RAB	iPZ	182344.0	0.5	2.2	u	2?°	182308	
	iSE	2411.1						
KRT	iPZ	182342½	0.3	1.8	d	2°	182310	
	iSN	2409½						
RAB	i(P)Z	185609	1.0		u			Distant
KRT	ePZ	14	1.6	1.4	d			
RAB	iPZ	212135.0	0.3	1.0	d			Regional

			T sec	A mm	GM	Dist	H	Remarks
ESA'ALA								
8th May, 1968.								
ESA	ePZ	023553½			d			
ESA	iPZ	110848			u			Teleseism
ESA	iPZ	114129			d			Regional
ESA	ePZ	121752			d			Teleseism
ESA	e(P)Z	123012	1.0	0.5	d			Teleseism
ESA	iPZ	161527½		2.0	u			Regional
9th May, 1968.								
ESA	ePZ	041843½			u			Near
ESA	iPZ	101643						Regional
ESA	iPZ	173316	0.4	1.0	u			Near
10th May, 1968.								
ESA	iPZ	000724			u			Regional
ESA	ePZ	040300			d			Regional
ESA	ePZ	093138½			u			
ESA	iPZ	151729			u			Near
11th May, 1968.								
ESA	ePZ	085045	0.4		d			Near
ESA	iPZ	153448			u			Near
12th May, 1968.								
ESA	ePZ	024333½						
ESA	ePZ	184350	0.8		u			
13th May, 1968.								
ESA	iPZ	040049½	1.0	1.0	u			
ESA	iPZ	091602			u			
ESA	ePZ	125644						Near
ESA	ePZ	170021			d			
14th May, 1968.								
ESA	iPZ	152037½	0.5	1.p				

		T sec	A mm	GM	Dist	H	Remarks

TABELE

1st May, 1968.

TBL NIL RECORDED

2nd May, 1968.

TBL	ePZ	150942					
TBL	ePZ	205843			d		
TBL	eiPZ	232834½			(d)		Local

3rd May, 1968.

TBL NIL RECORDED

4th May, 1968.

TBL NIL RECORDED

5th May, 1968. Very strong microseismic activity associated with heavy rain between 0314 - 0412 hours.

TBL	iPZ	011342½	0.4	6.0	u		
TBL	iPZ	023847½	0.5	5.0	d		
TBL	ePZ	071401½					
TBL	iPZ	130755½	0.8	1.0	(d)		Near

6th May, 1968.

TBL	ePZ	033633½					Local
TBL	ePZ	131518					

7th May, 1968. NIL RECORDED

Rabaul Central Observatory,
24th May, 1968.

(G.W. D'ADDARIO)
Volcanologist-in-Charge

TERRITORY OF PAPUA AND NEW GUINEA
GEOLOGICAL AND VOLCANOLOGICAL BRANCH
VOLCANOLOGICAL SECTION

11 JUN 1968

PRELIMINARY EARTHQUAKE ANALYSIS
RABAUL CENTRAL OBSERVATORY
1968

Rabaul	RAB	From: 22nd — 28th May, 68 To :
Rabaul Harbour Network	WAN SUL RAL TAV VUL	From: 22nd — 28th May, 68 TO :
Keravat	KRT	From: 22nd — 28th May, 68 To :
Esa'ala	ESA	From: 1st — 7th May, 68 To:
Tabele	TBL	From: 8th — 14th May, 68 To :
Agenahambo	AGE	From: 4th — 9th May, 68 To :
Waris	WAA	Not operational
Ulamona	ULA	Not operational
Piva	PIV	Not pperational
Cape Gloucester	LAG	Not operational

STATION PERSONNEL

RAB Central Observatory, Rabaul.

Volcanologist-in-Charge	G.W. D'Addario
Volcanologist	R.F. Heming
Seismologist	(Position vacant)
Seismogram Readers	D.J.Cook, H. Carrick
Senior Technical Officer	N.O. Myers
Technical Officer	R.J. Conway
Volcanological Assistants	L.Topue, M. Gaium V. Kaita.
Technical Assistant	P. Daimbari
Trainee Volcanological Assistants	B. Talai, M. Salaiau, C. Matapit
Secretary	H. James.

KRT Keravat Outstation:

Observer (part-time)	G.E.Chorick

TBL Tabele Observatory

Observer	E. Kavian

ESA Esa'ala Observatory

Observer	F. Dira

AGE Agenahambo Outstation

Observer (Part-Time)	Br. B. Hughes

The Rabaul Preliminary Earthquake Analysis (PEA) is produced by the staff under the direction of the Volcanologist-in-Charge from whom additional information and photocopies of seismogram records from all stations may be obtained on request.

Please address all communications to:-

Volcanologist-in-Charge,
Central Observatory
P.O. Box 386,
RABAUL. T.P. & N. G.

SEISMOGRAPH STATIONS

Station (NEW GUINEA)	Code	South Latitude	East Longitude	Elev. (m)	Foundation
Rabaul	RAB	04°11'28.6"	152°10'11.4"	183.5	Basalt Flow
Wanliss Street	WAN*	04°11'39.6"	152°10'32.5"	25.0	Basalt Flow
Sulphur Creek	SUL*	04°13'09.8"	152°10'33.3"	8.5	Unconsolidated volcanic ash
Rabalanakaia	RAL*	04°13'13.0"	152°12'07.0"	91.0	Unconsolidated volcanic ash
Tavurvur	TAV*	04°13'52.2"	152°13'12.9"	27.0	Andesite Flow
Taviliu	VUL*	04°16'56.2"	152°08'44.6"	332.3	Unconsolidated volcanic ash
Keravat	KRT	04°21'10.5"	152°03'[illegible]"	20.0	Alluvium
Ulamona	ULA	04°59'24.0"	151°16'30.0"	17.0	Lapilli Tuff
Tabele	TBL	04°06'[illegible]	145°00'41.37"	179.5	Basalt Flow
Waris	WAA	04°07'00"	4[illegible]'[illegible].0"	48.0	Lapilli Tuff
Piva	PIV	06°12'00"	[illegible]°03'30"	60.0	Alluvium
Cape Gloucester	LAG	04°27'20"	148°26'00"	24.0	Lapilli Tuff
(PAPUA)					
Agenahambo	AGE	08°48'49"	148°[illegible]'[illegible]"	503.0	Unconsolidated volcanic ash
Esa'ala	ESA	09°44'18.2"	150°48'50.7"	46.4	Granite Gneiss

* Rabaul Harbour Network

STATION INSTRUMENTATION

Station & Instruments	Comp.	To	Tg	Trace Speed mm/min	Approximate relative Magnification	Approximate damping
(NEW GUINEA)						
Rabaul Central Observatory RAB						
World-Wide Standard	Z	1.0	0.74	60	12,500	critical
	N,E	1.0	0.74	60	6,250	critical
	Z/N/E/	15.0	100.0	15	750	critical
Benioff VR 14.7Kg	Zh	1.0	0.02	180+	4,000	critical

* Recording is triggered by the onset of any earthquake with pre-determined minimum amplitude. Recorder is stopped automatically by hour break pulse.

Omori 15Kg	No	3.6	-	24	12	10.1 air
Omori 15Kg	Eo	3.8	-	24	10	10.1 air
Wood-Anderson Torsion	Na,Ea	0.8	-	60	2,800	critical

Rabaul Harbour Network

Readings from the Harbour Network are entered in the PEA only for large earthquakes, with impulsive and sharply defined onset of phases.

WAN° Benioff VR 14.7Kg Z	1.0	0.02	60	5,240	critical
SUL° Benioff VR 14.7Kg Z	1.0	0.02	60	2,850	critical
MO2 Accelerograph					
RAL° Benioff VR 14.7Kg Z	1.0	0.02	60	8,075	critical
TAV° Benioff VR 14.7Kg Z	1.0	0.02	60	20,900	critical
VUL° Benioff VR 14.7Kg Z	1.0	0.02	60	5,000	critical

STATION INSTRUMENTATION

Station & Instruments	Comp.	To	Tg	Trace speed mm/min	Approximate relative Magnification	Approx. damping
Rabaul Harbour Network (cont'd).						
° Signals from these stations are telemetered by land line to Helicorders (Geotech Mod. 2484) at the Central Observatory.						
°° Signals from this station are telemetered via VHF to its Helicorder at the Central Observatory.						
KRT - Keravat Outstation						
Benioff MC 50 Kg	Z	1.2	0.2	15	20% sensitivity	critical
Benioff MC 50Kg	N/E	1.2	0.2	15	10% sensitivity	critical
ULA - Ulamona Field Station						
Willmore portable	Z	0.6	0.25	60	3,000	underdamped
PIV - Piva Field Station						
Willmore portable	Z	0.6	0.25	60	3,000	underdamped
WAA - Waris Field Station						
Willmore portable	Z	0.6	0.25	60	3,000	underdamped
LAG - Cape Gloucester Field Station						
Willmore portable	Z	0.6	0.25	60	3,000	underdamped

N.B. These field stations consist of a permanent building in which instruments are installed when necessary.

Details of emergency field stations, within the Territory will be listed when in operation.

TBL - Tabele Observatory						
Benioff VR 107.5Kg	Z	1.0	0.2	60	1,350	critical
(PAPUA)						
ESA - Esa'ala Observatory						
Benioff VR 107.5Kg	Z	1.0	0.2	15	36,000	critical
Benioff VR 107.5Kg	N,E	1.0	0.2	15	18,000	critical
Benioff VR 107.5Kg	Z/N/E	1.0	60.0	30	50% sensitivity	critical
AGE - Agerahambo Station						
Willmore portable	Z	0.6	0.25	60	3,000	underdamped

VR Variable Reluctance

MC Moving-coil

Relative magnification curves of seismograph systems installed in the stations controlled by the Rabaul Central Observatory are listed once a month on the P.E.A.

PRESENTATION OF DATA

(reviewed in November, 1967).

All times are reduced to Greenwich Mean Time (GMT), which is 10 hours behind Eastern Standard Time.

At RABAUL and Harbour Network, the time signal is marked every minute on each seismogram record from the Observatory crystal chronometer. Second marks from Radio signal VNG (Australia) are recorded on World-wide Standard System S.P.-N. component only according with the W.W.S.S. programme, at six hour intervals. Primary time is provided by W.W.S.S. equipment and secondary time by a Labtronic crystal chronometer with the accuracy of ± 5 ms per day compared with VNG (Australia) with the aid of a chronoscope.

At TBL and AGE, the time signal is derived from a spring driven chronometer (Mercer) and marked each minute on records. Time accuracy is determined by comparison with signals from WWVH daily. Linear correction is applied to the daily drift.

On all seismogram records time increases from left to right and time break is upward.

At RAB and Harbour Network the recording drum of each seismograph is driven by a 110VAC 50 H_z synchronous motor. The 110VAC is frequently regulated by a crystal chronometer.

* The Omori recording drum is driven by a nonregulated 50 Hz frequency supply.

At ESA and KRT power for recorder motors is frequency regulated by a crystal chronometer at 50 Hz. Power for AGE and TBL and field stations is supplied by a 50 Hz free running oscillator.

Direction of Motion.

Upward direction of ground motion corresponds to upward trace motion on vertical seismogram records. Direction of component of ground motion to North or East corresponds to upward trace motion on horizontal seismogram records.

Vertical trace motion from impulsive onset of longitudinal waves of compressional or dilatational ground movement is indicated by "u" or "d" accompanied by N.S.E. or W. as per trace motion amplitude on horizontal seismogram records, to represent vectorially the direction of ground motion. "+" or "-" indicates upward or downward motion of the ground respectively, from a wave not known to be of the longitudinal type.

Accuracy of Readings:

When readings are given with a decimal figure, they are to 1/10 of a second, other readings have been made to the nearest half second.

Crustal Phases

Px, Sx Crustal phases, other than Pn and Sn for local and near earthquakes.

Felt Intensity.

Information on maximum intensities of shocks reported felt is included. Intensities are given in Roman numerals based on the Modified Mercalli Scale, of 1931.

Determination of Epicentre.

Where no source is cited, the determination of epicentral distance and origin time for local and regional earthquakes, is carried out at the Central Observatory, Rabaul, from the S-P travel times assuming a normal depth of the focus.

Geographical Designation of Epicentre.

The regional names which follow the co-ordinates of epicentres located at the Central Observatory are meant only to supplement the co-ordinates and normally follow well-known geographical rather than geological features. Use is made of the full degree blocks according to the method defined by E.A.Flinn and E.R. Engadhl in - " A PROPOSED BASIS FOR GEOGRAPHICAL AND SEISMIC REGIONALIZATION", Seismic Data Laboratory Report No. 101, U.I.D. Inc, Alexandria, Virginia, 1964, adopted by the U.S.C.G.S. for computer requirements.

Magnitude Definition and Determination.

M_L - Local Magnitude (Richter, 1935) is calculated from the recorded trace amplitude of the Wood-Anderson torsion seismographs of stated physical constants (installed at the Observatory in November, 1967).

Maximum trace amplitude (0 to peak) expressed in millimetres and tenths is measured directly on both components. Magnitude is determined independently and the arithmetic mean taken. M_L values are given to the tenth of a unit.

The station correction factor is assumed to be zero until better known.

M_S - Surface Wave Magnitude (Gutemberg & Richter, 1956) is calculated from the amplitude of surface waves of period near 20 seconds for shallow distant earthquakes.

M_B - Body Wave Magnitude is calculated from the ratio of amplitude over period for body waves on S.P.-Z of World-wide Seismograph System only when depth is known. The magnification factor for the standard seismograph is taken into account.

m. - Unified magnitude (Gutemberg & Richter, 1956) has the following relation to M_L , M_S , and M_B.

$$m = 1.7 + 0.8\ M_L - 0.01\ M_L^2$$

$m = M_B$ (without correction).

$$m = 2.5 + 0.63\ M_S$$

Local Magnitude of earthquakes recorded at RAB with a clear S-P interval is tabulated on a Day-Distance (in Central Angle Degrees) graph which is added to the PEA monthly.

Symbols.

i. - impulsive and sharply defined beginning of a phase.

e. - emergent and poorly defined beginning of phase.

T. - Period in seconds.

A. - Peak-to-Trough trace amplitude in millimetres.

GM - Ground Motion.

Dist. - Epicentral Distance in central angle degrees.

H. - Origin Time

h. - Focal depth in Kilometres

CBM - Confused by microseisms.

PRESENTATION OF DATA(CONTINUED.)

Remarks:

Local - Typical signature of an earthquake with epicentre within 0.9^{o}

Near - Typical signature of an earthquake with epicentre between 0.9^{o} and 9^{o}.

Distant - Typical signature of an earthquake with epicentre between 9^{o} and 45^{o}.

Teleseism - Typical signature of an earthquake with epicentre more than 45^{o}.

Traces - Any recorded disperse waves or very weak unknown earthquake phases.

Local and Near earthquakes will be classified Regional, and Distant earthquakes will be grouped with Teleseisms if sheer waves and their reflections are unidentifiable.

G.W. D'ADDARIO
Vulcanologist-in-Charge.

			T sec	A mm	GM	Dist	H	Remarks
RABAUL								
22nd May, 1968.								
RAB	eZ/	001924			→			Traces
KRT	iPZ	22		3.4	u			Traces
RAB	iPZ	025657.1	0.5	3.0	d	¾°	025642	M_L= 3.9
	iSE	5707.8						
WAN	iPZ	5657.4		4.4	d			
RAL	iPZ	57.0			d			
KRT	iPZ	59½			d	¾°	025644	
	iSN	5711						
RAB	eiPZ	110017	0.8	1.0	d	46°		
	eSE/	0702						
KRT	eiPZ	0018½			d			
RAB	iPZ	115057.6	0.5	1.2	u			Distant
KRT	e(P)Z	5100						Distant
RAB	iPZ	175336.8	0.5	9.1	d	1½°	175313	M_L= 4.4
	iSE	55.0						
WAN	iPZ	36.5		7.0	d			
RAL	iPZ	36.5		9.0	d			
KRT	iPZ	36						Near
RAB	ePZ	193739½			u	47°		
	eSN/	4416						
	eLqE/	4819						
	eLrZ/	5045						
KRT	eiPZ	41	0.6	1.2	u			
RAB	iPZ	193955.5	0.4	5.8	u	1¼°	193934	M_L= 4.5
	iSE	4011.0						
KRT	iPZ	3954				1°	193935	
	iSN	4008						
RAB	eZ/	212047			+			Traces
23rd May, 1968. Bad microseismic activity on KRT records.								
RAB	ePZ	002012½	0.4	5.9	u			Local
VUL	iPZ	14.4	0.5	8.0	u			
RAB	ePZ	004314½	0.4	8.5	d	¼°	004305	
	iSN	21.1						
WAN	iPZ	14.6		8.8				
RAB	iPZ	031549.9	0.4	5.0	d	2¾°	001505	
	iSN	1623.4						
VUL	iPZ	49.0		6.0	d			
RAB	ePZ	105037	0.3	1.0	d	4½°	104927	
	eSNa	5131						
RAB	ePZ	133712½	0.4	1.7	u	1½°	133646	
	iSE	32.8						

			T sec	A mm	GM	Dist	H	Remarks
23rd May, 1968 (cont'd).								
KRT	e(P)Z	133709						
RAB	ePZ	145928½	0.5	1.0	d	2¾°	145845	
	eSN	150001.1						
RAB	iPZ	162559.3	0.4	10.0	d	1½°	162534	
	eSE	2618½						
VUL	iPZ	58.8		31.0	d			
KRT	iPZ	57.4		4.8	d			Near
RAB	ePZ	173203	1.0	11.4	d	1¼°	173139	
	iSN	20.8						
RAB	e(P)Z	173248			d	(38°)		In coda of preceeding shock
	eSN/	3806						
	eLqN/	4057						
	eLrN/	4256						
	MZ/	4705						
* 24th May, 1968. (see page 11)								
25th May, 1968.								
RAB	iPZ	043711.5	0.5	3.8	u	1¾°	043640	M_L = 4.7
	iSN	36.0						
WAN	iPZ	11.0			u			
VUL	iPZ	10.5		13.1	u			
KRT	iPZ	11						
RAB	iPZ	070705.0	0.5	3.0	u	1¾°	070735	
	iSN	28.0						
RAL	iPZ	04.5		5.1	u			
VUL	iPZ	03.6	0.2	11.6	u			
KRT	iPZ	03			u			
RAB	ePZ	120110.0	0.8	2.0	d			Teleseism
	iSN	0744.0						
KRT	ePZ	12	0.6	2.0	u			
RAB	iPZ	200226.0	0.5	8.0	d	¾°	200208	
	iSN	39.6						
VUL	iPZ	27.6	0.5	6.5	u			
KRT	iPZ	30½	0.4	2.2	d	(1¼°)	200 (10)	
	i(S)N	45½						
RAB	iPZ	201327.6	0.5	5.5	d	½°	201315	
	iSN	37.0						
RAB	iPZ	235702.2	1.0	1.0	u			Distant
26th May, 1968.								
RAB	iPZ	040744.0	1.0	1.5	u			Distant
RAB	iPZ	061900.3	0.5	34.0	d	1°	061842	M_L = 4.3
	iSE	14.0						
KRT	iPZ	061904			d			
	eSN	14½						

			T sec	A mm	GM	Dist	H	Remarks
26th May, 1968.								
RAB	ePZ eSN/	145202½ 150028			u	63°		
KRT	iPZ	145204			u			
RAB	iPZ iSN	152144.5 2222.0	0.4	1.0	u	3¼°	152055	M_L= 4.8
KRT	iPZ eSN	152146 2217½	0.6	0.5	u			
RAB	iPZ iSE	195735.2 58.0			u	2°	195705	M_L= 4.2
RAB	iPZ iSN	234019.8 55.3	0.2	2.7	u	2¾°	233935	M_L= 4.8
27th May, 1968.								
RAB	i(P)Z eSN	004802.0 21	0.4	2.9	d	(1½°)	0047(37)	M_L= 3.9
RAB	iPZ iSN/	042311.5 32	0.5	4.0	d		042244	M_L= 4.5
WAN	iPZ	11.4	0.6	3.9	u			
RAL	iPZ	12.0			u			
VUL	iPZ	10.6			u			
RAB	iPZ	082755.1	0.5	2.3	u			(Local)
RAB	iPZ	114907.0	0.4	3.0	u			Local
RAB	iPZ iSE	180753.0 0811.5	0.5	2.0	u	1½°	180728	
KRT	ePZ	180747	0.4	1.0	u			
RAB	eZ/	192032			+			Traces
28th May, 1968.								
RAB	ePZ i(S)Na	014303 38	0.4	12.5	u	(3°)	0142(16)	M_L= 6.0
WAN	iPZ	02.7	0.4	2.0	u			
SUL	iPZ	02.8	0.8	2.0	u			
RAL	iPZ	02.9	0.8	4.0	u			
VUL	iPZ	01.5			u			
RAB	eZ/	034112			+			Traces
RAB	iPZ iSN	062858.0 2916.3	0.4	2.0	d	1¼°	062834	M_L= 3.8
RAB	ePZ	091352½			d			Teleseism
KRT	iPZ	091354			d			
RAB	eiPZ iPPZ i(S)E/	133021 29.4 3208	1.0	14.0	u	10°	111313	M_B= 7.1 M_L= 6.7

			T sec	A mm	GM	Dist	H	Remarks
28th May, 1968. (cont'd)								
RAB		133021 Felt:-						
	Lumi	142°01E	03°29S	Int. III				
	Tari	142°57E	05°52S	Int. IV				
	Telefomin	141°35E	05°10S	Int. V				
	Green River	141°03E	03°57S	Int V				
	Vanimo	141°20E	02°40S	Int. III IV				
	Manum	145°05E	04°05S	Int. II				
	West New Guinea Region							
KRT	iPZ	133020			u			Near
RAB	iPZ	163305.9		1.5	u			Local
* 24th May, 1968.								
RAB	iPZ	045151.7	0.5	15.0	u	½°	045141	
	i(S)N	59.8						
WAN	iPZ	51.7						
VUL	iPZ	52.0						
RAB	iPZ	141443.5	0.6	4.0	u			Teleseism
	iPZ/	42.0						
	i(PcP)Z/	1540.0						
	iSN/	2124.0						
	iSSE/	2444.0						
	eLqN/	2530.0						
	eLrZ/	2736.0						
KRT	iPZ	1445	1.0	2.0	u			
RAB	iPZ	154943.6	0.5	10.5	u	¾°	154926	M_L = 3.6
	iSN	56.8						
KRT	eiPZ	154941	1.2	4.4	d	¾°	154926	
	iPZ	41½						
	iSE	52						
RAB	iPZ	174839.7	0.7	3.1	d			Regional
KRT	ePZ	174840½			d			
RAB	ePZ	205452.4	0.4	2.0	d	3¾°	205352	
	iSE	5538.6						
RAB	iPZ	210514.0	0.7	5.6	u			Regional
ESA'ALA								
1st May, 1968.								
ESA	iPZ	043621	1.0	0.6	u			Distant
ESA	iPZ	050107½		1.5	d			Local
ESA	iPZ	085230½						Teleseism
ESA	iPZ	112832						Local
ESA	ePZ	161032½						
ESA	ePZ	212005½			d			Distant

			T sec	A mm	GM	Dist	H	Remarks
2rd May, 1968.								
ESA	ePZ	045705½						
ESA	iPZ	064138½	0.5	1.5	d			
ESA	iPZ	114606	0.5	4.0	d			Regional
ESA	ePZ	121843½			d			
ESA	iPZ	233038	0.9	6.0	u			Distant
3rd May, 1968.								
ESA	ePZ	054038	1.0	2.0	u			Distant
ESA	iPZ	133036			d			
4th May, 1968.								
ESA	ePZ	031257½	0.7	0.5	u			Distant
ESA	iPZ	061454½			d			Regional
ESA	iPZ	210921						Local
5th May, 1968.								
ESA	ePZ	014406	0.6		u			Regional
ESA	iPZ	083330.1			u			Local
ESA	iPZ	121402½						Local
ESA	iPZ	130742½			u			Local
6th May, 1968.								
ESA	iPZ	033702½		3.0	d			
ESA	ePZ	081704½						Distant
ESA	ePZ	125057½	0.4	0.6	u			Local
7th May, 1968.								
ESA	iPZ	114914½	1.0	2.1	u			
ESA	iPZ	150410						Regional
ESA	ePZ	183459	0.8	0.5	u			Distant
ESA	ePZ	190849						Near

TABELE

8th - 9th May, 1968.

TBL NIL RECORDED

10th May, 1968.

TBL	iPZ	000634½	0.4	11.0	d	000614	1°	
	iSZ	49½						

Microseismic activity between 1237 - 1243 hrs.

TBL	iPZ	140605	0.7	3.0	u			Local

11th May, 1968.

TBL	iPZ	155036½	0.3	16.0	d	1½°	155010	
	iSZ	56½						
TBL	ePZ	231334						

		T sec	A mm	GM	Dist	H	Remarks
12th May, 1968.							
TBL		NIL RECORDED					
13th May, 1968.							
TBL	ePZ	115037	0.2	1.4	(u)	½°	115026
	iSZ	44½					
TBL	eiPZ	173527					Near
14th May, 1968.							
TBL	ePZ	141209½	0.5	0.7	d		Teleseism
TBL	ePZ	142736	0.5	1.0	u		Teleseism
AGENAHAMBO							
4th May, 1968.							
AGE		NIL RECORDED					
5th May, 1968.							
AGE	eiPZ	025849½	0.3	1.3	d	3°	025802
	iSZ	5925½					
AGE	iPZ	071352	0.1	2.0	u	3°	071304
	iSZ	1428½					
AGE	iPZ	130724	0.2	1.1	d	2½°	130644
	iSZ	54					
6th May, 1968.							
AGE	eiPZ	033632	0.4	3.0	d	2¾°	033546
	iSZ	3706½					
AGE	iPZ	193019½			u	3¾°	192921
	iSZ	3104					
7th May, 1968.							
AGE		NIL RECORDED					
8th May, 1968.		Records unserviceable					
9th May, 1968.		"					"

Rabaul Central Observatory,
31st May, 1968.

(G. W. D'ADDARIO)
Volcanologist-in-Charge

TERRITORY OF PAPUA AND NEW GUINEA
GEOLOGICAL AND VOLCANOLOGICAL BRANCH
VOLCANOLOGICAL SECTION

PRELIMINARY EARTHQUAKE ANALYSIS
RABAUL CENTRAL OBSERVATORY
1968

Rabaul	RAB	From: 29TH May 1968. To : 4TH June 1968.
Rabaul Harbour Network	WAN SUL RAL TAV VUL	From: 29TH May 1968. To : 4TH June 1968.
Keravat	KRT	From: 29TH May 1968. To : ~~4TH~~ 3RD June 1968.
Esa'ala	ESA	From: 9TH May 1968. To : 21ST May 1968.
Tabele	TBL	From: 15TH May 1968. To : 21ST May 1968.
Agenahambo	AGE	From: To :
Waris	WAA	Not operational
Ulamona	ULA	Not operational
Piva	PIV	Not operational
Cape Gloucester	LAG	Not operational

STATION PERSONNEL

RAB Central Observatory, Rabaul.

Volcanologist-in-Charge	G.W. D'Addario
Volcanologist	R.F. Heming
Seismologist	(Position vacant)
Seismogram Readers	D.J.Cock, H. Carrick
Senior Technical Officer	N.C. Myers
Technical Officer	R.J. Conway
Volcanological Assistants	L.Topue, M. Gaiam V. Kaita.
Technical Assistant	P. Daimbari
Trainee Volcanological Assistants	B. Talai, M. Salaiau, C. Matapit
Secretary	H. James.

KRT Keravat Outstation:

Observer (part-time)	G.E.Chorick

TBL Tabelo Observatory

Observer	E. Kavian

ESA Esa'ala Observatory

Observer	F. Dira

AGE Agenahambo Outstation

Observer (Part-Time)	Br. B. Hughes

The Rabaul Preliminary Earthquake Analysis (PEA) is produced by the staff under the direction of the Volcanologist-in-Charge from whom additional information and photocopies of seismogram records from all stations may be obtained on request.

Please address all communications to:-

Volcanologist-in-Charge,
Central Observatory
P.O. Box 386,
RABAUL. T.P. & N. G.

SEISMOGRAPH STATIONS

Station (NEW GUINEA)	Code	South Latitude	East Longitude	Elev. (m)	Foundation
Rabaul	RAB	04°11'28.6"	152°10'11.4"	183.5	Basalt Flow
Wanliss Street	WAN*	04°11'39.6"	152°10'32.5"	25.0	Basalt Flow
Sulphur Creek	SUL*	04°13'09.8"	152°10'33.3"	8.5	Unconsolidated volcanic ash
Ra'alanakaia	RAL*	04°13'13.0"	152°12'07.0"	91.0	Unconsolidated volcanic ash
Tavurvur	TAV*	04°13'52.2"	152°13'12.9"	27.0	Andesite Flow
Taviliu	VUL*	04°16'58.2"	152°08'44.6"	332.3	Unconsolidated volcanic ash
Keravat	KRT	04°21'10.5"	152°03'[illegible]"	20.0	Alluvium
Ulamona	ULA	04°59'24.0"	151°16'30.0"	17.0	Lapilli Turf
Tabele	TBL	04°06'04.67"	145°00'41.37"	179.3	Basalt Flow
Waris	WAA	04°07'00"	145°[illegible]'00"	48.0	Lapilli Tuff
Piva	PIV	06°12'00"	145°03'30"	60.0	Alluvium
Cape Gloucester	LAG	04°27'20"	148°16'00"	24.0	Lapilli Tuff
(PAPUA)					
Agenahambo	AGE	08°48'49"	148°[illegible]'[illegible]"	503.0	Unconsolidated volcanic ash
Esa'ala	ESA	09°44'18.2"	150°48'50.7"	46.4	Granite Gneiss

* Rabaul Harbour Network

STATION INSTRUMENTATION

Station & Instruments	Comp.	To	Tg	Trace Speed mm/min	Approximate relative Magnification	Approximate damping
(NEW GUINEA)						
Rabaul Central Observatory RAB						
World-Wide Standard	Z	1.0	0.74	60	12,500	critical
	N,E	1.0	0.74	60	6,250	critical
	Z/N/E/	15.0	100.0	15	750	critical
Benioff VR 14.7Kg	Zh	1.0	0.02	180+	4,000	critical

+ Recording is triggered by the onset of any earthquake with pre-determined minimum amplitude. Recorder is stopped automatically by hour break pulse.

Omori 15Kg	No	3.6	-	24	12	10.1 air
Omori 15Kg	Eo	3.8	-	24	10	10.1 air
Wood-Anderson Torsion	Na,Ea	0.8	-	60	2,800	critical
Rabaul Harbour Network						

Readings from the Harbour Network are entered in the PEA only for large earthquakes, with impulsive and sharply defined onset of phases.

WAN° Benioff VR 14.7Kg Z	1.0	0.02	60	5,240	critical
SUL° Benioff VR 14.7Kg Z	1.0	0.02	60	2,850	critical
MO2 Accelerograph					
RAL° Benioff VR 14.7Kg Z	1.0	0.02	60	8,075	critical
TAV° Benioff VR 14.7Kg Z	1.0	0.02	60	20,900	critical
VUL° Benioff VR 14.7Kg Z	1.0	0.02	60	5,000	critical

STATION INSTRUMENTATION

Station & Instruments	Comp.	To	Tg	Trace speed mm/min	Approximate relative Magnification	Approx. damping
Rabaul Harbour Network (cont'd).						
° Signals from these stations are telemetered by land line to Helicorders (Geotech Mod. 2484) at the Central Observatory.						
°° Signals from this station are telemetered via VHF to its Helicorder at the Central Observatory.						
KRT - Keravat Outstation						
Benioff MC 50 Kg	Z	1.2	0.2	15	20% sensitivity	critical
Benioff MC 50Kg	N/E	1.2	0.2	15	10% sensitivity	critical
ULA - Ulamona Field Station						
Willmore portable	Z	0.6	0.25	60	3,000	underdamped
PIV - Piva Field Station						
Willmore portable	Z	0.6	0.25	60	3,000	underdamped
WAA - Waris Field Station						
Willmore portable	Z	0.6	0.25	60	3,000	underdamped
LAG - Cape Gloucester Field Station						
Willmore portable	Z	0.6	0.25	60	3,000	underdamped

N.B. These field stations consist of a permanent building in which instruments are installed when necessary.

Details of emergency field stations, within the Territory will be listed when in operation.

TBL - Tabele Observatory						
Benioff VR 107.5Kg	Z	1.0	0.2	60	1,350	critical
(PAPUA)						
ESA - Esa'ala Observatory						
Benioff VR 107.5Kg	Z	1.0	0.2	15	36,000	critical
Benioff VR 107.5Kg	N,E	1.0	0.2	15	18,000	critical
Benioff VR 107.5Kg	Z/N/E	1.0	60.0	30	50% sensitivity	critical
AGE - Agerahambo Station						
Willmore portable	Z	0.6	0.25	60	3,000	underdamped

VR Variable Reluctance

MC Moving-coil

Relative magnification curves of seismograph systems installed in the stations controlled by the Rabaul Central Observatory are listed once a month on the P.E.A.

PRESENTATION OF DATA

(reviewed in November, 1967).

All times are reduced to Greenwich Mean Time (GMT), which is 10 hours behind Eastern Standard Time.

At RABAUL and Harbour Network, the time signal is marked every minute on each seismogram record from the Observatory crystal chronometer. Second marks from Radio signal VNG (Australia) are recorded on World-wide Standard System S.P.-N. component only according with the W.W.S.S. programme, at six hour intervals. Primary time is provided by W.W.S.S. equipment and secondary time by a Labtronic crystal chronometer with the accuracy of ± 5 ms per day compared with VNG (Australia) with the aid of a chronoscope.

At TBL and AGE, the time signal is derived from a spring driven chronometer (Mercer) and marked each minute on records. Time accuracy is determined by comparison with signals from WWVH daily. Linear correction is applied to the daily drift.

On all seismogram records time increases from left to right and time break is upward.

At RAB* and Harbour Network the recording drum of each seismograph is driven by a 110VAC 60 H_z synchronous motor. The 110VAC is frequently regulated by a crystal chronometer.

* The Omori recording drum is driven by a nonregulated 50 Hz frequency supply.

At ESA and KRT power for recorder motors is frequency regulated by a crystal chronometer at 50 Hz. Power for AGE and TBL and field stations is supplied by a 50 Hz free running oscillator.

Direction of Motion.

Upward direction of ground motion corresponds to upward trace motion on vertical seismogram records. Direction of component of ground motion to North or East corresponds to upward trace motion on horizontal seismogram records.

Vertical trace motion from impulsive onset of longitudinal waves of compressional or dilatational ground movement is indicated by "u" or "d" accompanied by N.S.E. or W. as per trace motion amplitude on horizontal seismogram records, to represent vectorially the direction of ground motion. "+" or "-" indicates upward or downward motion of the ground respectively, from a wave not known to be of the longitudinal type.

Accuracy of Readings:

When readings are given with a decimal figure, they are to 1/10 of a second, other readings have been made to the nearest half second.

Crustal Phases

Px, Sx Crustal phases, other than Pn and Sn for local and near earthquakes.

Felt Intensity.

Information on maximum intensities of shocks reported felt is included. Intensities are given in Roman numerals based on the Modified Mercalli Scale, of 1931.

Determination of Epicentre.

Where no source is cited, the determination of epicentral distance and origin time for local and regional earthquakes, is carried out at the Central Observatory, Rabaul, from the S-P travel times assuming a normal depth of the focus.

Geographical Designation of Epicentre.

The regional names which follow the co-ordinates of epicentres located at the Central Observatory are meant only to supplement the co-ordinates and normally follow well-known geographical rather than geological features. Use is made of the full degree blocks according to the method defined by E.A.Flinn and E.R. Engadhl in - " A PROPOSED BASIS FOR GEOGRAPHICAL AND SEISMIC REGIONALIZATION", Seismic Data Laboratory Report No. 101, U.I.D. Inc, Alexandria, Virginia, 1964, adopted by the U.S.C.G.S. for computer requirements.

Magnitude Definition and Determination.

M_L - Local Magnitude (Richter, 1935) is calculated from the recorded trace amplitude of the Wood-Anderson torsion seismographs of stated physical constants (installed at the Observatory in November, 1967).

Maximum trace amplitude (0 to peak) expressed in millimetres and tenths is measured directly on both components. Magnitude is determined independently and the arithmetic mean taken. M_L values are given to the tenth of a unit.

The station correction factor is assumed to be zero until better known.

M_S - Surface Wave Magnitude (Gutemberg & Richter, 1956) is calculated from the amplitude of surface waves of period near 20 seconds for shallow distant earthquakes.

M_B - Body Wave Magnitude is calculated from the ratio of amplitude over period for body waves on S.P.-Z of World-wide Seismograph System only when depth is known. The magnification factor for the standard seismograph is taken into account.

m. - Unified magnitude (Gutemberg & Richter, 1956) has the following relation to M_L , M_S , and M_B.

$$m = 1.7 + 0.8\ M_L - 0.01\ M_L^2$$

$$m = M_B \text{ (without correction)}.$$

$$m = 2.5 + 0.63\ M_S$$

Local Magnitude of earthquakes recorded at RAB with a clear S-P interval is tabulated on a Day-Distance (in Central Angle Degrees) graph which is added to the PEA monthly.

Symbols.

i. - impulsive and sharply defined beginning of a phase.

e. - emergent and poorly defined beginning of phase.

T. - Period in seconds.

A. - Peak-to-Trough trace amplitude in millimetres.

GM - Ground Motion.

Dist. - Epicentral Distance in central angle degrees.

H. - Origin Time

h. - Focal depth in Kilometres

CBM - Confused by microseisms.

PRESENTATION OF DATA(CONTINUED.)

Remarks:

Local - Typical signature of an earthquake with epicentre within 0.9°

Near - Typical signature of an earthquake with epicentre between 0.9° and 9°.

Distant - Typical signature of an earthquake with epicentre between 9° and 45°.

Teleseism - Typical signature of an earthquake with epicentre more than 45°.

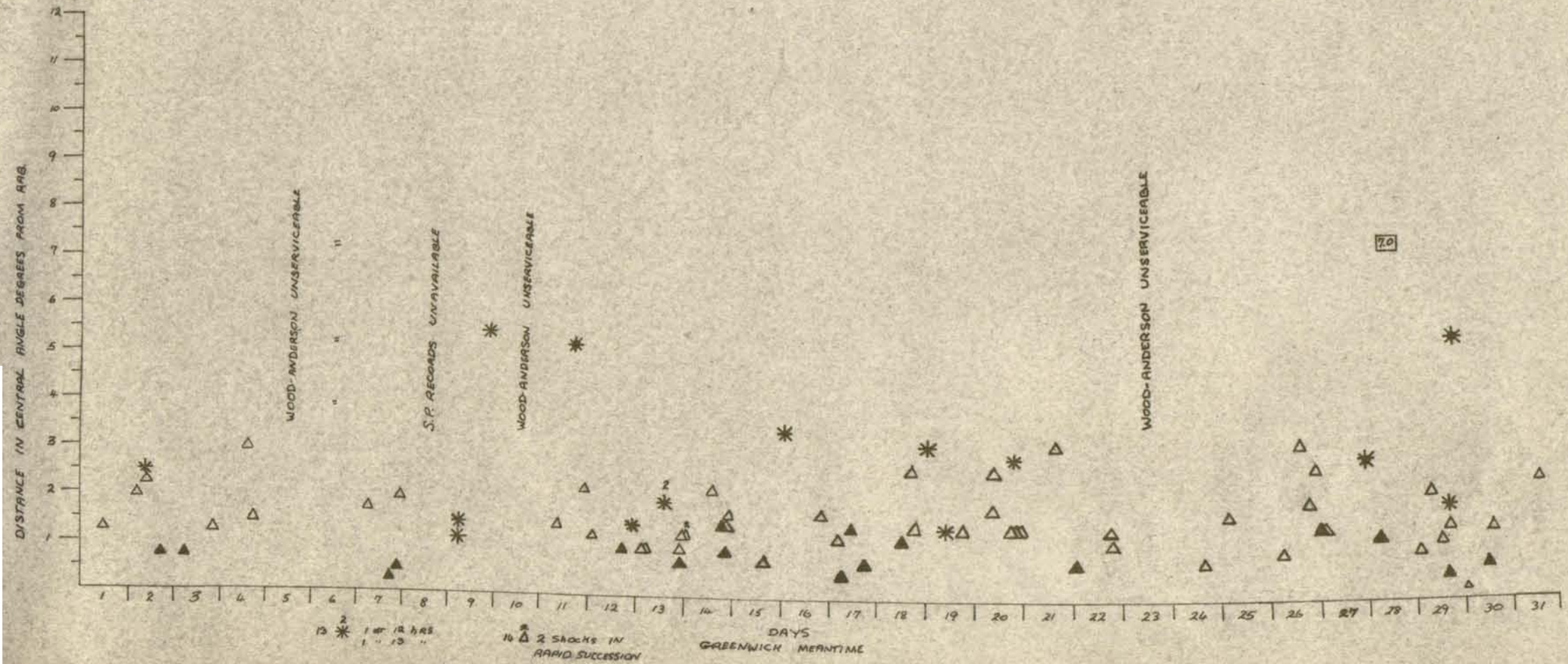
Traces - Any recorded disperse waves or very weak unknown earthquake phases.

Local and Near earthquakes will be classified Regional, and Distant earthquakes will be grouped with Teleseisms if sheer waves and their reflections are unidentifiable.

G.W. D'ADDARIO
Vulcanologist-in-Charge.

MAGNITUDE OF REGIONAL EARTHQUAKES WITH A CLEAR S-P INTERVAL
MAY 1968

LOCAL MAGNITUDE ML
△ 20-29
▲ 30-39
△ 40-49
✱ 50-59
✱ 60-69
□ 70-79



			T sec	A mm	GM	Dist	H	Remarks
RABAUL								
29th May, 1968.								
RAB	i(P)Z	023125.4			d			Regional
RAB	iPZ iSE	034227.8 43.0	0.4	4.8	u	1°	034208	M_L= 4.4
WAN	iPZ	27.6	0.6	17.8	d			
SUL	iPZ	28.0		11.9	d			
RAL	iPZ	27.7			d			
VUL	iPZ	27.0		16.7	d			
RAB	iPZ	044048.0			d			Distant
RAB	eZ/	090333			-			Traces
RAB	ePZ iSE	090538½ 0606.3	0.4	7.0	u	2½°	090502	M_L= 4.3
RAB	e(P)Z eSE	135516 23	0.2	3.0	d	½°	135506	
VUL	iPZ	08.4		11.2	d			
KRT	e(P)Z iSN	19 28		1.8	d	½°	135506	
RAB	ePZ eSE	145108½ 26½	0.4	20.0	d	1½°	145045	M_L= 4.7
WAN	iPZ	08.4		11.2	d			
SUL	iPZ	08.4	0.5	6.5	d			
RAL	iPZ	08.0			d			
VUL	iPZ	08.0			d			
KRT	iPZ	10½			d			
RAB	ePZ	145643	1.0	1.0	u			Distant
KRT	iPZ	47	2.0	1.8	d			Distant
RAB	ePZ iSN	165836 43.8	0.3	2.8	d	½°	165825	M_L= 3.9
KRT	iPZ iSN	38½ 48	0.2	1.6	d	½°	165824	
RAB	ePZ	172628			d			Distant
KRT	iPZ	28½	1.0	1.2	d			Distant
RAB	iPZ eSE	215233.1 53½	0.5	2.0	u	1½°	215207	M_L= 4.6
RAB	iPZ eSE	215835.9 5900½	0.4	2.0	u	2°	215803	M_L= 5.0
SUL	iPZ	37.2	0.5	6.0	d			
VUL	iPZ	37.7		20.1	d			
KRT	iPZ iSN	36 56½			d	1½°	215809	

			T sec	A mm	GM	Dist	H	Remarks
29th May, 1968 (cont'd).								
RAB	iPZ	235803.0	0.5	2.8	d	5½°	235641	M_L= 6.2
	iSE/	5906						
VUL	iPZ	5802.4	0.3	3.0	d			
KRT	ePZ	03	0.4	2.4	d			
30th May, 1968.		Very strong microseismic activity on KRT records between 0045-1100/2000-2358.						
RAB	iPZ	000950.4	0.5	1.0	u			Regional
RAB	eiPZ	013920½	0.5	2.1	d	¼°	015914	Local M_L= 2.5
	iZ	21.1						
	iSE	25.7						
VUL	iPZ	21.0		8.7	d			
RAB	ePZ	053230			u	50°		
	eSE/	3932						
RAB	ePZ	100032	1.0	2.8	d	2¼°		
	eSE/	0440						
	eLqE/	0506						
	eLrZ/	0615						
RAB	iPZ	151336.3	0.5	4.0	d	1½°	151311	M_L= 4.3
	iSN	55.0						
VUL	iPZ	36.0	0.4	9.2	u			
KRT	iPZ	37	0.4	2.0	d	1½°	151312	
	iSN	55½						
RAB	iPZ	153608.8	0.4	2.0	d	¾°	153554	M_L= 3.5
	iSE	19.2						
KRT	iPZ	10	0.4	1.2	d	1°	153553	
	iSE	22½						
RAB	ePZ	194948	0.8	1.2	d	41°		
	ePPZ/	5116						
	eSN/	5550						
	eLqE/	5855						
	eLrZ/	200052						
	MZ/	0356						
KRT	iPZ	4949	0.4	1.8	d			Distant
31st May, 1968.								
RAB	iPZ	040323.0	0.5	2.0	u	1¾°	040253	
	iSN	46.0						
RAB	eZ/	125904.0			+			Traces
RAB	eZ/	153750.0			-			Traces
RAB	iPZ	162527.1	0.5	17.1	d	2½°	162450	M_L= 4.8
	iSN	59.2						
WAN	iPZ	27.0	0.5	10.9	d			
SUL	iPZ	27.8	0.5	4.0	d			
RAL	iPZ	27.7	0.5	7.4	d			
VUL	iPZ	26.5	0.5	26.0	d			
KRT	iPZ	25				3°	162439	
	iSN	59½						

			T sec	A mm	GM	Dist	H	Remarks
31st May, 1968 (cont'd).								
RAB	iPZ	173104.4	1.0	2.2	d	23°		
KRT	iPZ	04	1.0	1.0	d			Distant
RAB	iPZ	173657.6	0.5	4.0	d	½°	173645	In coda of
	iSN	3707.0						preceeding shock
RAB	e(P)Z	180754.0	0.4	1.2	u	5¼°	180636	
	iSE	0854						
KRT	iPZ	0754				5¼°	180636	
	iSE	0854						
RAB	e(P)Z	193533.0			d			Distant
RAB	e(P)Z	215053.0			d			Distant
1st June, 1968.								
RAB	e(P)Z	064252	0.5	2.7	u	1½°	064221	C.B.M.
	iSE	4315.5						
RAB	e(P)Z	075217	0.5	2.0	d	3¼°	075128	
	iSE	40.1						
RAB	ePZ	091245	0.9	2.0	u			Teleseism
	eSN/	1510.0						
RAB	ePZ	104002			u	43°		
	eSE/	4640.0						
RAB	iPZ	115023.0	0.6	(4.0)	d	1½°	114957	
	iSN	42.5						
WAN	iPZ	22.9	0.6	5.0	u			
RAL	iPZ	22.9	0.6	5.0	u			
VUL	iPZ	22.0			u			
KRT	iPZ	115024			d	(1½°)	1149(59)	
	iE	34½						
	i(S)E	(43)						
RAB	iPZ	211248.4	0.5	7.0	u	2°	211217	
	iSE	1312.9						
VUL	iPZ	47.4	0.4	6.0	u			
2nd June, 1968.								
RAB	eZ/	044203			-			Traces
RAB	eZ/	052250			-			Traces
RAB	iPZ	082030.0	0.4	1.0	u	10¾°	081756	M_L = 6.8
	iSN/	2230.0						
WAN	iPZ	30.7	0.8	11.0	u			
SUL	iPZ	32.6	0.6	8.4	u			
RAL	iPZ	30.0	0.7	15.7	u			
VUL	iPZ	30.9			u			
KRT	ePZ	082027½			u			C.B.M.
RAB	ePZ	095903½	0.5		d	15°		
	eSN/	0144						

			T sec	A mm	GM	Dist	H	Remarks
2nd June, 1963 (cont'd).								
RAB	iPZ	194132.5	0.4	2.0	d			Regional
KRT	e(P)Z	194138½			d			
RAB	e(P)Z	200433½			d			
RAB	ePZ	223151½			d			Distant
RAB	eZ/	223622			-			Traces
RAB	iPZ	230325.5	0.5	7.6	u	½°	230313	M_L= 3.4
	iSN	34.2						
VUL	iPZ	26.9	0.5	4.8	d			
KRT	ePZ	230328			d			C.B.M.
RAB	iPZ	234249.3	0.5	7.2	u	2°	234216	M_L= 5.0
	iZ	53.0						
	iSN	4314.8						
3rd June, 1968.								
RAB	iPZ	012104.0	0.5	38.0	u	½°	012052	Local M_L= 4.4
	iSE/	13						
WAN	iPZ	03.8	0.5	23.7	u			
RAB	iPZ	034056.6	0.4	4.2	d	2½°	034018	M_L= 5.0
	iSN	4125.4						
VUL	iPZ	4055.9	0.4	8.8	d			
RAB	eiPZ	082321	0.4	2.1	u	1¼°	082252	M_L= 4.2
	iZ	21.5						
	iSN	43.3						
VUL	iPZ	19.9	0.5	2.4	d			
RAB	iPZ	091905.5	1.0	75.0	d	5½°	091741	M_L= 6.2 M_s=6.9 d W.S.W. Epicentre 5¾°S, 147°E Intermediate depth
	iSN/	2011						
WAN	iPZ	1905.0	0.7	51.9	d			
SUL	iPZ	05.5	0.6	10.3	d			
RAL	iPZ	05.4	0.6	18.7	d			
VUL	iPZ	04.9	0.6		d			
KRT	iPZ	04½			d			
RAB	ePZ	131511½			d			Distant
KRT	ePZ	131511						
RAB	eZ/	142457			+			Traces
RAB	ePZ	165019½			d			Distant
KRT	ePZ	165023			d			
RAB	e(P)Z	180558			d			Distant
KRT	e(P)Z	180557½						

			T sec	A mm	GM	Dist	H	Remarks
3rd June, 1968 (cont'd).								
RAB	iPZ iSN/	181526.2 1604	1.0	1.3	d	3¼°	181436	
KRT	iPZ iSN	181525½ 1602½	1.2	1.2	d	3¼°	181437	
4th June, 1968.								
RAB	iPZ iSN	011736.0 55.0	0.4	3.1	u	1½°	011706	M_L= 3.8
RAB	eZ/	031214			+			Traces
RAB	iPZ iSN	124736.0 47.5	0.4	2.0	u	¾°	124721	M_L= 3.4
VUL	iPZ	35.4			u			
RAB	eZ/	125146			+			Traces
RAB	ePZ	150236½			u			Distant
RAB	iPZ	172244.0	0.8	1.4	u			Distant
RAB	iPZ iSE	204735.8 4809.2	0.4	3.2	u	2¾°	204632	M_L= 5.0
VUL	iPZ	4734.9	0.3	3.8	u			

			T sec	A mm	GM	Dist	H	Remarks
ESA'ALA								
9th April, 1968.								
ESA	iPZ	113310	1.0	2.0	d			Local
10th April, 1968.								
ESA	iPZ	042641	0.3	0.6	u			Local
ESA	iPZ	081020	1.0	0.8	u			Regional
ESA	iPZ	100927			d			
ESA	iPZ	201708½	0.6	0.5	u			Regional
11th April, 1968.								
ESA	iPZ	012500½	0.2	0.2	u			
ESA	iPZ	051151	0.3	0.3	u			
ESA	iPZ	132915½			d			Distant
12th April, 1968.								
ESA	ePZ	052931½	0.3	0.8	u			Distant
13th April, 1968.								
ESA	iPZ	183434½	0.7	1.0	d			Regional
14th April, 1968.								
ESA	iPZ	014721	0.4	1.0	d			Regional
ESA	ePZ	141510	1.0	0.3	u			Distant
15th April, 1968.								
ESA	iPZ	030953	0.5	1.5	u			Multiple Shock
ESA	iPZ	174728½	0.5	0.2	d			Local
16th April, 1968.								
ESA	ePZ	084326	0.5	0.5	u			Distant
ESA	ePZ	184132½			d			Deep
17th April, 1968.								
ESA	iPZ	121402	0.5	2.0	u			Local
ESA	ePZ	151851½	0.8	1.0	d			Teleseism
18th April, 1968.								
ESA	iPZ	125101½	0.5	1.0	d			Near
ESA	iPZ	143701½	0.4	1.5	u			
ESA	ePZ	181433	0.8	0.2	u			Teleseism
19th April, 1968.								
ESA	ePZ	084726½			d			
20th April, 1968.								
ESA	ePZ	133210½	1.0	0.2	d			Distant

			T sec	A mm	GM	Dist	H	Remarks
21st April, 1968.								
ESA	iPZ	124041	0.5	0.8	u			Regional
ESA	iPZ	145005	0.4	0.2	u			Regional
22nd April, 1968.								
ESA	iPZ	112436	0.4	2.2	u			Regional
15th May, 1968.								
ESA	ePZ	150[illegible]5½						
16th May, 1968.								
ESA	iPZ	005754½			d			
ESA	ePZ	081755						Distant
ESA	ePZ	090727	1.0	2.0	d			
ESA	iPZ	101804½	0.5	3.2	d			
ESA	ePZ	162231						Distant
ESA	iPZ	192547			u			
ESA	iPZ	195021½			d			Distant
17th May, 1968.								
ESA	ePZ	080232						Distant
ESA	ePZ	105127						Teleseism
18th May, 1968.								
ESA	iPZ	000031½	0.5	3.5	d			Regional
ESA	iPZ	032547½			u			Near
19th May, 1968.								
ESA	ePZ	042102						Distant
ESA	ePZ	104202						
ESA	iPZ	114102						
20th May, 1968.								
ESA	eiPZ	072002	1.0	2.1	u			Distant
21st May, 1968.								
ESA	e(P)Z	082924½			d			Teleseism

			T sec	A mm	GM	Dist	H	Remarks
TABELE								
15th May, 1968.								
TBL	iPZ	120422	0.5	1.5	u	(1°)	1204(04)	
	i(S)Z	34½						
TBL	ePZ	123946						Near
16th May, 1968.								
TBL	e(P)Z	005723				(3½°)	0057(29)	
	i(S)Z	5803½			(d)			
TBL	iPZ	10:731½	1.0	4.5	u			Regional
TBL	ePZ	231312						Teleseism
17th May, 1968.								
		NIL RECORDED						
18th May, 1968.								
TBL	ei(P)Z	000045						Distant
TBL	iPZ	171317½	1.0	31.2	u	(2¼°)	1702(43)	
	i(S)Z	43½						
19th May, 1968.								
TBL	ePZ	193723			d			(Teleseism)
TBL	iPZ	204633½	0.5	6.0	u			Local
20th May, 1968.								
TBL	iPZ	031053½	0.5	6.0	(u)	(¼°)	0310(47)	
	i(S)Z	58½						
TBL	ePZ	072209						(Teleseism)
TBL	ePZ	172230						Teleseism
TBL	ePZ	201351½						Teleseism
21st May, 1968.								
TBL	ePZ	063838½						Teleseism
TBL	iPZ	125018½	0.6	4.0	u	(¼°)	125011	
	i(S)Z	25						

Rabaul Central Observatory,
6th May, 1968.

(G.W. D'ADDARIO)
Volcanologist-in-Charge

PEA JUN.68 NO.24

TERRITORY OF PAPUA AND NEW GUINEA
GEOLOGICAL AND VOLCANOLOGICAL BRANCH
VOLCANOLOGICAL SECTION

PRELIMINARY EARTHQUAKE ANALYSIS
RABAUL CENTRAL OBSERVATORY
1968

Rabaul	RAB	From: JUN. 5TH. 1968 To : JUN. 11TH. 1968
Rabaul Harbour Network	WAN SUL RAL TAV VUL	From: JUN. 5TH. 1968 To : JUN. 11TH. 1968
Keravat	KRT	From: JUN. 4TH. 1968 To : JUN. 11TH. 1968
Esa'ala	ESA	From: MAY. 22ND. 1968 To : MAY. 27TH. 1968
Tabala	TBL	From: MAY. 22ND. 1968 To : MAY. 27TH. 1968
Agenahambo	AGE	From: To :
Waris	WAA	Not operational
Ulamona	ULA	Not operational
Piva	PIV	Not operational
Cape Gloucester	LAG	Not operational

STATION PERSONNEL

RAB Central Observatory, Rabaul.

Volcanologist-in-Charge	G.W. D'Addario
Volcanologist	R.F. Heming
Seismologist	(Position vacant)
Seismogram Readers	D.J.Cook, H. Carrick
Senior Technical Officer	N.C. Myers
Technical Officer	R.J. Conway
Volcanological Assistants	L.Topue, M. Gaiam V. Kaita.
Technical Assistant	P. Daimbari
Trainee Volcanological Assistants	B. Talai, M. Salaiau, C. Matapit
Secretary	H. James.

KRT Keravat Outstation:

Observer (part-time)	G.E. Chorick

TBL Tabele Observatory
Observer E. Ravian

ESA Esa'ala Observatory

Observer	F. Dira

AGE Agenahambo Outstation

Observer (Part-Time)	Br. B. Hughes

The Rabaul Preliminary Earthquake Analysis (PEA) is produced by the staff under the direction of the Volcanologist-in-Charge from whom additional information and photocopies of seismogram records from all stations may be obtained on request.

Please address all communications to:-

Volcanologist-in-Charge,
Central Observatory
P.O. Box 386,
RABAUL. T.P. & N. G.

SEISMOGRAPH STATIONS

Station (NEW GUINEA)	Code	South Latitude	East Longitude	Elev. (m)	Foundation
Rabaul	RAB	04°11'28.6"	152°10'11.4"	183.5	Basalt Flow
Wanliss Street	WAN*	04°11'39.6"	152°10'32.5"	25.0	Basalt Flow
Sulphur Creek	SUL*	04°13'09.8"	152°10'33.3"	8.5	Unconsolidated volcanic ash
Rabalanakaia	RAL*	04°13'13.0"	152°12'07.0"	91.0	Unconsolidated volcanic ash
Tavurvur	TAV*	04°13'52.2"	152°13'12.9"	27.0	Andesite Flow
Tavilui	VUL*	04°16'58.2"	152°08'44.6"	332.3	Unconsolidated volcanic ash
Keravat	KRT	04°21'10.5"	152°03'00"	20.0	Alluvium
Ulamona	ULA	04°59'24.0"	151°16'30.0"	17.0	Lapilli Tuff
Tabele	TBL	04°06'04.67"	145°00'41.37"	179.5	Basalt Flow
Waria	WAA	04°07'00"	145°08'00"	48.0	Lapilli Tuff
Piva	PIV	06°12'00"	155°03'30"	60.0	Alluvium
Cape Gloucester	LAG	04°27'20"	148°26'00"	24.0	Lapilli Tuff
(PAPUA)					
Agenabambo	AGE	08°48'49"	148°05'56"	303.0	Unconsolidated volcanic ash
Esa'ala	ESA	09°44'18.2"	150°48'50.7"	46.4	Granite Gneiss

* Rabaul Harbour Network

STATION INSTRUMENTATION

Station & Instruments	Comp.	To	Tg	Trace Speed mm/min	Approximate relative Magnification	Approximate damping
(NEW GUINEA)						
Rabaul Central Observatory RAB						
World-Wide Standard	Z	1.0	0.74	60	12,500	critical
	N,E	1.0	0.74	60	6,250	critical
	Z/N/E/	15.0	100.0	15	750	critical
Benioff VR 14.7Kg	Zh	1.0	0.02	180+	4,000	critical

+ Recording is triggered by the onset of any earthquake with pre-determined minimum amplitude. Recorder is stopped automatically by hour break pulse.

Omori 15Kg	Nc	3.6	-	24	12	10.1 air
Omori 15Kg	Eo	3.8	-	24	10	10.1 air
Wood-Anderson Torsion	Na,Ea	0.8	-	60	2,800	critical

Rabaul Harbour Network

Readings from the Harbour Network are entered in the PEA only for large earthquakes, with impulsive and sharply defined onset of phases.

WAN° Benioff VR 14.7Kg Z	1.0	0.02	60	5,240	critical
SUL° Benioff VR 14.7Kg Z MO2 Accelerograph	1.0	0.02	60	2,850	critical
RAL° Benioff VR 14.7Kg Z	1.0	0.02	60	8,075	critical
TAV° Benioff VR 14.7Kg Z	1.0	0.02	60	20,900	critical
VUL° Benioff VR 14.7Kg Z	1.0	0.02	60	5,000	critical

STATION INSTRUMENTATION

Station & Instruments	Comp.	To	Tg	Trace speed mm/min	Approximate relative Magnification	Approx. damping
Rabaul Harbour Network (cont'd).						
° Signals from these stations are telemetered by land line to Helicorders (Geotech Mod. 2484) at the Central Observatory.						
°° Signals from this station are telemetered via VHF to its Helicorder at the Central Observatory.						
KRT - Keravat Outstation						
Benioff MC 50 Kg	Z	1.2	0.2	15	20% sensitivity	critical
Benioff MC 50Kg	N/E	1.2	0.2	15	10% sensitivity	critical
ULA - Ulamona Field Station						
Willmore portable	Z	0.6	0.25	60	3,000	underdamped
PIV - Piva Field Station						
Willmore portable	Z	0.6	0.25	60	3,000	underdamped
WAA - Waris Field Station						
Willmore portable	Z	0.6	0.25	60	3,000	underdamped
LAG - Cape Gloucester Field Station						
Willmore portable	Z	0.6	0.25	60	3,000	underdamped

N.B. These field stations consist of a permanent building in which instruments are installed when necessary.

Details of emergency field stations, within the Territory will be listed when in operation.

TBL - Tabele Observatory						
Benioff VR 107.5Kg	Z	1.0	0.2	60	1,350	critical
(PAPUA)						
ESA - Esa'ala Observatory						
Benioff VR 107.5Kg	Z	1.0	0.2	15	36,000	critical
Benioff VR 107.5Kg	N,E	1.0	0.2	15	18,000	critical
Benioff VR 107.5Kg	Z/N/E	1.0	60.0	30	50% sensitivity	critical
AGE - Agerahambo Station						
Willmore portable	Z	0.6	0.25	60	3,000	underdamped

VR Variable Reluctance

MC Moving-coil

Relative magnification curves of seismograph systems installed in the stations controlled by the Rabaul Central Observatory are listed once a month on the P.E.A.

PRESENTATION OF DATA

(reviewed in November, 1967).

All times are reduced to Greenwich Mean Time (GMT), which is 10 hours behind Eastern Standard Time.

At RABAUL and Harbour Network, the time signal is marked every minute on each seismogram record from the Observatory crystal chronometer. Second marks from Radio signal VNG (Australia) are recorded on World-wide Standard System S.P.-N. component only according with the W.W.S.S. programme, at six hour intervals. Primary time is provided by W.W.S.S. equipment and secondary time by a Labtronic crystal chronometer with the accuracy of ± 5 ms per day compared with VNG (Australia) with the aid of a chronoscope.

At TBL and AGE, the time signal is derived from a spring driven chronometer (Hercer) and marked each minute on records. Time accuracy is determined by comparison with signals from WWVH daily. Linear correction is applied to the daily drift.

On all seismogram records time increases from left to right and time break is upward.

At RAB* and Harbour Network the recording drum of each seismograph is driven by a 110VAC 60 H_z synchronous motor. The 110VAC is frequently regulated by a crystal chronometer.

* The Omori recording drum is driven by a nonregulated 50 Hz frequency supply.

At ESA and KRT power for recorder motors is frequency regulated by a crystal chronometer at 50 Hz. Power for AGE and TBL and field stations is supplied by a 50 Hz free running oscillator.

Direction of Motion.

Upward direction of ground motion corresponds to upward trace motion on vertical seismogram records. Direction of component of ground motion to North or East corresponds to upward trace motion on horizontal seismogram records.

Vertical trace motion from impulsive onset of longitudinal waves of compressional or dilatational ground movement is indicated by "u" or "d" accompanied by N.S.E. or W. as per trace motion amplitude on horizontal seismogram records, to represent vectorially the direction of ground motion. "+" or "-" indicates upward or downward motion of the ground respectively, from a wave not known to be of the longitudinal type.

Accuracy of Readings:

When readings are given with a decimal figure, they are to 1/10 of a second, other readings have been made to the nearest half second.

Crustal Phases

Px, Sx Crustal phases, other than Pn and Sn for local and near earthquakes.

Felt Intensity.

Information on maximum intensities of shocks reported felt is included. Intensities are given in Roman numerals based on the Modified Mercalli Scale, of 1931.

Determination of Epicentre.

Where no source is cited, the determination of epicentral distance and origin time for local and regional earthquakes, is carried out at the Central Observatory, Rabaul, from the S-P travel times assuming a normal depth of the focus.

Geographical Designation of Epicentre.

The regional names which follow the co-ordinates of epicentres located at the Central Observatory are meant only to supplement the co-ordinates and normally follow well-known geographical rather than geological features. Use is made of the full degree blocks according to the method defined by E.A.Flinn and E.R. Engadhl in - " A PROPOSED BASIS FOR GEOGRAPHICAL AND SEISMIC REGIONALIZATION", Seismic Data Laboratory Report No. 101, U.I.D. Inc, Alexandria, Virginia, 1964, adopted by the U.S.C.G.S. for computer requirements.

Magnitude Definition and Determination.

M_L - Local Magnitude (Richter, 1935) is calculated from the recorded trace amplitude of the Wood-Anderson torsion seismographs of stated physical constants (installed at the Observatory in November, 1967).

Maximum trace amplitude (C to peak) expressed in millimetres and tenths is measured directly on both components. Magnitude is determined independently and the arithmetic mean taken. M_L values are given to the tenth of a unit.

The station correction factor is assumed to be zero until better known.

M_S - Surface Wave Magnitude (Gutemberg & Richter, 1956) is calculated from the amplitude of surface waves of period near 20 seconds for shallow distant earthquakes.

M_B - Body Wave Magnitude is calculated from the ratio of amplitude over period for body waves on S.P.-Z of World-wide Seismograph System only when depth is known. The magnification factor for the standard seismograph is taken into account.

m. - Unified magnitude (Gutemberg & Richter, 1956) has the following relation to M_L , M_S , and M_B.

$$m = 1.7 + 0.8\ M_L - 0.01\ M_L^2$$

$$m = M_B \text{ (without correction).}$$

$$m = 2.5 + 0\ 63\ M_S$$

Local Magnitude of earthquakes recorded at RAB with a clear S-P interval is tabulated on a Day-Distance (in Central Angle Degrees) graph which is added to the PEA monthly.

Symbols.

i. - impulsive and sharply defined beginning of a phase.

e. - emergent and poorly defined beginning of phase.

T. - Period in seconds.

A. - Peak-to-Trough trace amplitude in millimetres.

GM - Ground Motion.

Dist. - Epicentral Distance in central angle degrees.

H. - Origin Time

h. - Focal depth in Kilometres

CBM - Confused by microseisms.

PRESENTATION OF DATA(CONTINUED.)

Remarks:

Local - Typical signature of an earthquake with epicentre within 0.9°

Near - Typical signature of an earthquake with epicentre between 0.9° and 9°.

Distant - Typical signature of an earthquake with epicentre between 9° and 45°.

Teleseism - Typical signature of an earthquake with epicentre more than 45°.

Traces - Any recorded disperse waves or very weak unknown earthquake phases.

Local and Near earthquakes will be classified Regional, and Distant earthquakes will be grouped with Teleseisms if sheer waves and their reflections are undistinguishable.

G.W. D'ADDARIO
Vulcanologist-in-Charge.

			T sec	A mm	GM	Dist	H	Remarks
RABAUL								
4th June, 1968.								
KRT	iPZ iSN	124735 45½		2.0	d	¾°	124721	
KRT	ePZ	150239½						Distant
KRT	iPZ	172245	1.?	1.6	d			Distant
5th June, 1968.		Strong microseismic activity on KRT records between 0001-1100 and 2000-2400.						
RAB	iPZ iSE	012226.0 52.1	0.4	3.4	u	2¼°	012152	M_L= 5.0
RAB	iPZ	015540.0						Regional
RAB	iPZ	051214.0	0.4	3.8	d			Regional
RAB	iPZ iSE/	063934.0 4030	0.5	4.2	d	¾°	063821	M_L= 6.2
RAB	eZ/	123239						Traces
KRT	iPZ iSN	35½ 3312				3°	123147	
RAB	eiPZ iZ iSE	161452 53.0 1556.5	0.8	3.5	d	5½°	161329	M_L= 5.8
KRT	iPZ iSN	1452 1557½		1.3	u	5½°	161328	
RAB	iPZ iSE/	220645.8 0702	0.5	35.1	d	1¼°	220624	M_L= 4.9
WAN	iPZ	0645.7		22.8	d			
SUL	iPZ	45.4		11.8	d			
PAL	iPZ	45.3		28.0	d			
VUL	iPZ	46.0			d			
RAB	eZ/	233318			-			Traces
6th June, 1968.								
RAB	iPZ iSE/	003853.3 3928	0.5	5.1	d	3°	003807	M_L= 5.0
RAB	ePZ/	012654						Distant
RAB	iPZ iSN	085531.3 52.0			u	1½°	085504	M_L= 4.2
RAL	iPZ	30.0	0.7	3.0	u			
VUL	iPZ	22.5	0.5	3.5	u			
RAB	eZ/	121202			-			Traces
RAB	iPZ iSN	152959.8 3010.0	0.3	5.0	u	¾°	152946	M_L= 3.8
KRT	iPZ iSE	3001 13		8.0	d	1°	152948	

			T sec	A mm	GM	Dist	H	Remarks
6th June, 1968 (cont'd).								
RAB	eZ/	163259			+			Traces
WAN	iPZ	58.5	0.7	5.3	d			
VUL	iPZ	58.0	0.5	4.0	d			
KRT	ePZ	55						C.B.M. Distant
RAB	ePZ	195115	1.0	1.0	u			Distant
WAN	iPZ	14.2	0.7	4.5	d			
RAL	iPZ	14.5	0.7	2.7	d			
VUL	iPZ	14.6	0.7	7.0	d			
KRT	ePZ	15			d			
RAB	iPZ	205540.7			u			Regional
RAB	ePZ	212538			d			Distant
7th June, 1968.								
RAB	eZ/	053533			+			Traces
RAB	iPZ iSE/	073505.1 31	0.5	12.2	u	2¼°	073431	M_L= 5.6
WAN	iPZ	04.9	0.5	(8.8)	u			
SUL	iPZ	06.4	0.6	5.0	u			
RAL	iPZ	05.0	0.7	4.5	u			
VUL	iPZ	03.9		(22.5)	u			
RAB	iPZ iSN	074705.0 18.2	0.4	5.1	u	1°	074647	M_L= 3.5
WAN	iPZ	05.0		5.6	d			
VUL	iPZ	05.2	0.3	28.5	d			
RAB	iPZ iSN	102552.3 2618.1	0.5	3.1	d	2¼°	102518	M_L= 4.5
VUL	iPZ	51.2		5.0	u			
KRT	iPZ	50			u			
RAB	ePZ eZ eSE/	113944 44.4 4009	0.5	16.8	u	2°	113911	M_L= 5.4
SUL	iPZ	3945.2		10.2	u			
VUL	iPZ	44.0	0.4	24.0	u			
KRT	iPZ	45	0.6	1.5	u			
RAB	ePZ ePPZ/ eSN/ ePSN/ eLoN/	120356 0505 0912 1008 1106	1.0	2.0	u	34°		
RAB	iPZ iSE	130418.0 34.1	0.5	3.6	u	1¼°	130357	M_L= 4.0
VUL	iPZ	17.5	0.5	8.0	u			
KRT	iPZ iSE	17 32	0.6	4.0	u	1¼°	130357	

			T sec	A mm	GM	Dist	H	Remarks
7th June, 1968 (cont'd).								
RAB	iPZ	173632.3	0.6	2.0	u			Regional
WAN	iPZ	32.9	0.6	3.1	u			
KRT	iPZ	31.5	0.4	1.0	u			
RAB	eZ/	182918			+			Traces
RAB	iPZ iSN	202117.8 44.0	0.5	1.4	u	2¼°	202043	M_L= 4.3
RAB	ePZ eSN/ eLqE/ eLqZ/ eScSN/	213714½ 4228 4424 4606 4724			u	34°		
8th June, 1968. Strong microseismic activity on KRT records between 0001-0900 and 2100-2200.								
RAB	iPZ iSE/	001829.9 2008	1.0	2.0	u	3¾°	001823	M = 6.4
RAB	e(P)Z/ eSN/	053818 4519				(50°)		
RAB	iPZ iSE	063517.0 3624.3	0.5	2.2	u	5¾°	063350	M_L= 5.8
RAB	eZ/	081216			+			Traces
RAB	iPZ iSE	093046.9 3118.0	0.5	3.2	d	2½°	093005	M_L= 4.6
VUL	iPZ	42.5	0.4	3.2	d			
KRT	iPZ iSN	3044 3115	0.3	3.2	u	2½°	093003	
RAB	eZ/	161124			+			Traces
RAB	iPZ iSN	192457.0 2610.1	0.5	1.2	u	6½°	192439	M_L= 5.5
KRT	ePZ iSN	2457 2510				1°	192439	
RAB	eZ/	214936			-			Traces
9th June, 1968.								
RAB	ePZ eSN	002704 38½	0.3	5.4	d	2¾°	002618	M_L= 5.0
WAN	iPZ	04.0	0.3	9.8	d			
SUL	iPZ	04.2	0.4	2.3	d			
VUL	iPZ	03.8	0.5	11.0	d			
KRT	ePZ eSN	02½ 40			d	(3¼°)	0026(14)	
RAB	ePZ iSN	004507 20	5.4	0.4	u	¾°	004449	M_L= 3.6
WAN	iPZ	07.0	0.3	1.2	u			

			T sec	A mm	GM	Dist	H	Remarks
9th June, 1968 (cont'd).								
SUL	iPZ	004507.2		2.6	u			
RAL	iPZ	06.8	0.6	7.0	u			
VUL	i(P)Z	06.0			u			
KRT	ePZ	06½		0.6	u	¾°	004453	
	eSN	16½						
RAB	eZ/	024932			+			Traces
RAB	eZ/	091053			+			Traces
RAB	ePZ	130[illegible]6	1.0	2.2	d			Distant
KRT	ePZ	130615	1.2		d			Distant
RAB	iPZ	131633.0	0.4	2.5	u	1½°	131605	M_L= 4.1
	eSN	53½						
KRT	iPZ	31			u	(1½°)	1316(08)	
	i(S)N	48						
RAB	ePZ	150831½	0.4	2.0	d	¾°	150816	M_L= 3.8
	iSN	42.6						
KRT	iPZ	31½		7.0	d	¾°	150816	
	eSN	41						
RAB	ePZ	201917½			u			Distant
RAB	ePZ	202820½	0.4	11.6	u	1¼°	202757	M_L= 4.2
	iSE	38.0						
WAN	iPZ	20.5		3.0	u			
SUL	iPZ	20.0	0.5	2.0	u			
RAL	iPZ	20.4	0.6	3.0	u			
VUL	iPZ	19.6		20.0	u			
KRT	ePZ	19½			u	1¼°	202737	C.B.M.
	iSN	36						
RAB	e(P)Z	220920			d			Teleseism
RAB	iPZ	231307.6	1.0	1.0	u			Distant
10th June, 1968.		No S.P. records between 0400 and 2400 No Wood Anderson records.						
RAB	iPZ	003744.0	0.5	5.3	d	1½°	003718	M_L= 4.7
	iSN	3803.8						
WAN	iPZ	3744.0	0.2	3.9	d			
RAL	iPZ	44.4	0.2	1.5	u			
VUL	iPZ	43.0	0.3	5.8	d			
KRT	iPZ	43			d	1¼°	003722	
	iSN	59						
RAB	eZ/	034412			+			Traces
RAB	eZ/	125150			-			Traces

			T sec	A mm	GM	Dist	H	Remarks
10th June, 1968 (cont'd).								
RAB	i(P)Z/ iSE/	154538 59				(1½°)	1545(10)	
WAN	iPZ	37.0	0.3	3.2	u			
SUL	iPZ	36.9	0.3	2.5	u			
RAL	iPZ	37.0	0.4	16.0	u			
VUL	iPZ	36.0	0.4	7.2	u			
KRT	iPZ	35			u			Near
WAN	iPZ	1621[illegible]1.2			u			
RAL	iPZ	31.2	0.2	5.0	u			
VUL	iPZ	30.0	0.2	3.0	u			
KRT	iPZ iSE	29½ 46			u	1½°	162107	
KRT	iPZ iSE	2535+9½ 3609½	0.1	4.8	d	1½°	233523	
11th June, 1968. Strong microseismic activity all day on WWSS records, Harbour Network and KRT between 0001-0800/1900-2400.								
RAB	eZ/	014330			-			Traces
RAB	ePZ	061611		2.0	d			Local
VUL	iPZ	095732.8	0.4	4.8	u			
KRT	iPZ iSN	31 38			u	¼°	095721	
KRT	ePZ iSN	171431 59	0.1	1.0	d	2¼°	171[illegible]5½	
RAB	eZ/	203345			-			Traces

			T sec	A mm	GM	Dist	H	Remarks
ESA'ALA								
22nd May, 1968.								
ESA	iPZ	070628.6			u			
ESA	iPZ	071035.1			u			
ESA	ePZ	115055			d			
23rd May, 1968.								
ESA	iPZ	035609.7	0.5	1.0	d			
24th May, 1968.								
ESA	iPZ	021927.5			u			
ESA	ePZ	045341½	0.6	1.0	d			
25th May, 1968.								
ESA	iPZ	232638.8						Local
26th May, 1968.								
ESA	iPZ	084349.0			u			Local
ESA	iPZ	113011.2			u			Local
27th May, 1968.								
ESA	iPZ	034017.5			u			Local
ESA	ePZ	042347½			d			
TABEL'E								
22nd May, 1968. Microseismic activity between 1529-1554 hrs.								
TBL	iPZ i(S)Z	125013½ 44	1.0	2.0	d		(2½°) 1249(33)	
23rd May, 1968.								
TBL	ePZ	173230½						Distant
24th May, 1968.								
TBL	eZ(P)Z	154844½			(d)			Teleseism
25th May, 1968.		NIL RECORDED						
26th May, 1968.								
TBL	ePZ	194812						Regional
TBL	ePZ	215824½	0.4	2.8	(d)			Regional
27th May, 1968.								

Continuous microseismic activity associated with moderate rain between 1246-1556 hrs.

Rabaul Central Observatory,
14th June, 1968.

(G.W. D'ADDARIO)
Volcanologist-in-Charge

TERRITORY OF PAPUA AND NEW GUINEA
GEOLOGICAL AND VOLCANOLOGICAL BRANCH
VOLCANOLOGICAL SECTION

2 JUL 1968

PRELIMINARY EARTHQUAKE ANALYSIS
RABAUL CENTRAL OBSERVATORY
1968

Rabaul	RAB	From: 12TH.JUN.1968 To : 18TH.JUN.1968
Rabaul Harbour Network	WAN SUL RAL TAV VUL	From: 12TH.JUN.1968 To : 18TH.JUN.1968
Keravat	KRT	From: 12TH.JUN.1968 To : 17TH.JUN1968
Esa'ala	ESA	From: To :
Tabele	TBL	From: 28TH.MAY 1968 To : 10TH.JUN.1968
Agenabambo	AGE	From: 30TH.MAY 1968 To : 7TH.JUN.1968
Waris	WAA	Not operational
Ulamona	ULA	Not operational
Piva	PIV	Not operational
Cape Gloucester	LAG	Not operational

STATION PERSONNEL

RAB Central Observatory, Rabaul.

Volcanologist-in-Charge	G.W. D'Addario
Volcanologist	R.F. Heming
Seismologist	(Position vacant)
Seismogram Readers	D.J. Cook, H.M.Carrick
Senior Technical Officer	N.O. Myers
Technical Officer	R.J. Conway
Volcanological Assistants	L. Topue, M. Gaiam, E. Ravian
Technical Assistant	P. Daimbari
Trainee Volcanological Assistants	B. Talai, M. Salaiau, C. Matupit.
Secretary	H. James.

KRT Keravat Outstation

Observer (part-time)	G.E. Chorick

TBL Tabele Observatory

Observer	V. Kaita

ESA Esa'ala Observatory

Observer	F. Dira

AGE Agenahambo Outstation

Observer (part time)	B. Kirke

The Rabaul Preliminary Earthquake Analysis (PEA) is produced by the staff under the direction of the Volcanologist-in-Charge from whom additional information and photocopies of seismogram records from all stations may be obtained on request.

Please address all communcations to:-

Volcanologist-in-Charge,
Central Observatory,
P.O. Box 386,
RABAUL .. T.N.G.

SEISMOGRAPH STATIONS

Station (NEW GUINEA)	Code	South Latitude	East Longitude	Elev. (m)	Foundation
Rabaul	RAB	04°11'28.6"	152°10'11.4"	183.5	Basalt Flow
Wanliss Street	WAN*	04°11'39.6"	152°10'32.5"	25.0	Basalt Flow
Sulphur Creek	SUL*	04°13'09.8"	152°10'33.3"	8.5	Unconsolidated volcanic ash
Rabalanakaia	RAL*	04°13'13.0"	152°12'07.0"	91.0	Unconsolidated volcanic ash
Tavurvur	TAV*	04°13'52.2"	152°13'12.9"	27.0	Andesite Flow
Taviliu	VUL*	04°16'58.2"	152°08'44.6"	332.3	Unconsolidated volcanic ash
Keravat	KRT	04°21'10.5"	152°03'06"	20.0	Alluvium
Ulamona	ULA	04°59'24.0"	151°16'30.0"	17.0	Lapilli Tuff
Tabele	TBL	04°06'04.67"	145°00'41.37"	179.5	Basalt Flow
Waris	WAA	04°07'00"	145°06'00"	48.0	Lapilli Tuff
Piva	PIV	06°12'00"	155°03'30"	60.0	Alluvium
Cape Gloucester	LAG	04°27'20"	148°26'00"	24.0	Lapilli Tuff
(PAPUA)					
Agenahambo	AGE	08°48'49"	148°05'56"	303.0	Unconsolidated volcanic ash
Esa'ala	ESA	09°44'18.2"	150°48'50.7"	46.4	Granite Gneiss

* Rabaul Harbour Network

STATION INSTRUMENTATION

Station & Instruments	Comp.	To	Tg	Trace Speed mm/min	Approximate relative Magnification	Approximate damping
(NEW GUINEA)						
Rabaul Central Observatory RAB						
World-Wide Standard	Z	1.0	0.74	60	12,500	critical
	N,E	1.0	0.74	60	6,250	critical
Benioff VR 14.7Kg	Z/N/E/	15.0	100.0	15	750	critical
	Zh	1.0	0.02	180+	4,000	critical
Omori 15Kg	No	3.6	-	24	12	10.1 air
Omori 15Kg	Eo	3.8	-	24	10	10.1 air
Wood Anderson Torsion	Na,Ea	0.8	-	60	2,800	critical

+ Recording is triggered by the onset of any earthquake with pre-determined minimum amplitude. Recorder is stopped automatically by hour break pulse.

Rabaul Harbour Network

Readings from the Harbour Network are entered in the PEA only for large earthquakes, with impulsive and sharply defined onset of phases.

WAN°	Benioff VR 14.7Kg	Z	1.0	0.02	60	12,000	critical
SUL°	Benioff VR 14.7Kg	Z	1.0	0.02	60	6,000	critical
	MO2 Accelerograph						
RAL°	Benioff VR 14.7Kg	Z	1.0	0.02	60	12,000	critical
TAV°	Benioff VR 14.7Kg	Z	1.0	0.02	60	24,000	critical
VUL°	Benioff VR 14.7Kg	Z	1.0	0.02	60	12,000	critical

STATION INSTRUMENTATION

Station & Instruments	Comp.	To	Tg	Trace Speed mm/min	Approximate relative Magnification	Approximate damping
Rabaul Harbour Network (cont'd).						
°Signals from these stations are telemetered by land line to Helicorders (Geotech Mod. 2484) at the Central Observatory.						
°°Signals from this station are telemetered via VHF to its Helicorder at the Central Observatory.						
KRT - Keravat Outstation						
Benioff MC 50 Kg	Z	1.2	0.2	15	20% sensitivity	critical
Benioff MC 50Kg	N/E	1.2	0.2	15	10% sensitivity	critical
ULA -Ulamona Field Station						
Willmore portable	Z	0.6	0.25	60	3,000	underdamped
PIV - Piva Field Station						
Willmore portable	Z	0.6	0.25	60	3,000	underdamped
WAA - Waris Field Station						
Willmore portable	Z	0.6	0.25	60	3,000	underdamped
LAG - Cape Gloucester Field Station						
Willmore portable	Z	0.6	0.25	60	3,000	underdamped

N.B. These field stations consist of a permanent building in which instruments are installed when necessary.

Details of emergency field stations, within the Territory will be listed when in operation.

TBL - Tabele Observatory						
Benioff VR 107.5Kg (PAPUA)	Z	1.0	0.2	60	1,350	critical
ESA - Esa'ala Observatory						
Benioff VR 107.5Kg	Z	1.0	0.2	15	36,000	critical
Benioff VR 107.5Kg	N,E	1.0	0.2	15	18,000	critical
Benioff VR 107.5Kg	Z/N/E	1.0	60.0	30	50% sensitivity	critical
AGE - Agenahambo Station						
Willmore portable	Z	0.6	0.25	60	3,000	underdamped

VR Variable Reluctance

MC Moving-coil

Relative magnification curves of seismograph systems installed in the stations controlled by the Rabaul Central Observatory are listed once a month on the P.E.A.

PRESENTATION OF DATA

(reviewed in November, 1967.)

All times are reduced to Greenwich Mean Time (GMT), which is 10 hours behind Eastern Standard Time.

At RABAUL and Harbour Network, the time signal is marked every minute on each seismogram record from the Observatory crystal chronometer. Second marks from Radio signal VNG (Australia) are recorded on World-wide Standard System S.P.-N. component only according with the W.W.S.S. programme, at six hour intervals. Primary time is provided by W.W.S.S. equipment and secondary time by a Labtronic crystal chronometer with the accuracy of ± 5 ms per day compared with VNG (Australia) with the aid of a chronoscope.

At TBL and AGE, the time signal is derived from a spring driven chronometer (Mercer) and marked each minute on records. Time accuracy is determined by comparison with signals from WWVH daily. Linear correction is applied to the daily drift.

On all seismogram records time increases from left to right and time break is upward.

At RAB* and Harbour Network the recording drum of each seismograph is driven.by a 110VAC 60 H_z synchronous motor.
The 110VAC is frequently regulated by a crystal chronometer.

* The Omori recording drum is driven by a nonregulated 50 Hz frequency supply.

At ESA and KRT power for recorder motors is frequency regulated by a crystal chronometer at 50 Hz. Power for AGE and TBL and field stations is supplied by a 50 Hz free running oscillator.

Direction of Motion.

Upward direction of ground motion corresponds to upward trace motion on vertical seismogram records. Direction of component of ground motion to North or East corresponds to upward trace motion on horizontal seismogram records.

Vertical trace motion from impulsive onset of longitudinal waves of compressional or dilatational ground movement is indicated by "u" or "d" accompanied by N.S.E. or W. as per trace motion amplitude on horizontal seismogram records, to represent vectorially the direction of ground motion. "+" or "-" indicates upward or downward motion of the ground respectively, from a wave not known to be of the longitudinal type.

Accuracy of readings:

When readings are given with a decimal figure, they are to 1/10 of a second, other readings have been made to the nearest half second.

Crustal Phases:

Px, Sx Crustal phases, other than Pn and Sn for local and near earthquakes.

Felt Intensity:

Information on maximum intensities of shocks reported felt is included. Intensities are given in Roman numerals based on the Modified Mercalli Scale, of 1931.

Determination of Epicentre:

Where no source [illegible] the determination of epicentral distance and origin time for local and regional earthquakes, is carried out at the Central Observatory, Rabaul, from the S-P travel times assuming a normal depth of the focus.

Geographical Designation of Epicentre:

The regional names which follow the co-ordinates of epicentres located at the Central Observatory are meant only to supplement the co-ordinates and normally follow well-known geographical rather than geological features. Use is made of the full degree blocks according to the method defined by E.A. Flinn and E.R. Engadhl in - " A PROPOSED BASIS FOR GEOGRAPHICAL AND SEISMIC REGIONALIZATION", Seismic Data Laboratory Report No. 101, U.I.D. Inc, Alexandria, Virginia, 1964, adopted by the U.S.C.G.S. for computer requirements.

Magnitude Definition and Determination.

M_L - Local Magnitude (Richter, 1935) is calculated from the recorded trace amplitude of the Wood-Anderson torsion seismographs of stated physical constants (installed at the Observatory in November, 1967).

Maximum trace amplitude (0 to peak) expressed in millimetres and tenths is measureddirectly on both components, Magnitude is determined independently and the arithmetic mean taken. M_L values are given to the tenth of a unit.

The station correction factor is assumed to be zero until better known.

M_S - Surface Wave Magnitude (Gutenberg & Richter, 1956) is calculated from the amplitude of surface waves of period near 20 seconds for shallow distant earthquakes.

M_B - Body Wave Magnitude is calculated from the ratio of amplitude over period for body waves on S.P.-Z of World-wide Seismograph System only when depth is known. The magnification factor for the standard seismograph is taken into account.

m - Unified Magnitude (Gutenberg & Richter, 1956) has the following relation to M_L , M_S , and M_B.

$$m = 1.7 + 0.8\ M_L - 0.01\ M_L^2$$

$$m = M_B \text{ (without correction)}$$

$$m = 2.5 + 0.63\ M_S$$

Local Magnitude of earthquakes recorded at RAB with a clear S-P interval is tabulated on a Dep-Distance (in Central Angle Degrees) graph which is added to the PEA monthly.

Symbols:

i. - impulsive and sharply defined beginning of a phase.

e. - emergent and poorly defined beginning of phase.

T. - Period in seconds.

A. - Peak-to- Trough trace amplitude in millimetres.

GM. - Ground Motion.

Dist. - Epicentral Distance in central angle degrees.

H. - Origin Time.

h. - Focal depth in Kilometres.

CBM - Confused by microseisms.

PRESENTATION OF DATA (CONTINUED).

Remarks:

Local - Typical signature of an earthquake with epicentre within 0.9°

Near - Typical signature of an earthquake with epicentre between 0.9° and 9°.

Distant - Typical signature of an earthquake with epicentre between 9° and 45°.

Teleseism - Typical signature of an earthquake with epicentre more than 45°.

Traces - Any recorded disperse waves or very weak unknown earthquake phases.

Local and Near earthquakes will be classified Regional, and Distant earthquakes will be grouped with Teleseisms if sheer waves and their reflections are unidentifiable.

G.W. D'ADDARIO
Vulcanologist-in-Charge.

			T sec	A mm	GM	DIST	H	Remarks
RABAUL								
12th June, 1968. Strong microseismic activity all day.								
RAB	iPZ	082456.1	0.5	4.1	u	1½°	082432	M_L= 4.0
	iSN	2514.2						
RAL	iPZ	2457.0			u			
VUL	iPZ	56.2			u			
RAB	iPZ	123343.2	0.4	4.5	d	1¼°	123323	M_L= 4.4
	iSN	58.0						
WAN	iPZ	43.0		3.0	d			
VUL	iPZ	42.2		9.0	d			
KRT	iPZ	123341½		0.4	d	1¼°	123323	
	eSN	55						
RAB	eiPZ	134957	1.0	2.0	d	46°	M_S= 6.7	Overlapping traces Epicentre 39°5N 143°E M = 7.3 (MAT.)
	ePPZ/	5218						
	eSE/	5647						
	eLqE/	140044						
	eLrZ/	0304						
KRT'	iPZ	135000½	1.0	2.0	d			
RAB	iPZ	202017.0	1.0	8.2	u	20°		
	eSN/	2356						
	eLqE/	2410						
	eLrZ/	2516						
	MZ/	2649						
WAN	iPZ	2019.0	0.7	5.3	d			
RAL	iPZ	17.7	0.7	5.0	d			
VUL	iPZ	17.0		9.0	d			
KRT	iPZ	202017	1.0	6.0	d			
RAB	iPZ	220548.1	1.0	1.8	u	46°		
	eSE/	1218						
	eLqN/	1612						
RAB	e(P)Z	233320½	0.4	1.0	u			Teleseism
13th June, 1968.								
RAB	ePZ	021354½	0.3		u			Distant
RAB	eZ/	075314			-			Traces
RAB	iPZ	080523.5	0.2	4.0	d	¾°	080507	
	iSN	35.4						
RAL	iPZ	24.0		3.2	d			
VUL	iPZ	24.8	0.3	1.8	d			
RAB	ePZ	095617½			u			Distant
RAB	ePZ	120429½			(d)			Distant
KRT	ePZ	30			d			Distant
RAB	eZ/	161432			-			Traces
RAB	iPZ	211841.2	0.8	2.2	d			Teleseism

			T sec	A mm	GM	Dist	H	Remarks
14th June, 1968. Strong microseismic activity all day.								
RAB	e(P)Z/	032626						Distant
RAB	eZ/	105950			+			Traces
RAB	i(P)Z	120045.9	0.8	1.0	u			Distant
RAB	iPZ	122614.3	0.8	2.0	u	52°		
	eSN/	3323						
KRT	ePZ	122616			u			
RAB	iPZ	191115.2	1.0	3.0	d	43°		
	eSN/	1727						
RAB	iPZ	224406.8	0.4	1.5	u	1½°	224343	M_L= 4.0
	iSN	25.0						
VUL	iPZ	06.5			u			
RAB	eZ/	224525			-			Traces
RAB	iPZ	232026.8	0.5	2.4	d	1½°	232002	
	iSE	45.7						
15th June, 1968. Strong microseismic activity on RAB, KRT and Harbour Network records.								
RAB	ePZ	030113	0.5	3.0	u			Local
RAB	eZ/	033914			-			Traces
RAB	eZ/	060624			-			Traces C.B.M.
RAB	eZ/	114238			+			Traces
RAB	ePZ	133853	0.5	3.0	d	23°		
	iSN/	4254						
KRT	iPZ	3904	1.1	1.2	d			
RAB	eZ/	180002			+			Traces
16th June, 1968. Strong Microseismic activity on RAB records.								
RAB	eZ/	004737			+			Traces
RAB	iPZ	022133.8	0.5	4.2	u	7¼°	022053	M_L= 5.1
	eSN/	2256						
WAN	iPZ	2133.8			u			
SUL	iPZ	33.2	0.4	2.0	u			
RAL	iPZ	31.8			u			
VUL	iPZ	33.0		6.0	u			
KRT	ePZ	33						C.B.M.
RAB	eZ/	040510			+			Traces
RAB	iPZ	045922.0	0.4	5.0	u	(1½°)	0458(56)	(M_L= 4.4)
	i(S)E	42.5						
RAL	iPZ	20.3			u			
KRT	ePZ	23½				1¾°	045858	C.B.M.
	eSN	44½						

			T sec	A mm	GM	Dist	H	Remarks
16th June, 1968 (cont'd).								
RAB	eZ/	055610			+			Traces
RAB	i(P)Z iSE	080940.9 56.0	0.4	3.9	d	1¼°	080921	M_L= 4.1
VUL	iPZ	41.8		5.0	d			
KRT	ePZ i(S)N	080941 52½				(1°)	0809(25)	C.B.M.
RAB	eZ/	101653			-			Traces
RAB	eZ/	110530			+			Traces
RAB	eZ/	135322			-			Traces
RAB	eZ/	160253			+			Traces
RAB	eZ/	193223			+			Traces
17th June, 1968.								
RAB	eZ/	024432			-			Traces
RAB	eZ/	043412			+			Traces
RAB	eZ/	070238			-			Traces
RAB	iPZ eSE	072124.5 42½	0.4	6.0	u	1½°	072100	M_L= 4.1
VUL	iPZ	072123.3		4.8	u			
RAB	ePZ eSN/	120120 0802	0.5	2.0	u	48°		
KRT	ePZ	0120½			u			
RAB	ePZ eSE/	170430 1108	0.8	1.0	d	47°		
KRT	ePZ	0432½			d			
RAB	iPZ eSN/	175110.0 5214	0.5	27.0	d	5½°		M_L= 6.0
WAN	iPZ	5110.0	0.5	7.0	d			Felt: Lae Int. IV
SUL	iPZ	10.3	0.5	3.0	u			Siassi Int. III-IV
RAL	iPZ	09.3	0.8	8.0	u			Kerema Int. III
VUL	iPZ	09.7	0.5	12.0	u			Saidor Int. IV
KRT	iPZ	08	0.8	7.0	u			
RAB	ePZ eSN/	181327 1636	0.6	1.2	u	17°		
KRT	ePZ	1328			u			
RAB	ePZ eSE/	190532 1202			d	46°		
KRT	ePZ	0532			d			Distant
RAB	ePZ	193710	0.5	1.0	d			Distant

			T sec	A mm	GM	Dist	H	Remarks
18th June, 1968.								
				Wood-Anderson records unreadable				
RAB	eZ/	003824			-			Traces
RAB	iPZ iSE	055822.8 29.9	0.5	6.1	u	½°	055813	C.B.M.
RAB	i(P)Z iSN	064841.9 4900.8	0.5	5.6	d	(1½°)	0648(17)	C.B.M.
RAB	eZ/	074236			-			Traces
RAB	iPZ iSE	095243.3 57.8	0.4	9.0	d			
RAB	eZ/	105948			-			Traces
RAB	iPZ iSN	120056.4 0119.1	0.4	1.5	u	2°	120026	
RAB	eZ/	123934			+			Traces
RAB	iPZ iSE	134149.7 57.0	0.4	3.0	u	½°	134140	
WAN	iPZ	49.7		2.5	u			
VUL	iPZ	51.1	0.3	6.1	u			
RAB	iPZ iSN	160117.8 39.9	0.5	3.1	d	1¾°	160048	
WAN	iPZ	18.5	0.3	3.0	d			
RAL	iPZ	18.4	0.5	5.1	d			
VUL	iPZ	17.8	0.3	3.0	d			
RAB	iPZ iSE/	214400.3 37	0.5	8.1	u	3¼°	214312	
VUL	iPZ	4359.7		4.0	u			
RAB	iPZ iSE	215255.2 5329.5	0.5	5.0	u	2¾°	215211	

			T sec	A mm	GM	Dist	H	Remarks
TABELE								
28th May, 1968.								
TBL	ePZ	132844	0.4	0.8	u			Distant
Microseismic activity between 1638 - 2004								
29th May, 1968.								
TBL	iPZ	023112	0.3	1.4	u			
	i(S)Z	32						
Microseismic activity between 0046 and 2235								
30th May, 1968.								
TBL		NIL RECORDED						
31st May, 1968.								
TBL		NIL RECORDED						
1st June, 1968.								
TBL	ePZ	091107½			u			Local
2nd June, 1968.								
TBL	ePZ	095724½			d			Distant
3rd June, 1968.								
TBL	iPZ	091825½			u			Regional
TBL	iPZ	123416½	0.4	1.0	u	(3¼°)		
	i(S)Z	56½						
4th June, 1968.								
TBL		NIL RECORDED						
5th June, 1968.								
TBL		NIL RECORDED						
6th June, 1968.								
TBL		NIL RECORDED						
Microseismic activity all day								
7th June, 1968.								
TBL	ePZ	120352½						
Microseismic activity between 0342 and 0825								
8th June, 1968.								
TBL	ePZ	115338½	0.3	1.2	u			Local
9th June, 1968.								
TBL	ePZ	034650	0.5	0.5	d	(1¼°)		
	i(S)Z	4707 8½						
10th June, 1968.								
TBL	iPZ	034243.1	0.3	2.0	d			Regional

		T sec	A mm	GM	Dist	H	Remarks
AGENAHAMBO							
30th May, 1968.							
AGE	NIL RECORDED						
31st May, 1968.							
AGE	iPZ 162739			d			Regional
1st June, 1968.							
AGE	NIL RECORDED						
2nd June, 1968.							
AGE	NIL RECORDED						
3rd June, 1968.							
AGE	iPZ 091840			d			
4th June, 1968.							
AGE	NIL RECORDED						
5th June, 1968.							
AGE	iPZ 220759			u			Regional
6th June, 1968.							
AGE	ePZ 013854						Regional
AGE	ePZ 163209½						
AGE	iPZ 233017½			d			Local
7th June, 1968.							
AGE	NIL RECORDED						

Rabaul Central Observatory,
20th June, 1968.

G.W. D'ADDARIO
Volcanologist-in-Charge

TERRITORY OF PAPUA AND NEW GUINEA
GEOLOGICAL AND VOLOCANOLOGICAL BRANCH
VOLCANOLOGICAL SECTION

PRELIMINARY EARTHQUAKE ANALYSIS
RABAUL CENTRAL OBSERVATORY
1968

Rabaul	RAP	From: 19th. JUN. 1968 To : 25th. JUN. 1968
Rabaul Harbour Network	WAN BUL PAL TAV VOL	From: 19th. JUN. 1968 To : 25th. JUN. 1968
Keravat	KRT	From: 18th. JUN. 1968 To : 25th. JUN. 1968
Esa'ala	ESA	From: 28th. MAY 1968 To : 9th. JUN. 1968
Tabele	TBL	From: To :
Agennahambo	AGE	From: 8th. JUN. 1968 To : 14th. JUN. 1968
Waris	WAA	Not operational
Ulamona	ULA	Not operational
Piva	PIV	Not operational
Cape Gloucester	LAC	Not operational

STATION PERSONNEL

RAB Central Observatory, Rabaul.

Volcanologist-in-Charge	G.W. D'Addario
Volcanologist	R.F. Heming
Seismologist	(Position vacant)
Seismogram Readers	D.J. Cook, H.M.Carrick
Senior Technical Officer	N.O. Myers
Technical Officer	R.J. Conway
Volcanological Assistants	L. Topue, M. Gaiam, E. Ravian
Technical Assistant	P. Daimbari
Trainee Volcanological Assistants	B. Talai, M. Salaiau, C. Matupit.
Secretary	H. James.

KRT Keravat Outstation

Observer (part-time)	G.E. Chorick

TBL Tabele Observatory

Observer	V. Kaita

ESA Esa'ala Observatory

Observer	F. Dira

AGE Agenahambo Outstation

Observer (part time)	B. Kirke

The Rabaul Preliminary Earthquake Analysis (PEA) is produced by the staff under the direction of the Volcanologist-in-Charge from whom additional information and photocopies of seismogram records from all stations may be obtained on request.

Please address all communcations to:-

Volcanologist-in-Charge,
Central Observatory,
P.O. Box 386,
RABAUL .. T.N.G.

SEISMOGRAPH STATIONS

Station (NEW GUINEA)	Code	South Latitude	East Longitude	Elev. (m)	Foundation
Rabaul	RAB	04°11'28.6"	152°10'11.4"	183.5	Basalt Flow
Wanliss Street	WAN*	04°11'39.6"	152°10'32.5"	25.0	Basalt Flow
Sulphur Creek	SUL*	04°13'09.8"	152°10'33.3"	8.5	Unconsolidated volcanic ash
Rabalanakaia	RAL*	04°13'13.0"	152°12'07.0"	91.0	Unconsolidated volcanic ash
Tavurvur	TAV*	04°13'52.2"	152°13'12.9"	27.0	Andesite Flow
Taviliu	VUL*	04°16'58.2"	152°08'44.6"	332.3	Unconsolidated volcanic ash
Keravat	KRT	04°21'10.5"	152°03'06"	20.0	Alluvium
Ulamona	ULA	04°59'24.0"	151°16'30.0"	17.0	Lapilli Tuff
Tabele	TBL	04°06'04.67"	145°00'41.37"	179.5	Basalt Flow
Waris	WAA	04°07'00"	145°06'00"	48.0	Lapilli Tuff
Piva	PIV	06°12'00"	155°03'30"	60.0	Alluvium
Cape Gloucester	LAG	04°27'20"	148°26'00"	24.0	Lapilli Tuff
(PAPUA)					
Agenahambo	AGE	08°48'49"	148°05'56"	303.0	Unconsolidated volcanic ash
Esa'ala	ESA	09°44'18.2"	150°48'50.7"	46.4	Granite Gneiss

* Rabaul Harbour Network

STATION INSTRUMENTATION

Station & Instruments	Comp.	To	Tg	Trace Speed mm/min	Approximate relative Magnification	Approximate damping
(NEW GUINEA)						
Rabaul Central Observatory RAB						
World-Wide Standard	Z	1.0	0.74	60	12,500	critical
	N,E	1.0	0.74	60	6,250	critical
Benioff VR 14.7Kg	Z/N/E/	15.0	100.0	15	750	critical
	Zh	1.0	0.02	180+	4,000	critical
Omori 15Kg	No	3.6	-	24	12	10.1 air
Omori 15Kg	Eo	3.8	-	24	10	10.1 air
Wood Anderson Torsion	Na,Ea	0.8	-	60	2,800	critical
Rabaul Harbour Network						
WAN° Benioff VR 14.7Kg	Z	1.0	0.02	60	12,000	critical
SUL° Benioff VR 14.7Kg	Z	1.0	0.02	60	6,000	critical
MO2 Accelerograph						
RAL° Benioff VR 14.7Kg	Z	1.0	0.02	60	12,000	critical
TAV° Benioff VR 14.7Kg	Z	1.0	0.02	60	24,000	critical
VUL° Benioff VR 14.7Kg	Z	1.0	0.02	60	12,000	critical

\+ Recording is triggered by the onset of any earthquake with pre-determined minimum amplitude. Recorder is stopped automatically by hour break pulse.

Readings from the Harbour Network are entered in the PEA only for large earthquakes, with impulsive and sharply defined onset of phases.

STATION INSTRUMENTATION

Station & Instruments	Comp.	To	Tg	Trace Speed mm/min	Approximate relative Magnification	Approximate damping
Rabaul Harbour Network (cont'd).						
°Signals from these stations are telemetered by land line to Helicorders (Geotech Mod. 2484) at the Central Observatory.						
°°Signals from this station are telemetered via VHF to its Helicorder at the Central Observatory.						
KRT - Keravat Outstation						
Benioff MC 50 Kg	Z	1.2	0.2	15	20% sensitivity	critical
Benioff MC 50Kg	N/E	1.2	0.2	15	10% sensitivity	critical
ULA -Ulamona Field Station						
Willmore portable	Z	0.6	0.25	60	3,000	underdamped
PIV - Piva Field Station						
Willmore portable	Z	0.6	0.25	60	3,000	underdamped
WAA - Waris Field Station						
Willmore portable	Z	0.6	0.25	60	3,000	underdamped
LAG - Cape Gloucester Field Station						
Willmore portable	Z	0.6	0.25	60	3,000	underdamped

N.B. These field stations consist of a permanent building in which instruments are installed when necessary.

Details of emergency field stations, within the Territory will be listed when in operation.

TBL - Tabele Observatory						
Benioff VR 107.5Kg (PAPUA)	Z	1.0	0.2	60	1,350	critical
ESA - Esa'ala Observatory						
Benioff VR 107.5Kg	Z	1.0	0.2	15	36,000	critical
Benioff VR 107.5Kg	N,E	1.0	0.2	15	18,000	critical
Benioff VR 107.5Kg	Z/N/E	1.0	60.0	30	50% sensitivity	critical
AGE - Agenahambo Station						
Willmore portable	Z	0.6	0.25	60	3,000	underdamped

VR Variable Reluctance

MC Moving-coil

Relative magnification curves of seismograph systems installed in the stations controlled by the Rabaul Central Observatory are listed once a month on the P.E.A.

PRESENTATION OF DATA

(reviewed in November, 1967.)

All times are reduced to Greenwich Mean Time (GMT), which is 10 hours behind Eastern Standard Time.

At RABAUL and Harbour Network, the time signal is marked every minute on each seismogram record from the Observatory crystal chronometer. Second marks from Radio signal VNG (Australia) are recorded on World-wide Standard System S.P.-N. component only according with the W.W.S.S. programme, at six hour intervals. Primary time is provided by W.W.S.S. equipment and secondary time by a Labtronic crystal chronometer with the accuracy of ± 5 ms per day compared with VNG (Australia) with the aid of a chronoscope.

At TBL and AGE, the time signal is derived from a spring driven chronometer (Mercer) and marked each minute on records. Time accuracy is determined by comparison with signals from WWVH daily. Linear correction is applied to the daily drift.

On all seismogram records time increases from left to right and time break is upward.

At RAB* and Harbour Network the recording drum of each seismograph is driven by a 110VAC 60 H_z synchronous motor.
The 110VAC is frequently regulated by a crystal chronometer.

* The Omori recording drum is driven by a nonregulated 50 Hz frequency supply.

At ESA and KRT power for recorder motors is frequency regulated by a crystal chronometer at 50 Hz. Power for AGE and TBL and field stations is supplied by a 50 Hz free running oscillator.

Direction of Motion.

Upward direction of ground motion corresponds to upward trace motion on vertical seismogram records. Direction of component of ground motion to North or East corresponds to upward trace motion on horizontal seismogram records.

Vertical trace motion from impulsive onset of longitudinal waves of compressional or dilatational ground movement is indicated by "c" or "d" accompanied by N.S.E. or W. as per trace motion amplitude on horizontal seismogram records, to represent vectorially the direction of ground motion. "+" or "-" indicates upward or downward motion of the ground respectively, from a wave not known to be of the longitudinal type.

Accuracy of readings:

When readings are given with a decimal figure, they are to 1/10 of a second, other readings have been made to the nearest half second.

Crustal Phases:

Px, Sx Crustal phases, other than Pn and Sn for local and near earthquakes.

Felt Intensity:

Information on maximum intensities of shocks reported felt is included. Intensities are given in Roman numerals based on the Modified Mercalli Scale, of 1931.

Determination of Epicentre:

Where no source is cited, the determination of epicentral distance and origin time for local and regional earthquakes, is carried out at the Central Observatory, Rabaul, from the S-P travel times assuming a normal depth of the focus.

Geographical Designation of Epicentre:

The regional names which follow the co-ordinates of epicentres located at the Central Observatory are meant only to supplement the co-ordinates and normally follow well-known geographical rather than geological features. Use is made of the full degree blocks according to the method defined by E.A. Flinn and E.R. Engadhl in - " A PROPOSED BASIS FOR GEOGRAPHICAL AND SEISMIC REGIONALIZATION", Seismic Data Laboratory Report No. 101, U.I.D. Inc, Alexandria, Virginia, 1964, adopted by the U.S.C.G.S. for computer requirements.

Magnitude Definition and Determination.

ML - Local Magnitude (Richter, 1935) is calculated from the recorded trace amplitude of the Wood-Anderson torsion seismographs of stated physical constants (installed at the Observatory in November, 1967).

Maximun trace amplitude (0 to peak) expressed in millimetres and tenths is measureddirectly on both components. Magnitude is determined independently and the arithmetic mean taken. M_L values are given to the tenth of a unit.

The station correction factor is assumed to be zero until better known.

M_S - Surface Wave Magnitude (Gutemberg & Richter, 1956) is calculated from the amplitude of surface waves of period near 20 seconds for shallow distant earthquakes.

M_B Body Wave Magnitude is calculated from the ratio of amplitude over period for body waves or S.P.-Z of World-wide Seismograph System only when depth is known. The magnification factor for the standard seismograph is taken into account.

m -Unified magnitude (Gutemberg & Richter, 1956) has the following relation to M_L , M_S , and M_B.

$$m = 1.7 + 0.8\ M_L - 0.01\ M_L^2$$

$$m = M_B \text{ (without correction)}$$

$$m = 2.5 + 0.63\ M_S$$

Local Magnitude of earthquakes recorded at RAB with a clear S-P interval is tabulated on a Day-Distance (in Central Angle Degrees) graph which is added to the PEA monthly.

Symbols:

i. - impulsive and sharply defined beginning of a phase.

e. - emergent and poorly defined beginning of phase.

T. - Period in seconds.

A. - Peak-to- Trough trace amplitude in millimetres.

GM. - Ground Motion.

Dist. - Epicentral Distance in central angle degrees.

H. - Origin Time.

h. - Focal depth in Kilometres.

CBM - Confused by microseisms.

PRESENTATION OF DATA (CONTINUED).

Remarks:

Local - Typical signature of an earthquake with epicentre within 0.9°

Near - Typical signature of an earthquake with epicentre between 0.9° and 9°.

Distant - Typical signature of an earthquake with epicentre between 9° and 45°.

Teleseism - Typical signature of an earthquake with epicentre more than 45°.

Traces - Any recorded disperse waves or very weak unknown earthquake phases.

Local and Near earthquakes will be classified Regional, and Distant earthquakes will be grouped with Teleseisms if sheer waves and their reflections are unidentifiable.

G.W. D'ADDARIO
Vulcanologist-in-Charge.

			T sec	A mm	GM	Dist	H	Remarks
18th June, 1968.								
KRT	ePZ e(S)E	055825½ 34½			u	(¾°)	055813)	C.B.M.
KRT	iPZ	120058			u			
KRT	iPZ iSE	134152 4201½	0.4	9.0	u	¾°	134138	
KRT	iPZ eSE	160119 42	1.5		d	2°	160049	
KRT	iPZ iSE	215256 5331			u	3°	215210	
RABAUL 19th June, 1968.								
RAB	eZ/	014624			+			Traces
RAB	ePZ e(S)N/ eLqE/	083244 3616 36	0.6	3.0	d	(20°)		
RAL	iPZ	3243.5	0.8	2.3	d			
RAB	iPZ iSN	174313.0 29.5	0.5	7.0	u	1¼°	174251	M_L= 3.9
[illegible]	iPZ	12.2			d			
RAL	iPZ	[illegible]			d			
VUL	iPZ	[illegible].8		9.0	d			
KRT	iPZ [illegible]	13 28	0.2	4.0	d	1¼°	174253	
RAB	eZ/	202736			+			Traces
RAB	ePZ eSE	203426½ 49	0.4	2.0	u	2°	203356	M_L= 4.1
RAL	i(P)Z	26.0	1.0	1.0	u			
VUL	iPZ	25.9		6.7	u			
KRT	ePZ iSN	26 48½	0.2	3.0		1¼°	202356	
20th June, 1968. Strong microseismic activity on KRT records between [illegible]1200/1900-2400.								
RAB	eZ/	025744			-			Traces
RAB	eZ/	165222			-			Traces
RAB	iPZ	165610.0	0.4	2.0	d			Regional
KRT	iPZ iSN	171756½ 1809½			d	1°	171739	
KRT	iPZ iSN	183609½ 28½		3.6	d	1½°	183603	
RAB	eZ/	202604			-			Traces

			T sec	A mm	GM	Dist	H	Remarks
21st June, 1968. Strong microseismic activity on KRT between 0001-1200/ 2000-2400. No L.P.NS Rab. records.								
RAB	i(P)Z iSE/	004837.4 4904			(u)	(2¼°)	004802	(M_L= 4.7) C.B.M.
VUL	iPZ	4833.7			u			
RAB	eZ/	012556			+			Traces
RAB	iPZ iSE	101827.8 46.9	0.5	6.2	d	1½°	101802	M_L= 3.9
WAN	iPZ	26.9		2.7	u			
RAL	iPZ	27.7	0.5	3.3	u			
VUL	iPZ	28.0	0.5	7.0	u			
KRT	ePZ iSN	28 47	0.4	5.8	u	1½°	101803	
RAB	iPZ	115342.3	0.4	1.0	u			Regional
KRT	iPZ iSN	43 5402	0.1	2.6	u	1½°	115318	
RAB	iPZ iSE	172827.8 2917.4	0.5	6.0	u	4¼°	172722	M_L= 5.8
WAN	iPZ	2827.5	0.6	13.0	u			
SUL	iPZ	27.5	0.4	6.0	u			
RAL	iPZ	26.5		5.1	u			
VUL	iPZ	27.0			u			
KRT	iPZ	27½		11.4	u			Regional
RAB	ePZ iSN	180245.3 0350.4			d	5½°	180121	M_L= 5.5
KRT	eiPZ iSN	0247 0346½			d	5¼°	180130	
RAB	eZ/	202224			+			Traces
RAB	iPZ	221309.1			d			Distant
22nd June, 1968.								
RAB	ePZ eSE/	012048.3 2726	0.6	2.6	u	47°		
RAB	iPZ iSE	142915.0 27.2	0.3	4.0	d	1°	142859	M_L= 4.5
RAL	iPZ	14.3		10.9	d			
VUL	iPZ	15.3		14.0	d			
KRT	iPZ iSE	17 30		3.5	d	1°	142859	
RAB	iPZ iZ iSE	230012.6 15.4 40.5	0.4	4.0	u	2¼°	225937	M_L= 5.2
VUL	iPZ	11.4		6.1	u			

			T sec	A mm	GM	Dist	H	Remarks
23rd June, 1968.								
RAB	iPZ i(S)E/	003546.0 3646	0.5	4.8	d	(5¼°)	0034(28)	M_L= 5.5
WAN	iPZ	3545.7	0.5	3.3	u			
RAL	iPZ	46.0	0.6	3.8	u			
VUL	iPZ	45.1	0.5	5.0	u			
KRT	ePZ	43½			d			C.B.M.
RAB	iPZ iSE/	034234.0 4302	0.5	9.1	u	2¼°	034157	M_L= 5.4
WAN	iPZ	4233.8	0.5	2.0	u			
VUL	iPZ	33.0		9.0	u			
RAB	iPZ iSE	073353.4 3404.8	0.5	4.2	d	¾°	073338	M_L= 4.0
RAL	iPZ	3353.4	0.6	5.0	d			
VUL	iPZ	53.9	0.5	6.2	d			
RAB	e(P)Z	095011			d			Distant
RAB	iPZ iSN	165542.3 59.8	0.5	2.0	u	1¼°	165520	M_L= 4.2
KRT	iPZ eSE	41 57		2.5	u	1¼°	165520	
RAB	eZ/	170534			+			Traces
RAB	iPZ iSN	183942.1 4013.5	0.4	2.8	u	2½°	183901	M_L= 4.7
KRT	ePZ eSE	3953 4009½			u	2½°	183857	C.B.M.
24th June, 1968.		Between 0001-0200/0300-0700 hrs. manmade noise, heavy equipment operating. N.S. Wood Anderson records unreadable.						
RAB	iPZ iSN/	065203.5 20	0.5	7.0	u	1¼°	065141	
WAN	iPZ	03.4		7.4	u			
SUL	iPZ	02.8	0.4	3.0	u			
VUL	iPZ	02.1			u			
RAB	eZ/	150610			d			
RAB	iPZ iSN	201624.3 35.4	0.5	1.2	d	¾°	201609	
25th June, 1968.		Unidentified manmade noise between 2300-0200/0300-0400. Wood Anderson records unreadable.						
RAB	ePZ e(S)N/	032851 2956	0.8	2.0	u	(5½°)	0327(27)	
RAB	eZ/	092406			-			Traces

			T sec	A mm	GM	Dist	H	Remarks
25th June, 1968.(cont'd).								
RAB	ePZ iSN	115047½ 5115.0	0.4	1.5	d	2¼°	115010	
VUL	iPZ	5044.8			d			
RAB	iPZ eSE/	152950.5 3008	0.4	66.0	dSSE	1½°	152926	Felt: RAB Int. II-III
WAN	iPZ	2950.6			d			
SUL	iPZ	50.4		19.0	d			
RAL	iPZ	50.6			d			
VUL	iPZ	49.8			d			
KRT	iPZ	48			d			

			T sec	A mm	GM	Dist	H	Remarks
ESA'ALA								
28th May, 1968.								
ESA			NIL RECORDED - NO TIME BREAKS					
29th May, 1968.								
ESA	ePZ	034314			u			Distant
ESA	iPZ	235816½	0.5	4.0	d			Regional
30th May, 1968.								
ESA	iPZ	053309			d			
ESA	iPZ	100016	0.5	0.6	d			Local
ESA	ePZ	194919½						Distant
31st May, 1968.								
ESA	ePZ	040243			u			Distant
ESA	iPZ i(S)Z	064911 24½			u			
ESA	iPZ	162538½		3.0	d			Regional
ESA	iPZ	173045½			d			Distant
ESA	iPZ	180807	1.0	1.0	d			Distant
1st June, 1968.								
ESA	iPZ	034802		5.0	u			
ESA	iPZ	091243½			d			Distant
ESA	iPZ	102714½	1.0	2.0	d			Local
ESA	iPZ	103933			u			Distant
2nd June, 1968,								
ESA	iPZ	082036	1.0	6.0	d			Regional
ESA	ePZ	095906						Distant
ESA	iPZ	121546½	0.6	1.0	u			Regional
ESA	iPZ	160053			u			Local
ESA	iPZ	191637			u			Local
3rd June, 1968.								
ESA	iPZ	023306			u			Regional
ESA	iPZ	030224½			d			Regional

		T sec	A mm	GM	Dist	H	Remarks
3rd June, 1968.							
ESA	iPZ	091907½		u			Regional
ESA	ePZ	131511					Distant
ESA	iPZ	135905		u			Local
ESA	iPZ	142534		d			Local
ESA	iPZ	161228		u			Local
4th June, 1968.							
ESA	iPZ	015238					Local
ESA	iPZ	111014½		u			
ESA	iPZ	140731		u			
5th June, 1968.		NO TIME BREAKS					
6th June, 1968.		INOPERATIVE					
7th June, 1968.		NO TIME BREAKS					
8th June, 1968.							
ESA	iPZ	001816½		d			Regional
ESA	iPZ	003726		d			
ESA	iPZ	004146		u			Local
ESA	iPZ	004410½		u			Local
ESA	iPZ	031754		d			Local
ESA	iPZ	060546		u			Local
ESA	ePZ	063413					Distant
9th June, 1968.							
ESA	ePZ	002720		d			Regional

Very heavy microseismic activity.

			T sec	A mm	GM	Dist	H	Remarks
AGENAHAMBO								
8th June, 1968.								
AGE	ePZ	115230			u	5½°	115105	
	iSZ	5335½						
9th June, 1968.								
AGE	iPZ	002716½			u	3¼°	002627	
	iSZ	54						
AGE	ePZ	203004½						Regional
10th June, 1968.								
AGE	ePZ	154721			u			Local
11th June, 1968.								
AGE	iPZ	185126			d			(Regional)
12th June, 1968.								
AGE	iPZ	120443	0.4	2.2	d	2½°	120404	
	iSZ	0512½						
AGE	ePZ	135012½						Teleseism
13th June, 1968.								
AGE	iPZ	115222½			u			Local
14th June, 1966.								
AGE	iPZ	160651½	0.2	1.2	u			Local

Rabaul Central Observatory,
28th June, 1968.

G.W. D'ADDARIO
Volcanologist-in-Charge

PEA JUNE-68 NO.27

15 JUL 1968

TERRITORY OF PAPUA AND NEW GUINEA
GEOLOGICAL AND VOLCANOLOGICAL BRANCH
VOLCANOLOGICAL SECTION

PRELIMINARY EARTHQUAKE ANALYSIS
RABAUL CENTRAL OBSERVATORY
1968

Rabaul	RAB	From: 26TH.JUN.1968 To : 2ND.JUL.1968
Rabaul Harbour Network	WAN SUL RAL TAV VUL	From: 26TH.JUN.1968 To : 2ND.JUL.1968
Keravat	KRT	From: 26TH.JUN.1968 To : 2ND.JUL.1968
Esa'ala	ESA	From: 10TH.JUN.1968 To : 16TH.JUN.1968
Tabele	TBL	From: 12TH., 19TH.JUN.1968 To : 18TH., 25TH.JUN.1968
Agenahambe	AGE	From: To :
Waris	WAA	Not operational
Ulamona	ULA	Not operational
Piva	PIV	Not operational
Cape Gloucester	LAG	Not operational

SEISMOGRAPH STATIONS

Station (NEW GUINEA)	Code	South Latitude	East Longitude	Elev. (m)	Foundation
Rabaul	RAB	04°11'28.6"	152°10'11.4"	183.5	Basalt Flow
Wanliss Street	WAN*	04°11'39.6"	152°10'32.5"	25.0	Basalt Flow
Sulphur Creek	SUL*	04°13'09.8"	152°10'33.3"	8.5	Unconsolidated volcanic ash
Rabalanakaia	RAL*	04°13'13.0"	152°12'07.0"	91.0	Unconsolidated volcanic ash
Tavurvur	TAV*	04°13'52.2"	152°13'12.9"	27.0	Andesite Flow
Taviliu	VUL*	04°16'58.2"	152°08'44.6"	332.3	Unconsolidated volcanic ash
Keravat	KRT	04°21'10.5"	152°03'06"	20.0	Alluvium
Ulamona	ULA	04°59'24.0"	151°16'30.0"	17.0	Lapilli Tuff
Tabele	TBL	04°06'04.67"	145°00'41.37"	179.5	Basalt Flow
Waris	WAA	04°07'00"	145°06'00"	48.0	Lapilli Tuff
Piva	PIV	06°12'00"	155°03'30"	60.0	Alluvium
Cape Gloucester	LAG	04°27'20"	148°26'00"	24.0	Lapilli Tuff
(PAPUA)					
Agenahambo	AGE	08°48'49"	148°05'56"	303.0	Unconsolidated volcanic ash
Esa'ala	ESA	09°44'18.2"	150°48'50.7"	46.4	Granite Gneiss

* Rabaul Harbour Network

STATION INSTRUMENTATION

Station & Instruments	Comp.	To	Tg	Trace Speed mm./min	Approximate relative Magnification	Approximate damping
(NEW GUINEA)						
Rabaul Central Observatory RAB						
World-Wide Standard	Z	1.0	0.74	60	12,500	critical
	N,E	1.0	0.74	60	6,250	critical
Benioff VR 14.7Kg	Z/N/E/	15.0	100.0	15	750	critical
	Zh	1.0	0.02	180+	4,000	critical
Omori 15Kg	No	3.6	-	24	12	10.1 air
Omori 15Kg	Eo	3.8	-	24	10	10.1 air
Wood Anderson Torsion	Na,Ea	0.8	-	60	2,800	critical

+ Recording is triggered by the onset of any earthquake with pre-determined minimum amplitude. Recorder is stopped automatically by hour break pulse.

Rabaul Harbour Network

Readings from the Harbour Network are entered in the PEA only for large earthquakes, with impulsive and sharply defined onset of phases.

WAN°	Benioff VR 14.7Kg	Z	1.0	0.02	60	12,000	critical
SUL°	Benioff VR 14.7Kg	Z	1.0	0.02	60	6,000	critical
	MO2 Accelerograph						
RAL°	Benioff VR 14.7Kg	Z	1.0	0.02	60	12,000	critical
TAV°	Benioff VR 14.7Kg	Z	1.0	0.02	60	24,000	critical
VUL°	Benioff VR 14.7Kg	Z	1.0	0.02	60	12,000	critical

STATION INSTRUMENTATION

Station & Instruments	Comp.	To	Tg	Trace Speed mm/min	Approximate relative Magnification	Approximate damping
Rabaul Harbour Network (cont'd).						
°Signals from these stations are telemetered by land line to Helicorders (Geotech Mod. 2484) at the Central Observatory.						
°°Signals from this station are telemetered via VHF to its Helicorder at the Central Observatory.						
KRT - Keravat Outstation						
Benioff MC 50 Kg	Z	1.2	0.2	15	20% sensitivity	critical
Benioff MC 50Kg	N/E	1.2	0.2	15	10% sensitivity	critical
ULA -Ulamona Field Station						
Willmore portable	Z	0.6	0.25	60	3,000	underdamped
PIV - Piva Field Station						
Willmore portable	Z	0.6	0.25	60	3,000	underdamped
WAA - Waris Field Station						
Willmore portable	Z	0.6	0.25	60	3,000	underdamped
LAG - Cape Gloucester Field Station						
Willmore portable	Z	0.6	0.25	60	3,000	underdamped

N.B. These field stations consist of a permanent building in which instruments are installed when necessary.

Details of emergency field stations, within the Territory will be listed when in operation.

TBL - Tabele Observatory						
Benioff VR 107.5Kg (PAPUA)	Z	1.0	0.2	60	1,350	critical
ESA - Esa'ala Observatory						
Benioff VR 107.5Kg	Z	1.0	0.2	15	36,000	critical
Benioff VR 107.5Kg	N,E	1.0	0.2	15	18,000	critical
Benioff VR 107.5Kg	Z/N/E	1.0	60.0	30	50% sensitivity	critical
AGE - Agenahambo Station						
Willmore portable	Z	0.6	0.25	60	3,000	underdamped

VR Variable Reluctance

MC Moving-coil

Relative magnification curves of seismograph systems installed in the stations controlled by the Rabaul Central Observatory are listed once a month on the P.E.A.

PRESENTATION OF DATA

(reviewed in November, 1967.)

All times are reduced to Greenwich Mean Time (GMT), which is 10 hours behind Eastern Standard Time.

At RABAUL and Harbour Network, the time signal is marked every minute on each seismogram record from the Observatory crystal chronometer. Second marks from Radio signal VNG (Australia) are recorded on World-wide Standard System S.P.-N. component only according with the W.W.S.S. programme, at six hour intervals. Primary time is provided by W.W.S.S. equipment and secondary time by a Labtronic crystal chronometer with the accuracy of ± 5 ms per day compared with VNG (Australia) with the aid of a chronoscope.

At TBL and AGE, the time signal is derived from a spring driven chronometer (Mercer) and marked each minute on records. Time accuracy is determined by comparison with signals from WWVH daily. Linear correction is applied to the daily drift.

On all seismogram records time increases from left to right and time break is upward.

At RAB* and Harbour Network the recording drum of each seismograph is driven by a 110VAC 60 H_z synchronous motor.
The 110VAC is frequently regulated by a crystal chronometer.

* The Omori recording drum is driven by a nonregulated 50 Hz frequency supply.

At ESA and KRT power for recorder motors is frequency regulated by a crystal chronometer at 50 Hz. Power for AGE and TBL and field stations is supplied by a 50 Hz free running oscillator.

Direction of Motion.

Upward direction of ground motion corresponds to upward trace motion on vertical seismogram records. Direction of component of ground motion to North or East corresponds to upward trace motion on horizontal seismogram records.

Vertical trace motion from impulsive onset of longitudinal waves of compressional or dilatational ground movement is indicated by "u" or "d" accompanied by N.S.E. or W. as per trace motion amplitude on horizontal seismogram records, to represent vectorially the direction of ground motion. "+" or "-" indicates upward or downward motion of the ground respectively, from a wave not known to be of the longitudinal type.

Accuracy of readings:

When readings are given with a decimal figure, they are to 1/10 of a second, other readings have been made to the nearest half second.

Crustal Phases:

Px, Sx Crustal phases, other than Pn and Sn for local and near earthquakes.

Felt Intensity:

Information on maximum intensities of shocks reported felt is included. Intensities are given in Roman numerals based on the Modified Mercalli Scale, of 1931.

Determination of Epicentre:

Where no source is cited, the determination of epicentral distance and origin time for local and regional earthquakes, is carried out at the Central Observatory, Rabaul, from the S-P travel times assuming a normal depth of the focus.

Geographical Designation of Epicentre:

The regional names which follow the co-ordinates of epicentres located at the Central Observatory are meant only to supplement the co-ordinates and normally follow well-known geographical rather than geological features. Use is made of the full degree blocks according to the method defined by E.A. Flinn and E.R. Engadhl in - " A PROPOSED BASIS FOR GEOGRAPHICAL AND SEISMIC REGIONALIZATION", Seismic Data Laboratory Report No. 101, U.I.D. Inc, Alexandria, Virginia, 1964, adopted by the U.S.C.G.S. for computer requirements.

Magnitude Definition and Determination.

ML - Local Magnitude (Richter, 1935) is calculated from the recorded trace amplitude of the Wood-Anderson torsion seismographs of stated physical constants (installed at the Observatory in November, 1967).

Maximun trace amplitude (0 to peak) expressed in millimetres and tenths is measureddirectly on both components. Magnitude is determined independently and the arithmetic mean taken. M_L values are given to the tenth of a unit.

The station correction factor is assumed to be zero until better known.

M_S - Surface Wave Magnitude (Gutemberg & Richter, 1956) is calculated from the amplitude of surface waves of period near 20 seconds for shallow distant earthquakes.

M_B Body Wave Magnitude is calculated from the ratio of amplitude over period for body waves on S.P.-Z of World-wide Seismograph System only when depth is known. The magnification factor for the standard seismograph is taken into account.

m -Unified magnitude (Gutemberg & Richter, 1956) has the following relation to M_L , M_S , and M_B.

$$m = 1.7 + 0.8\ M_L - 0.01\ M_L^2$$

$$m = M_B \text{ (without correction)}$$

$$m = 2.5 + 0.63\ M_S$$

Local Magnitude of earthquakes recorded at RAB with a clear S-P interval is tabulated on a Day-Distance (in Central Angle Degrees) graph which is added to the PEA monthly.

Symbols:

i. - impulsive and sharply defined beginning of a phase.

e. - emergent and poorly defined beginning of phase.

T. - Period in seconds.

A. - Peak-to- Trough trace amplitude in millimetres.

GM. - Ground Motion.

Dist. - Epicentral Distance in central angle degrees.

H. - Origin Time.

h. - Focal depth in Kilometres.

CBM - Confused by microseisms.

PRESENTATION OF DATA (CONTINUED).

Remarks:

Local - Typical signature of an earthquake with epicentre within 0.9°

Near - Typical signature of an earthquake with epicentre between 0.9° and 9°.

Distant - Typical signature of an earthquake with epicentre between 9° and 45°.

Teleseism - Typical signature of an earthquake with epicentre more than 45°.

Traces - Any recorded disperse waves or very weak unknown earthquake phases.

Local and Near earthquakes will be classified Regional, and Distant earthquakes will be grouped with Teleseisms if sheer waves and their reflections are unidentifiable.

G.W. D'ADDARIO
Vulcanologist-in-Charge.

Note: Replacement page for bulletin no. 26.

			T sec	A mm	GM	Dist	H	Remarks
18th June, 1968.								
KRT	ePZ e(S)E	055825½ 34½			u	(¾°)	0558(13)	C.B.M.
KRT	iPZ	120058						
KRT	iPZ iSE	134152 4201½	0.4	9.0	u	¾°	134138	
KRT	iPZ eSE	160119 42	1.5		d	2°	160049	
KRT	iPZ iSE	215256 5331			u	3°	215210	
RABAUL **19th June, 1968.**								
RAB	eZ/	014624			+			Traces
RAB	ePZ e(S)N/ eLqE/	083244 3616 36	0.6	3.0	d	(20°)		
RAL	iPZ	3243.5	0.8	2.3	d			
RAB	iPZ iSN	174313.0 29.5	0.5	7.0	u	1¼°	174251	M_L= 3.9
SUL	iPZ	12.2			d			
RAL	iPZ	12.0						
VUL	iPZ	11.8		9.0	d			
KRT	iPZ iSN	13 28	0.2	4.0	d	1¼°	174253	
RAB	eZ/	202736			+			Traces
RAB	ePZ eSE	203426½ 49	0.4	2.0	u	2°	203356	M_L= 4.1
RAL	i(P)Z	26.0	1.0	1.0	u			
VUL	iPZ	25.9		6.7	u			
KRT	ePZ iSN	26 48½	0.2	3.0		1¾°	202356	
20th June, 1968. Strong microseismic activity on KRT records between 0039-1200/1900-2400.								
RAB	eZ/	025744			-			Traces
RAB	eZ/	165222			-			Traces
RAB	iPZ	165610.0	0.4	2.0	d			Regional
KRT	iPZ iSN	171756½ 1809½			d	1°	171739	
KRT	iPZ iSN	183609½ 28½		3.6	d	1½°	183603	
RAB	eZ/	202604			-			Traces

			T sec	A mm	GM	Dist	H	Remarks
RABAUL								
26th June, 1968. Unidentified manmade noise from 0001-0200 hrs./0300-0700 hrs.								
RAB	eZ/	020640			+			Traces
RAB	iPZ	103215.8	0.5	1.0	u			Teleseism
VUL	i(P)Z	17.5	0.8	1.0	u			
RAB	iPZ	124339.0	0.6	9.0	d			Regional
WAN	iPZ	38.9	0.8	6.0	u			
SUL	i(P)Z	39.8	0.5	2.0	d			
RAL	iPZ	38.8			d			
VUL	iPZ	40.7	0.7	17.6	d			
KRT	iPZ iSE	42 52			u	¾°	124329	
RAB	ePZ	143420	0.5	5.0	d			(Regional)
VUL	iPZ	20.0	0.8	13.0	d			
KRT	iPZ	19	1.0	4.5	u			Distant
RAB	ePZ	154554	1.0	3.8	u			Teleseism
VUL	iPZ	54.2	1.0	6.0	u			
RAL	iPZ	54.3	1.0	3.8	u			
KRT	iPZ	55½		4.0	u			
RAB	iPZ i(S)N	183332.0 3404.6	0.4	1.0	d			
VUL	iPZ	3332.4	0.4	3.1	d			
RAB	ePZ	190612½	0.5	1.0	d			(Regional)
KRT	ePZ	190609½						Traces
RAB	ePZ	203631½	0.5	1.0	d			(Local)
VUL	iPZ	31.0	0.3	3.0	u			
27th June, 1968. Unidentified manmade noise between 2300-0200 and 0300-0430.								
RAB	eZ/	104718			+			Traces
RAB	eZ/	171532			+			Traces
RAB	eZ/	234849			+			Traces
28th June, 1968.								
RAB	iPZ iSN	010243.5 0304.0	0.5	4.8	u	1½°	010216	M_L= 4.3
VUL	iPZ	0211.0			u			
RAB	ePZ/ eSN/	072318 2448				8°	072122	
VUL	iPZ	2319.0	0.8	6.0	d			

		T sec	A mm	GM	Dist	H	Remarks
28th June, 1968.(cont)							
RAB eZ/	075851			+			Traces
RAB eZ/	092040			-			Traces
RAB iPZ iSN/	104705.3 10	0.5	5.8	d	1¼°	104659	M_L= 2.6
WAN iPZ	05.0			d			
RAL iPZ	04.7			d			
TAV iPZ	04.3			d			
VUL iPZ	05.0			d			
KRT ePZ	07						C.B.M. Local
RAB iPZ iSE	114848.0 4908.6	0.5	6.1	d	1½°	114822	M_L= 4.5
KRT iPZ eSN	4847 4906			d	1½°	114822	C.B.M.
RAB iPZ iSE	121922.3 39.0	0.4	6.2	d	1¼°	121900	M_L= 4.2
VUL iPZ	20.5			d			
KRT iPZ iSN	20 35			d	1¼°	121900	
RAB eZ/	133749			-			Traces
RAB eZ/	144440			+			Traces
29th June, 1968.							
RAB eiPZ	111121	0.3	1.0	u			Regional
RAB iPZ iSE	150702.2 26.8	0.2	2.0	u	2°	150629	M_L= 4.6
VUL iPZ	01.4			d			
RAB ePZ iSNa	180449½ 0535.8	0.5	18.0	(d)	3¾°	180347	M_L= 6.0
WAN iPZ	0449.5		11.0	d			
SUL iPZ	49.7		5.0	d			
RAL iPZ	48.8			d			
TAV iPZ	48.5		12.0	d			
VUL iPZ	50.0			d			
KRT iPZ	50			d			
RAB i(P)Z iSNa	182230.0 40.0			u	(¾°)	1822(16)	M_L= 3.6
WAN iPZ	29.8			d			
SUL iPZ	29.5			u			
RAL iPZ	29.4			u			
TAV iPZ	29.4			u			
VUL iPZ	31.0			u			
KRT iPZ eSE	32 44			u	1°	182216	

			T sec	A mm	GM	Dist	H	Remarks
29th June, 1968. (cont)								
RAB	iPZ eSE	184219.8 4307½			d	4°	184117	M_L= 4.6
RAB	iPZ/ iSE	214048.4 4121.8			u	2¾°	214006	M_L= 5.2
WAN	iPZ	4048.9			d			
SUL	iPZ	48.8			d			
RAL	iPZ	48.6			d			
TAV	iPZ	48.2			d			
VUL	iPZ	49.4			d			
KRT	iPZ	50½			d			
RAB	ePZ iSN	222002 35.0	0.7		d	2¾°	221919	M_L= 4.3
RAB	i(P)Z iSE	222703.9 2812.8	0.3		u	(6°)	2225(35)	M_L= 5.2
TAV	iPZ	2753.0	0.2	2.0	u			
VUL	iPZ	53.4			u			
30th June, 1968.								
RAB	ePZ eSE/ eLqE/	093941 4304 12	0.8	1.0	d	18½°		
RAB	iPZ eSN	124639.0 4712	0.5	2.1	u	2¾°	124556	M_L= 4.4
RAB	ePZ eSN/	131714 2056	0.8	2.0	u	20°		
KRT	ePZ	131715½			u			
RAB	iPZ iSN	144833.4 43.5	0.4	24.0	u	½°	144819	M_L= 3.9
WAN	iPZ	33.0	0.4	10.0	u			
RAL	iPZ	33.0			u			
TAV	iPZ	32.8			u			
KRT	iPZ iSN	35 47		8.0	u			
1st July, 1968.								
RAB	iPZ iSE	031605.2 48.0	0.5	2.0	d	3½°	031509	M_L= 5.7
RAB	iPZ iSE	094424.7 32.0	0.3	17.0	u	¼°	094415	M_L= 3.4
WAN	iPZ	25.4	0.3	8.0	u			
RAL	iPZ	26.0			u			
TAV	iPZ	26.3	0.3	7.0	u			
VUL	iPZ	27.0			u			
KRT	iPZ e(S)N	29 37½			u	(½°)	0944(17)	C.B.M.

			T sec	A mm	GM	Dist	H	Remarks
1st July, 1968. (cont)								
RAB	ePZ eSN/	105255 5903	1.0	2.0	u	43°		Japanese shock
RAB	iPZ iSN/	144006.8 22	0.3	43.0	d	1¼°	144050	M_L= 4.5
WAN	iPZ	06.5			d			
SUL	iPZ	06.4			d			
RAL	iPZ	06.2			d			
TAV	iPZ	06.0			d			
VUL	iPZ	07.0			d			
KRT	iPZ	09			d			
RAB	iPZ iSN	201550.5 1609.0	0.5	2.1	u	1½°	201525	M_L= 4.3
WAN	iPZ	1551.0	0.3	1.0	u			
2nd July, 1968.								
RAB	eZ/	022209			-			Traces
RAB	eZ/	035817						Teleseism
RAB	iPZ i(S)N	121604.0 30.2	0.3	1.4	u	(2°)	1216(30)	M_L= 4.3
WAN	iPZ	04.0		1.5	u			
TAV	iPZ	03.2		4.0	d			
RAB	iPZ iSN	175252.1 5304.7	0.3	5.1	d	¾°	175235	M_L= 3.6
RAB	ePZ iSN	184007 28.1	0.4	1.0	u	1½°	183939	M_L= 3.8
RAL	iPZ	06.4	1.0	1.2	u			
TAV	iPZ	06.2		1.5	u			
RAB	e(P)Z eSE/	184317 4604	1.0	2.0	u	(15¾°)		
RAB	iPZ e(S)N	190429.7 50½	0.4	2.0	d	(1½°)	1904(02)	M_L= 4.7

			T sec	A mm	GM	Dist	H	Remarks
ESA'ALA								
10th June, 1968.								
ESA	iPZ	002349						Local
ESA	iPZ	033655½						
ESA	iPZ	053408½			d			Local
ESA	iPZ	055632½			d			Local
11th June, 1968.								
ESA	iPZ	014533½			u			Local
ESA	iPZ	025308			u			Local
ESA	iPZ	040053½			u			Local
12th June, 1968.								
ESA	iPZ	071348½						Regional
ESA	iPZ	084418½						Regional
ESA	iPZ	085116						
ESA	iPZ	091109			d			Regional
ESA	iPZ	120500			u			Regional
ESA	iPZ	122545			u			Local
13th June, 1968.			UNREADABLE					
14th June, 1968.			UNREADABLE					
15th June, 1968.								
ESA	iPZ	060651½			u			Distant
ESA	ePZ	074148½						Regional
16th June, 1968.								
ESA	iPZ	021829			u			
17th June, 1968.								
ESA	ePZ	120158½			u			Distant
ESA	iPZ	121236½			u			Local

		T sec	A mm	GM	Dist	H	Remarks
TABELE							
12th June, 1968.							
TBL	eiPZ 134750			d			Regional
13th June, 1968.			NIL RECORDED				
14th June, 1968.			NIL RECORDED				
15th June, 1968.							
TBL	iPZ 131536	0.5	9 0	u	(¼°)	1315(24)	
	i(S)Z 44½						
16th June, 1968.			NIL RECORDED				
17th June, 1968.							
TBL	iPZ 174729	0.5	10.0	d	(½°)	1747(13)	
	i(S)Z 41						
TBL	ePZ 181338½			u			Teleseism
TBL	iPZ 233152½	0.5	8.0	u			Local
18th June, 1968.			UNREADABLE				
19th June, 1968.			NIL RECORDED				
20th June, 1968.			NIL RECORDED				
21st June, 1968.							
TBL	iPZ 044009						
22nd June, 1968.			NIL RECORDED				
23rd June, 1968.							
TBL	iPZ 003326½						
24th June, 1968.			NIL RECORDED				
25th June, 1968.							
TBL	eiPZ 032655½						

Rabaul Central Observatory,
4th June, 1968.

G.W. D'ADDARIO
Volcanologist-in-Charge

22 JUL 1968

PEA JULY -68 No 28

TERRITORY OF PAPUA AND NEW GUINEA
GEOLOGICAL AND VOLCANOLOGICAL BRANCH
VOLCANOLOGICAL SECTION.

PRELIMINARY EARTHQUAKE ANALYSIS
RABAUL CENTRAL OBSERVATORY
1968.

Rabaul	RAB	From: 3rd July, 1968. To: 9th July, 1968.
Rabaul Harbour Network	WAN SUL RAL TAV VUL	From: 3rd July, 1968. To: 9th July, 1968.
Keravat	KRT	From: 2nd July, 1968. To: 7th July, 1968.
Esa'ala	ESA	From: 18th July, 1968. To: 20th July, 1968.
Tabele	TBL	From: To:
Agenahambo	AGE	From: To:
Waris	WAA	Not operational
Ulamona	ULA	Not operational
Piva	PIV	Not operational
Cape Gloucester	LAG	Not operational

STATION PERSONNEL

RAB Central Observatory, Rabaul.

Volcanologist-in-Charge	G.W. D'Addario
Volcanologist	R.F. Heming
Seismologist	M. Mancini
Seismogram Readers	D.J.Cook, H.M.Carrick
Senior Technical Officer	N.O. Myers
Technical Officer	R.J. Conway
Volcanological Assistants	L. Topue, M.Gaiam, E. Ravian
Technical Assistant	P. Daimbari
Trainee Volcanological Assistants	B. Talai, M. Salaiau, C. Matupit.
Secretary	H. James

KRT Keravat Outstation

Observer (part-time)	G.E. Chorick

TBL Tabele Observatory

Observer	V. Kaita

ESA Esa'ala Observatory

Observer	F. Dira

AGE Agenahambo Outstation

Observer (part-time)	B. Kirke

The Rabaul Preliminary Earthquake Analysis (PEA) is produced by the staff under the direction of the Volcanologist-in-Charge from whom additional information and photocopies of seismogram records from all stations may be obtained on request.

Please address all communications to:-

Volcanologist-in-Charge,
Central Observatory,
P.O. Box 386,
RABAUL. T.N.G.

SEISMOGRAPH STATIONS

Station	Code	South Latitude	East Longitude	Elev. (m)	Foundation
(NEW GUINEA)					
Rabaul	RAB	04°11'26.6"	152°10'11.4"	183.5	Basalt Flow
Wanliss Street	WAN*	04°11'30.6"	152°10'32.5"	25.0	Basalt Flow
Sulphur Creek	SUL*	04°13'09.5"	152°10'33.3"	8.5	Unconsolidated volcanic ash
Rabalanakaia	RAL*	04°13'13.0"	152°12'07.0"	91.0	Unconsolidated volcanic ash
Tavurvur	TAV*	04°13'52.2"	152°13'12.9"	27.0	Andesite Flow
Tavilin	VUL*	04°16'58.2"	152°08'44.6"	332.3	Unconsolidated volcanic ash
Keravat	KRT	04°21'10.5"	152°03'06"	20.0	Alluvium
Ulamona	ULA	04°59'24.0"	151°16'30.0"	17.0	Lapilli Tuff
Tebelle	TBL	04°06'04.67"	145°00'41.37"	179.5	Basalt Flow
Wanin	WAA	04°07'00"	145°06'00"	48.0	Lapilli Tuff
Piva	PIV	06°12'00"	155°03'30"	60.0	Alluvium
Cape Gloucester	LAG	04°27'20"	148°26'00"	24.0	Lapilli Tuff
(PAPUA)					
Agenahambo	AGE	08°48'49"	148°05'56"	303.0	Unconsolidated volcanic ash
Esa'ala	ESA	09°44'18.2"	150°48'50.7"	46.4	Granite Gneiss

* Rabaul Harbour Network

STATION INSTRUMENTATION

Station & Instruments	Comp.	Ao	Ta	Trace Speed mm/min	Approximate relative Magnification	Approximate damping
(NEW GUINEA)						
Rabaul Central Observatory RAB						
World-Wide Standard	Z	1.0	0.25	60	12,500	critical
	N,E	1.0	0.25	60	6,250	critical
	Z/N/E/	35.0	100.0	15	750	critical
Benioff VR 14.7Kg	Zh	1.0	0.02	100+	4,000	critical
Omori 15Kg	No	3.6	-	24	12	10.1 air
Omori 15Kg	Eo	3.8	-	24	10	10.1 air
Wood Anderson Torsion	Na,Ea	0.8	-	60	2,800	critical

+ Recording is triggered by the onset of any earthquake with pre-determined minimum amplitude. Recorder is stopped automatically by hour break pulse.

Rabaul Harbour Network

Readings from the Harbour Network are entered in the PEA only for large earthquakes, with impulsive and sharply defined onset of phases.

WAN°	Benioff VR 14.7Kg	Z	1.0	0.02	60	12,000	critical
SUL°	Benioff VR 14.7Kg	Z	1.0	0.02	60	6,000	critical
	MO2 Accelerograph						
RAL°	Benioff VR 14.7Kg	Z	1.0	0.02	60	12,000	critical
TAV°	Benioff VR 14.7Kg	Z	1.0	0.02	60	24,000	critical
VUL°	Benioff VR 14.7Kg	Z	1.0	0.02	60	12,000	critical

STATION INSTRUMENTATION

Station & Instruments	Comp.	To	Tg	Trace Speed mm/min	Approximate relative Magnification	Approximate damping
Rabaul Harbour Network (cont'd).						
°Signals from these stations are telemetered by land line to Helicorders (Geotech Mod. 2484) at the Central Observatory.						
°°Signals from this station are telemetered via VHF to its Helicorder at the Central Observatory.						
KRT - Keravat Outstation						
Benioff MC 50 Kg	Z	1.2	0.2	15	20% sensitivity	critical
Benioff MC 50Kg	N/E	1.2	0.2	15	10% sensitivity	critical
ULA -Ulamona Field Station						
Willmore portable	Z	0.6	0.25	60	3,000	underdamped
PIV - Piva Field Station						
Willmore portable	Z	0.6	0.25	60	3,000	underdamped
WAA - Waris Field Station						
Willmore portable	Z	0.6	0.25	60	3,000	underdamped
LAG - Cape Gloucester Field Station						
Willmore portable	Z	0.6	0.25	60	3,000	underdamped

N.B. These field stations consist of a permanent building in which instruments are installed when necessary.

Details of emergency field stations, within the Territory will be listed when in operation.

TBL - Tabele Observatory						
Benioff VR 107.5Kg	Z	1.0	0.2	60	1,350	critical
(PAPUA)						
ESA - Esa'ala Observatory						
Benioff VR 107.5Kg	Z	1.0	0.2	15	36,000	critical
Benioff VR 107.5Kg	N,E	1.0	0.2	15	18,000	critical
Benioff VR 107.5Kg	Z/N/E	1.0	60.0	30	50% sensitivity	critical
AGE - Agenahambo Station						
Willmore portable	Z	0.6	0.25	60	3,000	underdamped

VR Variable Reluctance

MC Moving-coil

Relative magnification curves of seismograph systems installed in the stations controlled by the Rabaul Central Observatory are listed once a month on the P.E.A.

PRESENTATION OF DATA

(reviewed in November, 1967.)

All times are reduced to Greenwich Mean Time (GMT), which is 10 hours behind Eastern Standard Time.

At RABAUL and Harbour Network, the time signal is marked every minute on each seismogram record from the Observatory crystal chronometer. Second marks from Radio signal VNG (Australia) are recorded on World-wide Standard System S.P.-N. component only according with the W.W.S.S. programme, at six hour intervals. Primary time is provided by W.W.S.S. equipment and secondary time by a Labtronic crystal chronometer with the accuracy of ± 5 ms per day compared with VNG (Australia) with the aid of a chronoscope.

At TBL and AGE, the time signal is derived from a spring driven chronometer (Mercer) and marked each minute on records. Time accuracy is determined by comparison with signals from WWVH daily. Linear correction is applied to the daily drift.

On all seismogram records time increases from left to right and time break is upward.

At RAB* and Harbour Network the recording drum of each seismograph is driven by a 110VAC 60 H_z synchronous motor.
The 110VAC is frequently regulated by a crystal chronometer.

* The Omori recording drum is driven by a nonregulated 50 Hz frequency supply.

At ESA and KRT power for recorder motors is frequency regulated by a crystal chronometer at 50 Hz. Power for AGE and TBL and field stations is supplied by a 50 Hz free running oscillator.

Direction of Motion.

Upward direction of ground motion corresponds to upward trace motion on vertical seismogram records. Direction of component of ground motion to North or East corresponds to upward trace motion on horizontal seismogram records.

Vertical trace motion from impulsive onset of longitudinal waves of compressional or dilatational ground movement is indicated by "u" or "d" accompanied by N.S.E. or W. as per trace motion amplitude on horizontal seismogram records, to represent vectorially the direction of ground motion. "+" or "-" indicates upward or downward motion of the ground respectively, from a wave not known to be of the longitudinal type.

Accuracy of readings:

When readings are given with a decimal figure, they are to 1/10 of a second, other readings have been made to the nearest half second.

Crustal Phases:

Px, Sx Crustal phases, other than Pn and Sn for local and near earthquakes.

Felt Intensity:

Information on maximum intensities of shocks reported felt is included. Intensities are given in Roman numerals based on the Modified Mercalli Scale, of 1931.

Determination of Epicentre:

Where no source is cited, the determination of epicentral distance and origin time for local and regional earthquakes, is carried out at the Central Observatory, Rabaul, from the S-P travel times assuming a normal depth of the focus.

Geographical Designation of Epicentre:

The regional names which follow the co-ordinates of epicentres located at the Central Observatory are meant only to supplement the co-ordinates and normally follow well-known geographical rather than geological features. Use is made of the full degree blocks according to the method defined by E.A. Flinn and E.R. Engadhl in - " A PROPOSED BASIS FOR GEOGRAPHICAL AND SEISMIC REGIONALIZATION", Seismic Data Laboratory Report No. 101, U.I.D. Inc, Alexandria, Virginia, 1964, adopted by the U.S.C.G.S. for computer requirements.

Magnitude Definition and Determination.

ML - Local Magnitude (Richter, 1935) is calculated from the recorded trace amplitude of the Wood-Anderson torsion seismographs of stated physical constants (installed at the Observatory in November, 1967).

Maximun trace amplitude (0 to peak) expressed in millimetres and tenths is measureddirectly on both components. Magnitude is determined independently and the arithmetic mean taken. $M_L$values are given to the tenth of a unit.

The station correction factor is assumed to be zero until better known.

M_S - Surface Wave Magnitude (Gutemberg & Richter, 1956) is calculated from the amplitude of surface waves of period near 20 seconds for shallow distant earthquakes.

M_B Body Wave Magnitude is calculated from the ratio of amplitude over period for body waves on S.P.-Z of World-wide Seismograph System only when depth is known. The magnification factor for the standard seismograph is taken into account.

m -Unified magnitude (Gutemberg & Richter, 1956) has the following relation to M_L , M_S , and M_B.

$$m = 1.7 + 0.8\ M_L - 0.01\ M_L^2$$

$$m = M_B \text{ (without correction)}$$

$$m = 2.5 + 0.63\ M_S$$

Local Magnitude of earthquakes recorded at RAB with a clear S-P interval is tabulated on a Day-Distance (in Central Angle Degrees) graph which is added to the PEA monthly.

Symbols:

i. - impulsive and sharply defined beginning of a phase.

e. - emergent and poorly defined beginning of phase.

T. - Period in seconds.

A. - Peak-to- Trough trace amplitude in millimetres.

GM. - Ground Motion.

Dist. - Epicentral Distance in central angle degrees.

H. - Origin Time.

h. - Focal depth in Kilometres.

CBM - Confused by microseisms.

PRESENTATION OF DATA (CONTINUED).

Remarks:

Local - Typical signature of an earthquake with epicentre within 0.9°

Near - Typical signature of an earthquake with epicentre between 0.9° and 9°.

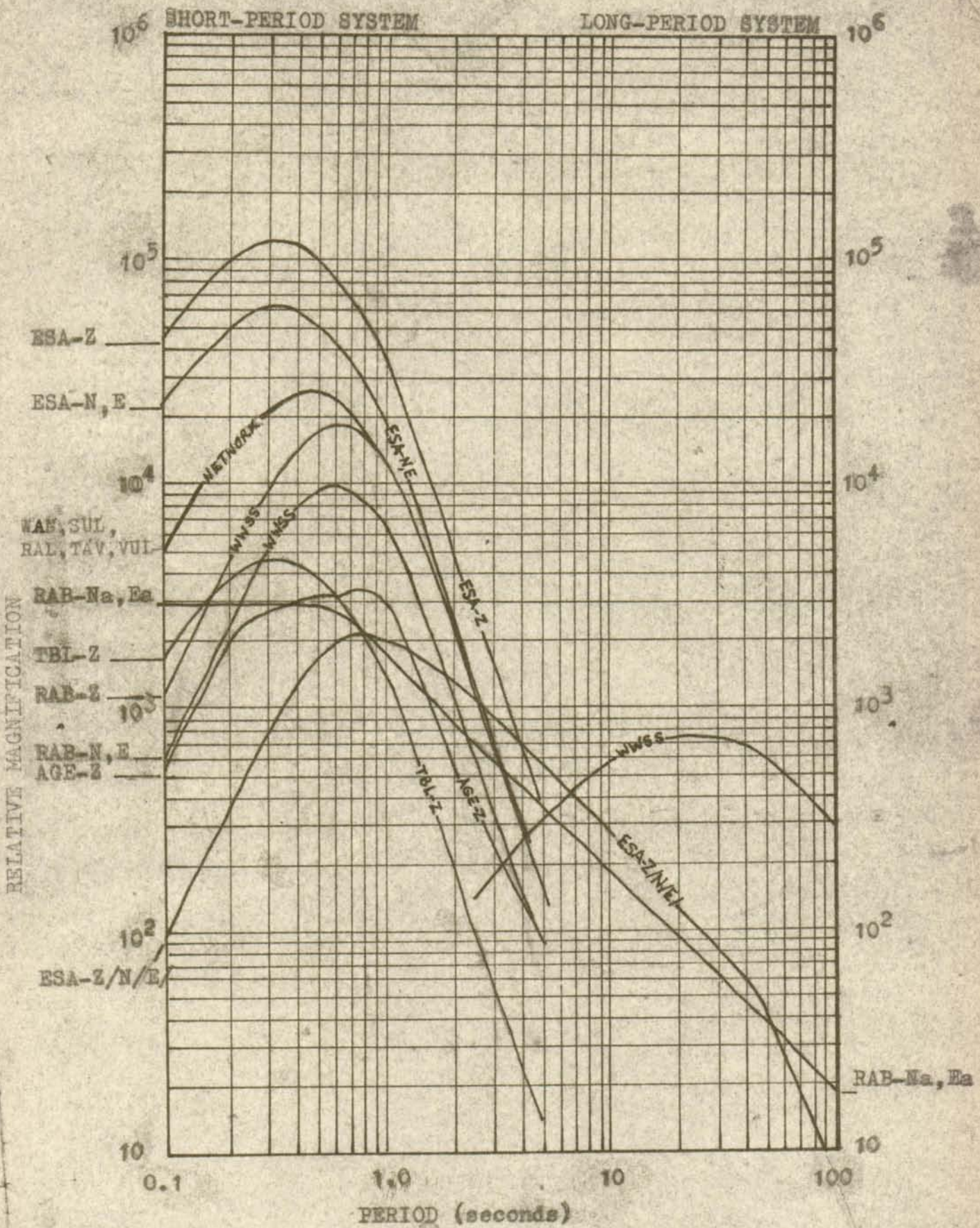
Distant - Typical signature of an earthquake with epicentre between 9° and 45°.

Teleseism - Typical signature of an earthquake with epicentre more than 45°.

Traces - Any recorded disperse waves or very weak unknown earthquake phases.

Local and Near earthquakes will be classified Regional, and Distant earthquakes will be grouped with Teleseisms if sheer waves and their reflections are unidentifiable.

G.W. D'ADDARIO
Vulcanologist-in-Charge.

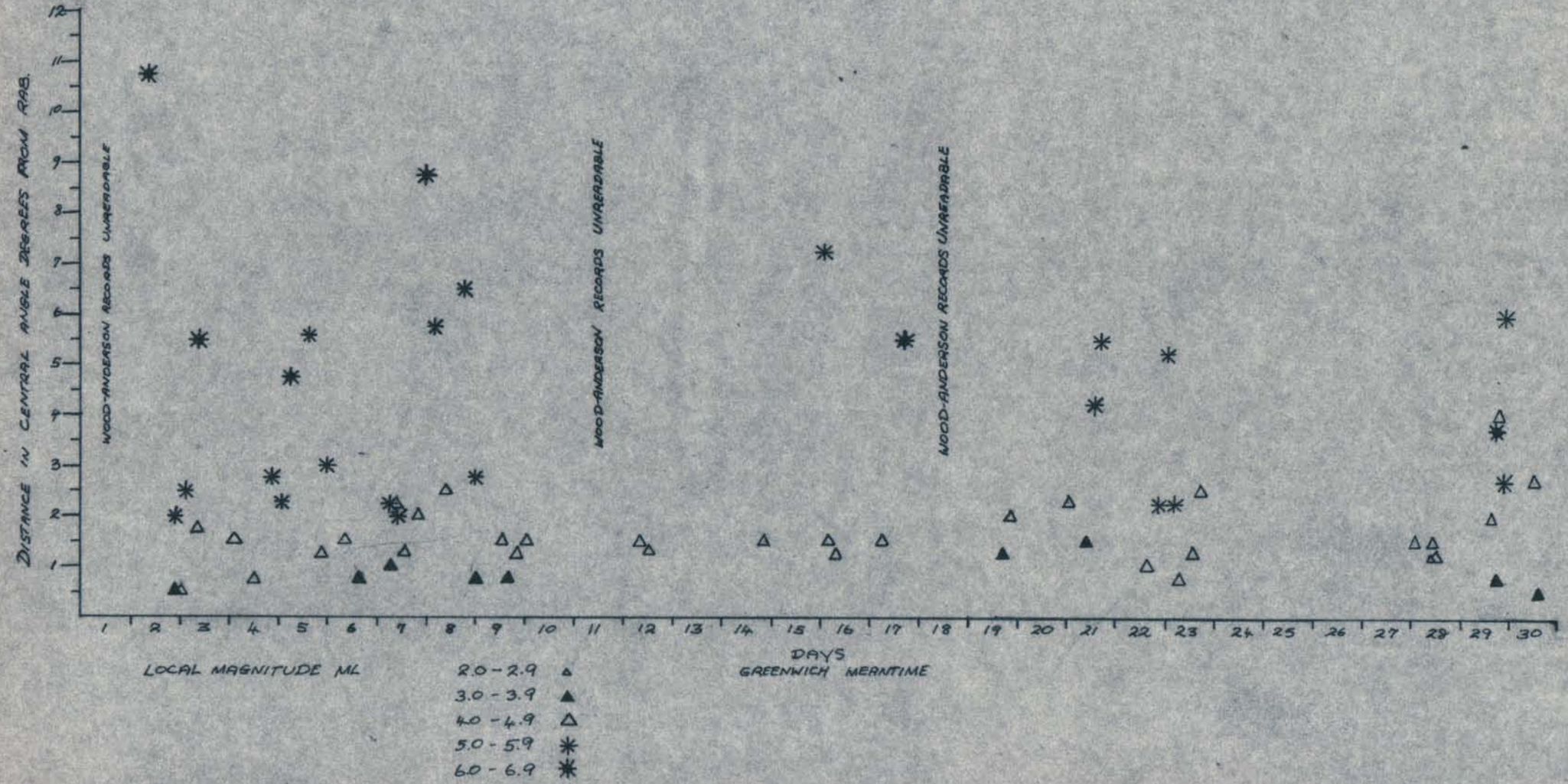


FREQUENCY RESPONSE CURVES OF THE INSTRUMENTS

GWDA Nov.67

MAGNITUDE OF REGIONAL EARTHQUAKES WITH A CLEAR S-P INTERVAL

JUNE 1968



			T sec	A mm	GM	Dist	H	Remarks
2nd July, 1968.								
KRT	iPZ	121604	0.4	6.8	u	1¾°	121534	
	iSN	26½						
KRT	iPZ	175250	0.2	4.8	u	¾°	175233	
	iSN	5302½						
KRT	eiPZ	184007	0.2	7.2	d	1¾°	183938	
	iSN	29						
KRT	iPZ	184316	2.0	1.0	d			Distant
KRT	iPZ	190427	0.2	2.8	u	1½°	190402	
	iSN	46						
RABAUL								
3rd July, 1968. Bad microseismic activity on KRT records - unreadable. RAB - unidentified man-made noise between 0300-0445.								
RAB	iPZ	025006.0	0.5	(4.0)	u			Local
RAB	i(P)Z	043805	0.5	(3.3)	u	¼°	043759	M_L= 3.0 C.B.M.
	iSN	12.5						
RAB	i(P)Z	053641.0	0.4	2.0	d			
RAB	iPZ	064907.2	0.5	14.0	u			Local
WAN	iPZ	07.0	0.2	18.0	u			
SUL	iPZ	07.0	0.2	4.0	u			
RAL	iPZ	07.2	0.2	7.0	u			
4th July, 1968.								
RAB	i(P)Z	100236.5	0.5	2.0	d			(Distant)
KRT	ePZ	100236½			u			Distant
RAB	ePZ	101641	0.5	2.0	d	2¾°		
	iSE	1738						
KRT	ePZ	101643	0.4	2.0	d			Distant
RAB	e(P)Z	115442	0.3	2.0	u	1½°		M_L= 3.9
	iSE	5501						
RAB	iPZ	175006.9	0.4	7.0	d	1°		
	iSE/	20						
WAN	iPZ	05.4	0.5	1.5	d			
RAL	iPZ	05.0	0.3	2.0	d			
TAV	iPZ	04.8	0.2	5.0	d			
KRT	iPZ	06½		8.6	u			Local
5th July, 1968.								
RAB	e(P)Z	001124.5	0.3	2.0	d	1½°	001058	
	iSN	44.9						
TAV	iPZ	26.0	0.1	3.0	d			
VUL	iPZ	26.1	0.4	5.0	d			

			T sec	A mm	GM	Dist	H	Remarks
5th July, 1968 (cont'd).								
RAB	e(P)Z iSN	001845.0 1901.5	0.4	1.8	d	1¼°	001824	
VUL	iPZ	1846.2	0.3	3.0	d			
RAB	e(P)Z e(S)N	032712.0 41.0	0.5	2.6	u	2¼°	032634	
RAB	iPZ eLqN/ eLrZ/ MZ/	113614 4624 4806 4828	1.0	3.9	u	44°		
KRT	ePZ	3615½						C.B.M.
RAB	e(P)Z iSN	121143.0 1217.5	0.3	2.9	d	2¾°	121058	
KRT	ePZ eSN	1144½ 1218½			d	2¾°	121100	C.B.M.
RAB	iPZ	204135.5	0.5	7.0	d			Regional
WAN	iPZ	36.0	0.9	3.1	d			
RAL	iPZ	36.3	0.7	3.0	d			
TAV	iPZ	36.7	0.7	3.3	d			
VUL	iPZ	35.1	0.6	8.0	d			
6th July, 1968.								
RAB	ePZ iSN	150838 0904.0	0.5	3.0	u	2¼°	150804	M_L= 5.0
WAN	iPZ	0838.0	0.8	14.0	u			
SUL	iPZ	37.8	0.5	2.4	u			
TAV	iPZ	38.0	0.7	12.0	u			
VUL	iPZ	37.4		15.0	u			
KRT	iPZ iSE	35 58	0.2	4.8	d	2°	150805	
RAB	eZ/	172956			+			Traces
RAB	ePZ	173313	0.8	1.0	d			(Distant)
KRT	eiPZ	13½						Distant
RAB	iPZ eSE/ eLqN/	193310.8 3638 48	0.8	4.0	u	19°		
VUL	iPZ	3310.1		33.0	d			
KRT	eiPZ	09	1.0	26.0	u			Distant
7th July, 1968.								
RAB	iPZ iSE	135959 140026	0.5	28.0	d	2¼°	135923	M_L= 3.7
WAN	iPZ	135958.7	0.5	9.0	d			
SUL	iPZ	58.6	0.3	4.0	d			
RAL	iPZ	58.8	0.3	6.0	d			
TAV	iPZ	58.1	0.4	2.0	d			

			T sec	A mm	GM	Dist	H	Remarks
7th July, 1968 (cont'd).								
VUL	iPZ	135957.8	0.3	11.0	d			
KRT	iPZ	55½			d	(2°)	1359(26)	
	i(S)E	140017½						
RAB	eZ/	143036			d			Distant
KRT	ePZ	36½			d			Distant
RAB	eZ/	163418			+			Traces
RAB	eZ/	165634			+			Traces
RAB	eZ/	214006			+			Traces
8th July, 1968								
RAB	ePZ	051445	0.3	1.6	d	(2°)	0514 12	
	iSN	1510.0						
RAB	iPZ	173010.0	0.4	2.0	u	(2°)	112937	
	iSN	35.0						
WAN	iPZ	113009.8			u			
TAV	iPZ	08.0	0.4	1.0	u			
VUL	iPZ	08.1	0.4	0.8	u			
RAB	iPZ	144036.3	0.3	2.0	d			Regional
TAV	iPZ	35.5			u			
VUL	iPZ	36.0		8.2	u			
RAB	ePZ	185925	0.8	1.0	d			Regional(deep)
RAB	ePZ	213129	0.8	2.0	u			(Distant)
9th July, 1968.					+			
RAB	eZ	023008			+	o		Traces
RAB	e(P)Z	034416				21°		
	eLqN/	4846						
	eLrZ	4936						
RAB	eZ	082414			+			Traces
RAB	iPZ	091536.2	0.5	(9.0)	d			Regional
	iPZ	115629.0	0.4	2.9	u	1½°	115603	
	iSE	49.0						
RAB	iPZ	140826.9	0.5	(8.0)	u	(1¼)	140804	M_L = 4.1
	i(S)N	44.0						
WAN	iPZ	28.0	0.5	15.0	d			
SUL	iPZ	27.0	0.3	12.0	u			
RAL	iPZ	26.6	0.5	28.8	u			
TAV	iPZ	28.0	0.5	13.8	d			
VUL	iPZ	25.5	0.5	38.0	d			

			T sec	A mm	GM	Dist	H	Remarks.
9th July, 1968 (cont'd)								
RAB	e(P)Z iSE	154740.0 4809.5	0.4	1.7	d	2¼°	154702	
RAB	iPZ	204731.0	0.5	2.2	u			Regional
RAB	iPZ	211243.2	0.5	1.9	d			Regional
RAB	iP Z iSE	215555.0 5611.0	0.5	14.0	d	1¼°	215534	M_L =3.9
TAV	iPZ	5554.6	0.4	20.2	d			

ESA'ALA

18th June, 1968	No time breaks from 181300 - 182226 hours							
ESA	iPZ	134015½	0.3	18.0	u			Regional
19th June, 1968	No time breaks from 191252 - 192217 hours.							
ESA	ePZ	061212	0.5	1.0	u			Regional
ESA	iPZ	062414½	0.2	3.0	u			Regional
ESA	iPZ	075539	0.3	2.0	u			Regional
ESA	ePZ	083245	0.8	1.0	d			Distant
ESA	ePZ	101950			d			Regional
20th June, 1968	No time breaks from 201239 - 202237 hours.							
ESA	iPZ	055603½			u			Local
ESA	iPZ	061512½	0.2	2.0	d			Regional

Rabaul Central Observatory,
12th July, 1968.

G.W.D'ADDARIO
Volcanologist-in-Charge.

25 JUL 1968

PEA JULY -68 NO.29

TERRITORY OF PAPUA AND NEW GUINEA
GEOLOGICAL AND VOLCANOLOGICAL BRANCH
VOLCANOLOGICAL SECTION.

PRELIMINARY EARTHQUAKE ANALYSIS
RABAUL CENTRAL OBSERVATORY
1968.

Rabaul	RAB	From: 10th. July,1968 To: 16th. July,1968
Rabaul Harbour Network	WAN SUL RAL TAV VUL	From: 10th. July,1968 To: 16th. July,1968
Keravat	KRT	From: 9th. July,1968 To: 15th. July,1968
Esa'ala	ESA	From: 28th. June,1968 To: 6th. July,1968
Tabele	TBL	From: To:
Agenahambo	AGE	From: To:
Waris	WAA	Not operational
Ulamona	ULA	Not operational
Piva	PIV	Not operational
Cape Gloucester	LAG	Not operational

STATION PERSONNEL

RAB Central Observatory, Rabaul.

Volcanologist-in-Charge	G.W. D'Addario
Volcanologist	R.F. Heming
Seismologist	M. Mancini
Seismogram Readers	D.J. Cook, H.M.Carrick
Senior Technical Officer	N.O. Myers
Technical Officer	R.J. Conway
Volcanological Assistants	L. Topue, M. Gaiam, E. Ravian.
Technical Assistant	P. Daimbari
Trainee Volcanological Assistants	B. Talai, M.Salaiau, C. Matupit.
Secretary	H. James.

KRT Keravat Outstation.

Observer (part-time)	G.E. Chorick

TBL Tabele Observatory

Observer	V. Kaita.

ISA Isabela Observatory

Observer	F. Dira

AGE Agenahambo Outstation

Observer (part-time)	B. Kirke

The Rabaul Preliminary Earthquake Analysis (PEA) is produced by the staff under the direction of the Volcanologist-in-Charge from whom additional information and photocopies of seismogram records from all stations may be obtained on request.

Please address all communications to:-

Volcanologist-in-Charge
Central Observatory,
P.O. Box 386,
RABAUL. T.N.G.

SEISMOGRAPH STATIONS

Station	Code	South Latitude	East Longitude	Elev. (m)	Foundation
(NEW GUINEA)					
Rabaul	RAB	04°11'28.6"	152°10'11.4"	183.5	Basalt Flow
Wanliss Street	WAN*	04°11'39.6"	152°10'32.5"	25.0	Basalt Flow
Sulphur Creek	SUL*	04°13'09.8"	152°10'33.3"	8.5	Unconsolidated volcanic ash
Rabalanakaia	RAL*	04°13'13.0"	152°12'07.0"	91.0	Unconsolidated volcanic ash
Tavurvur	TAV*	04°13'52.2"	152°13'12.9"	27.0	Andesite Flow
Taviliu	VUL*	04°16'58.2"	152°08'44.6"	332.3	Unconsolidated volcanic ash
Keravat	KRT	04°21'10.5"	152°03'06"	20.0	Alluvium
Ulamona	ULA	04°59'24.0"	151°16'30.0"	17.0	Lapilli Tuff
Tabele	TBL	04°06'04.67"	145°00'41.37"	179.5	Basalt Flow
Waris	WAA	04°07'00"	145°06'00"	48.0	Lapilli Tuff
Piva	PIV	06°12'00"	155°03'30"	60.0	Alluvium
Cape Gloucester	LAG	04°27'20"	148°26'00"	24.0	Lapilli Tuff
(PAPUA)					
Agenahambo	AGE	08°48'49"	148°05'56"	303.0	Unconsolidated volcanic ash
Esa'ala	ESA	09°44'18.2"	150°48'50.7"	46.4	Granite Gneiss

* Rabaul Harbour Network

STATION INSTRUMENTATION

Station & Instruments	Comp.	To	Tg	Trace Speed mm/min	Approximate relative Magnification	Approximate damping
(NEW GUINEA)						
Rabaul Central Observatory RAB						
World-Wide Standard	Z	1.0	0.74	60	12,500	critical
	N,E	1.0	0.74	60	6,250	critical
	Z/N/E/	15.0	100.0	15	750	critical
Benioff VR 14.7Kg	Zh	1.0	0.02	180+	4,000	critical
Omori 15Kg	No	3.6	-	24	12	10.1 air
Omori 15Kg	Eo	3.8	-	24	10	10.1 air
Wood Anderson Torsion	Na,Ea	0.8	-	60	2,800	critical

\+ Recording is triggered by the onset of any earthquake with pre-determined minimum amplitude. Recorder is stopped automatically by hour break pulse.

Rabaul Harbour Network

Readings from the Harbour Network are entered in the PEA only for large earthquakes, with impulsive and sharply defined onset of phases.

WAN°	Benioff VR 14.7Kg	Z	1.0	0.02	60	12,000	critical
SUL°	Benioff VR 14.7Kg	Z	1.0	0.02	60	6,000	critical
	MO2 Accelerograph						
RAL°	Benioff VR 14.7Kg	Z	1.0	0.02	60	12,000	critical
TAV°	Benioff VR 14.7Kg	Z	1.0	0.02	60	24,000	critical
VUL°	Benioff VR 14.7Kg	Z	1.0	0.02	60	12,000	critical

STATION INSTRUMENTATION

Station & Instruments	Comp.	To	Tg	Trace Speed mm/min	Approximate relative Magnification	Approximate damping
Rabaul Harbour Network (cont'd).						
°Signals from these stations are telemetered by land line to Helicorders (Geotech Mod. 2484) at the Central Observatory.						
°°Signals from this station are telemetered via VHF to its Helicorder at the Central Observatory.						
KRT - Keravat Outstation						
Benioff MC 50 Kg	Z	1.2	0.2	15	20% sensitivity	critical
Benioff MC 50Kg	N/E	1.2	0.2	15	10% sensitivity	critical
ULA -Ulamona Field Station						
Willmore portable	Z	0.6	0.25	60	3,000	underdamped
PIV - Piva Field Station						
Willmore portable	Z	0.6	0.25	60	3,000	underdamped
WAA - Waris Field Station						
Willmore portable	Z	0.6	0.25	60	3,000	underdamped
LAG - Cape Gloucester Field Station						
Willmore portable	Z	0.6	0.25	60	3,000	underdamped

N.B. These field stations consist of a permanent building in which instruments are installed when necessary.

Details of emergency field stations, within the Territory will be listed when in operation.

TBL - Tabele Observatory						
Benioff VR 107.5Kg (PAPUA)	Z	1.0	0.2	60	1,350	critical
ESA - Esa'ala Observatory						
Benioff VR 107.5Kg	Z	1.0	0.2	15	36,000	critical
Benioff VR 107.5Kg	N,E	1.0	0.2	15	18,000	critical
Benioff VR 107.5Kg	Z/N/E	1.0	60.0	30	50% sensitivity	critical
AGE - Agenahambo Station						
Willmore portable	Z	0.6	0.25	60	3,000	underdamped

VR Variable Reluctance

MC Moving-coil

Relative magnification curves of seismograph systems installed in the stations controlled by the Rabaul Central Observatory are listed once a month on the P.E.A.

PRESENTATION OF DATA

(reviewed in November, 1967.)

All times are reduced to Greenwich Mean Time (GMT), which is 10 hours behind Eastern Standard Time.

At RABAUL and Harbour Network, the time signal is marked every minute on each seismogram record from the Observatory crystal chronometer. Second marks from Radio signal VNG (Australia) are recorded on World-wide Standard System S.P.-N. component only according with the W.W.S.S. programme, at six hour intervals. Primary time is provided by W.W.S.S. equipment and secondary time by a Labtronic crystal chronometer with the accuracy of ± 5 ms per day compared with VNG (Australia) with the aid of a chronoscope.

At TBL and AGE, the time signal is derived from a spring driven chronometer (Mercer) and marked each minute on records. Time accuracy is determined by comparison with signals from WWVH daily. Linear correction is applied to the daily drift.

On all seismogram records time increases from left to right and time break is upward.

At RAB* and Harbour Network the recording drum of each seismograph is driven by a 110VAC 60 H_z synchronous motor.
The 110VAC is frequently regulated by a crystal chronometer.

* The Omori recording drum is driven by a nonregulated 50 Hz frequency supply.

At ESA and KRT power for recorder motors is frequency regulated by a crystal chronometer at 50 Hz. Power for AGE and TBL and field stations is supplied by a 50 Hz free running oscillator.

Direction of Motion.

Upward direction of ground motion corresponds to upward trace motion on vertical seismogram records. Direction of component of ground motion to North or East corresponds to upward trace motion on horizontal seismogram records.

Vertical trace motion from impulsive onset of longitudinal waves of compressional or dilatational ground movement is indicated by "u" or "d" accompanied by N.S.E. or W. as per trace motion amplitude on horizontal seismogram records, to represent vectorially the direction of ground motion. "+" or "-" indicates upward or downward motion of the ground respectively, from a wave not known to be of the longitudinal type.

Accuracy of readings:

When readings are given with a decimal figure, they are to 1/10 of a second, other readings have been made to the nearest half second.

Crustal Phases:

Px, Sx Crustal phases, other than Pn and Sn for local and near earthquakes.

Felt Intensity:

Information on maximum intensities of shocks reported felt is included. Intensities are given in Roman numerals based on the Modified Mercalli Scale, of 1931.

Determination of Epicentre:

Where no source is cited, the determination of epicentral distance and origin time for local and regional earthquakes, is carried out at the Central Observatory, Rabaul, from the S-P travel times assuming a normal depth of the focus.

Geographical Designation of Epicentre:

The regional names which follow the co-ordinates of epicentres located at the Central Observatory are meant only to supplement the co-ordinates and normally follow well-known geographical rather than geological features. Use is made of the full degree blocks according to the method defined by E.A. Flinn and E.R. Engadhl in - " A PROPOSED BASIS FOR GEOGRAPHICAL AND SEISMIC REGIONALIZATION", Seismic Data Laboratory Report No. 101, U.I.D. Inc, Alexandria, Virginia, 1964, adopted by the U.S.C.G.S. for computer requirements.

Magnitude Definition and Determination.

ML - Local Magnitude (Richter, 1935) is calculated from the recorded trace amplitude of the Wood-Anderson torsion seismographs of stated physical constants (installed at the Observatory in November, 1967).

Maximun trace amplitude (0 to peak) expressed in millimetres and tenths is measureddirectly on both components. Magnitude is determined independently and the arithmetic mean taken. $M_L$values are given to the tenth of a unit.

The station correction factor is assumed to be zero until better known.

M_S - Surface Wave Magnitude (Gutemberg & Richter, 1956) is calculated from the amplitude of surface waves of period near 20 seconds for shallow distant earthquakes.

M_B Body Wave Magnitude is calculated from the ratio of amplitude over period for body waves on S.P.-Z of World-wide Seismograph System only when depth is known. The magnification factor for the standard seismograph is taken into account.

m -Unified magnitude (Gutemberg & Richter, 1956) has the following relation to M_L , M_S , and M_B.

$$m = 1.7 + 0.8\ M_L - 0.01\ M_L^2$$

$$m = M_B \text{ (without correction)}$$

$$m = 2.5 + 0.63\ M_S$$

Local Magnitude of earthquakes recorded at RAB with a clear S-P interval is tabulated on a Day-Distance (in Central Angle Degrees) graph which is added to the PEA monthly.

Symbols:

i. - impulsive and sharply defined beginning of a phase.

e. - emergent and poorly defined beginning of phase.

T. - Period in seconds.

A. - Peak-to- Trough trace amplitude in millimetres.

GM. - Ground Motion.

Dist. - Epicentral Distance in central angle degrees.

H. - Origin Time.

h. - Focal depth in Kilometres.

CBM - Confused by microseisms.

PRESENTATION OF DATA (CONTINUED).

Remarks:

Local - Typical signature of an earthquake with epicentre within 0.9°

Near - Typical signature of an earthquake with epicentre between 0.9° and 9°.

Distant - Typical signature of an earthquake with epicentre between 9° and 45°.

Teleseism - Typical signature of an earthquake with epicentre more than 45°.

Traces - Any recorded disperse waves or very weak unknown earthquake phases.

Local and Near earthquakes will be classified Regional, and Distant earthquakes will be grouped with Teleseisms if sheer waves and their reflections are unidentifiable.

G.W. D'ADDARIO
Vulcanologist-in-Charge.

			T sec	A mm	GM	Dist	H	Remarks
9th July, 1968.								
KRT	iPZ	091538			d			Regional
KRT	ePZ iSN	115630 49			u	1½°	115605	
KRT	iPZ	140825			u			
KRT	ePZ e(S)N	154734 4810				(3°)	1546(47)	
KRT	ePZ eSN	215553 5609			d	1¼°	215532	
RABAUL								
10th July, 1968. No time breaks on KRT records								
RAB	ePZ iZ eSE/	004517 18.0 4906	0.8	1.0	d	20°		
RAB	ePZ	074441	0.5	2.0	d			(Regional)
RAB	iPZ	101911.3	0.5	18.0	u			Regional (deep)
RAB	ePZ eSE/	112821½ 3804	0.8	1.0	d	73°		
RAB	ePZ eSN	145739 5801	0.4	1.0	d	1¾°	145710	
RAB	iPZ iSE/	195822.2 44	0.5	21.0	u	1¾°	195753	Felt:- Rab. Int. 1 - 11 04°11'S,152°10'E.
WAN	iPZ	22.0	0.5	8.0	u			
SUL	iPZ	22.0			u			
RAL	iPZ	21.0	0.4	9.5	u			
TAV	iPZ	22.0			u			
RAB	ePZ eSE/	204845 5520	0.6	1.2	u	42°		
RAB	iPZ iSN	214558.3 4619.5	0.5	6.0	d	1¼°	214530	
WAN	iPZ	4558.0	0.3	3.0	d			
RAL	iPZ	58.0	0.4	3.0	d			
TAV	iPZ	58.2	0.3	5.0	d			
VUL	iPZ	57.2			d			
RAB	iPZ iSNa	233014.2 34.8	0.4	1.5	u	1¾°	232946	M = 4.1
VUL	iPZ	13.0	0.3	7.0	u			

			T sec	A mm	GM	Dist	H	Remarks
11th July, 1968.								
RAB	ePZ	065007½	0.3	1.7	u			Local
RAL	iPZ	07.0	0.6	9.0	u			
TAV	iPZ	07.0	0.3	9.0	u			
VUL	iPZ	08.5	0.4	13.6	u			
RAB	ePZ eSN	071606 26			u	1½°	071540	M_L= 3.9
RAB	iPZ iSN	074520.1 38.2	0.5	3.5	d	1½°	074456	M_L= 4.6
WAN	iPZ	20.5	0.3	12.0	d			
SUL	iPZ	20.5	0.3	6.0	d			
RAL	iPZ	20.3	0.7	11.0	d			
TAV	iPZ	20.2		9.0	d			
VUL	iPZ	19.5			d			
RAB	iPZ	101025.7	0.6	1.4	d			Local
VUL	iPZ	26.2	1.0	7.0	d			
RAB	iPZ iSN	104012.2 30.1		40.2	u	1½°	103948	M_L= 4.7
WAN	iPZ	12.0	0.7	18.5	u			
SUL	iPZ	12.4	0.4	3.7	u			
RAL	iPZ	12.7	0.3	7.5	u			
TAV	iPZ	13.0	0.3		u			
VUL	iPZ	13.7			u			
RAB	iPZ iSN	155415.0 40.4	0.4	10.2	d	2°	155342	M_L= 4.6
WAN	iPZ	14.7	0.4	5.2	d			
SUL	iPZ	14.5	0.3	2.8	d			
RAL	iPZ	14.5	0.5	5.0	d			
TAV	iPZ	14.0	0.3	3.8	d			
VUL	iPZ	13.5			d			
RAB	ePZ iSN	170004 20.2	0.4	5.0	u	1¼°	165943	M_L= 4.5
12th July, 1968.		L.P. N/S paper upside down Unidentified manmade noise between 2345-0200 and 0300-0430.						
RAB	ePZ eSE/	005246 5918	0.5	1.0	u	42°		
RAB	iPZ iSN	032531.5 48.0	0.4	2.0	d	1¼°	032508	
RAB	iPZ eSE/	040438 1112	0.8	2.0	d	42°		

			T sec	A mm	GM	Dist	H	Remarks
12th July, 1968 (cont'd)								
RAB	iPZ	070214.4	0.5	26.0	u	(3°)	0701(27)	
	e(S)E	50			(NEE)			
WAN	iPZ	13.8			u			
SUL	iPZ	14.0			u			
RAL	iPZ	13.			u			
TAV	iPZ	13.8	1.0	12.0	u			
RAB	ePZ	164150	0.4	1.0	d	1¾°	164121	
	iSE	4212.0						
KRT	ePZ	4148½			d			
RAB	iPZ	170646.2	0.3	2.0	u	1¾°	170617	
	iSE	0708.0						
KRT	iPZ	0644			u	1¾°	170617	
	iSN	0704						
13th July, 1968.								
RAB	iPZ	063916.3	0.5	(25.0)	u	(4¾°)	0638(02)	
	e(S)N/	4014.0						
WAN	iPZ	3916.0	1.0	15.0	u			
SUL	iPZ	17.0	0.8	5.0	u			
RAL	iPZ	16.2	0.5	13.5	u			
TAV	iPZ	16.2	0.5	13.8	u			
RAB	eZ/	132216.0			+			Traces
RAB	iPZ	205040.5	0.5	2.6	d	1¾°	205011	
	iSN	5102.5						
KRT	e(P)Z	5039	0.6		d	2°	205009	C.B.M.
	eSN	5102						
14th July, 1968.								
RAB	eZ/	074908			+			Traces
RAB	eZ/	081538			+			Traces
RAB	ePZ	143622	0.4	2.0	u	2°	143550	M_L = 4.1
	iSN	46.8						
TAV	iPZ	21.0	0.4	6.5	u			
VUL	iPZ	22.8	0.5	5.0	u			
KRT	ePZ	143622	0.2		u	2°	143551	
	eSE	45½						
RAB	eZ/	210044			+			Traces
RAB	eZ/	235832			+			Traces

			T sec	A mm	GM	Dist	H	Remarks
15th July, 1968.								
RAB	eZ/	034918		-	-			Traces
RAB	eZ/	050116		...	-			Traces
RAB	iPZ	054848.8	0.6	4.5	u			C.B.M. (Regional).
RAB	iPZ	080735.9	0.5	12.0	u			local
VUL	iPZ	080735.8	0.3	15.5	u			
RAB	iPZ	141302.4	0.5	4.0	d	1½°	141236	
	iSE	23.0						
VUL	iPZ	01.5	0.2	4.7	d			
KRT	iPZ	1259.4			d	1½°		
	iSE	1317.2					141236	
RAB	e(P)Z	181905	0.4	1.5	u			local
RAB	eZ/	191432		-	-			traces
RAB	iPZ	192032.7	0.4	4.0	d	2¾°	191949	M_L = 4.3
	iSN	2106.0						
WAN	iPZ	2033.7	0.4	8.0	d			
SUL	iPZ	35.7	0.3	0.2	d			
RAL	iPZ	36.2	0.8	6.0	u			
TAV	iPZ	36.0	0.6	13.0	u			
VUL	iPZ	31.9	0.3	3.0	d			
KRT	eiPZ	2030.4	1.2	2.0	u	(2½°)	1919(51)	
	iZ	30.6						
	i(S)E	2100.4						
RAB	eZ/	201912			+			traces
16th July, 1968.								
RAB	iPZ	101049.0	0.4	10.0	d	2°		M_L= 5.1
	iSE	1113.0					101017	
WAN	iPZ	49.0	0.3	6.0	d			
SUL	iPZ	49.0	0.5	1.8	d			
RAL	iPZ	49.0	0.4	3.0	d			
TAV	iPZ	48.7	0.4	3.0	d			
VUL	iPZ	48.0			d			
RAB	iPZ	140203.4	0.5	2.0	d	2½°	140124	M_L =4.9
	iSN	33.0						
VUL	iPZ	03.3	0.5	5.0	d			

			T sec	A mm	GM	Dist	H	Remarks
16th July, 1968 (cont).								
RAB	iPZ	142325.0	0.4	9.8	d	3¾°		M_L= 5.4
	iSN	2409.0					142228	
WAN	iPZ	24.8	0.4	13.0	d			
SUL	iPZ	25.0	0.3	1.8	d			
RAL	iPZ	24.6	0.5	8.0	d			
TAV	iPZ	24.4	0.3	19.0	d			
VUL	iPZ	25.2			d			
RAB	iPZ	212849.0	0.5	1.2	u	(25°)		
	e(S)N	3254						
ESA'ALA								
28th June,1968.								
ESA	iPZ	233941.5		0.8	d			local
29th June,1968.								
ESA	iPZ	003046			u			local
ESA	iPZ	035627			u			local
	eiPZ	222014	0.2	2.0	u			local
1st July, 1968.								
ESA	ePZ	031633	0.3	9.1	u			local
2nd July, 1968								
Record upside down								
3rd July,1968.								
ESA	iPZ	014412	1.0	3.2	u			local
	iPZ	022224		2.0	u			local
4th July,1968.								
ESA	iPZ	235925			d			local
5th July,1968.								
ESA	iPZ	044942.5			d			Regional
	iPZ	093558			u			Regional
	iPZ	113653.5	1.0	1.2	d			Teleseism
	iPZ	233611	0.2	4.2	d			Regional
	iPZ	233844	0.2	8.7	d			Regional
6th July,1968.								
ESA	iPZ	063250.5	0.3	2.4	u			Regional
	iPZ	223927	0.3	1.4	d			Local

Rabaul Central Observatory
19th July,1968.

G.W. D'ADDARIO
Volcanologist-in-Charge.

TERRITORY OF PAPUA AND NEW GUINEA
GEOLOGICAL AND VOLCANOLOGICAL BRANCH
VOLCANOLOGICAL SECTION.

PRELIMINARY EARTHQUAKE ANALYSIS
RABAUL CENTRAL OBSERVATORY
1968.

Rabaul	RAB	From: 17th.July,1968 To: 23rd.July,1968
Rabaul Harbour Network	WAN SUL RAL TAV VUL	From: 17th.July,1968 To: 23rd.July,1968
Keravat	KRT	From: 16th.July,1968 To: 22nd.July,1968
Esa'ala	ESA	From: 8th.July,1968 To: 15th.July,1968
Tabele	TBL	From: 26th.June-3rd.Ju To: 2nd.July-9th.July 1968
Agenahambo	AGE	From: To:
Waris	WAA	Not operational
Ulamona	ULA	Not operational
Piva	PIV	Not operational
Cape Gloucester	LAG	Not operational

STATION PERSONNEL

RAB Central Observatory, Rabaul.

Volcanologist-in-Charge	G.W. D'Addario
Volcanologist	R.F. Heming
Seismologist	M. Mancini
Seismogram Readers	D.J. Cook, H.M.Carrick
Senior Technical Officer	N.O. Myers
Technical Officer	R.J. Conway
Volcanological Assistants	L. Topue, M. Gaiam, E. Ravian.
Technical Assistant	P. Daimbari
Trainee Volcanological Assistants	B. Talai, M.Salaiau, C. Matupit.
Secretary	H. James.

KRT Keravat Outstation.

Observer (part-time)	G.E. Chorick

TBL Tabele Observatory

Observer	V. Kaita.

ESA Esa'ala Observatory

Observer	F. Dira

AGE Agenahambo Outstation

Observer (part-time)	B. Kirke

The Rabaul Preliminary Earthquake Analysis (PEA) is produced by the staff under the direction of the Volcanologist-in-Charge from whom additional information and photocopies of seismogram records from all stations may be obtained on request.

Please address all communications to:-

Volcanologist-in-Charge
Central Observatory,
P.O. Box 386,
RABAUL. T.N.G.

SEISMOGRAPH STATIONS

Station	Code	South Latitude	East Longitude	Elev. (m)	Foundation
(NEW GUINEA)					
Rabaul	RAB	04°11'28.6"	152°10'11.4"	183.5	Basalt Flow
Wanliss Street	WAN*	04°11'39.6"	152°10'32.5"	25.0	Basalt Flow
Sulphur Creek	SUL*	04°13'09.8"	152°10'33.3"	8.5	Unconsolidated volcanic ash
Rabalanakaia	RAL*	04°13'13.0"	152°12'07.0"	91.0	Unconsolidated volcanic ash
Tavurvur	TAV*	04°13'52.2"	152°13'12.9"	27.0	Andesite Flow
Taviliu	VUL*	04°16'58.2"	152°08'44.6"	332.3	Unconsolidated volcanic ash
Keravat	KRT	04°21'10.5"	152°03'06"	20.0	Alluvium
Ulamona	ULA	04°59'24.0"	151°16'30.0"	17.0	Lapilli Tuff
Tabele	TBL	04°06'04.67"	145°00'41.37"	179.5	Basalt Flow
Waris	WAA	04°07'00"	145°06'00"	48.0	Lapilli Tuff
Piva	PIV	06°12'00"	155°03'30"	60.0	Alluvium
Cape Gloucester	LAG	04°27'20"	148°26'00"	24.0	Lapilli Tuff
(PAPUA)					
Agenahambo	AGE	08°48'49"	148°05'56"	303.0	Unconsolidated volcanic ash
Esa'ala	ESA	09°44'18.2"	150°48'50.7"	46.4	Granite Gneiss

* Rabaul Harbour Network

STATION INSTRUMENTATION

Station & Instruments	Comp.	To	Tg	Trace Speed mm/min	Approximate relative Magnification	Approximate damping
(NEW GUINEA)						
Rabaul Central Observatory RAB						
World-Wide Standard	Z	1.0	0.74	60	12,500	critical
	N,E	1.0	0.74	60	6,250	critical
	Z/N/E/	15.0	100.0	15	750	critical
Benioff VR 14.7Kg	Zh	1.0	0.02	180+	4,000	critical

\+ Recording is triggered by the onset of any earthquake with pre-determined minimum amplitude. Recorder is stopped automatically by hour break pulse.

Omori 15Kg	No	3.6	-	24	12	10.1 air
Omori 15Kg	Eo	3.8	-	24	10	10.1 air
Wood Anderson Torsion	Na,Ea	0.8	-	60	2,800	critical
Rabaul Harbour Network						
Readings from the Harbour Network are entered in the PEA only for large earthquakes, with impulsive and sharply defined onset of phases.						
WAN° Benioff VR 14.7Kg	Z	1.0	0.02	60	12,000	critical
SUL° Benioff VR 14.7Kg	Z	1.0	0.02	60	6,000	critical
MO2 Accelerograph						
RAL° Benioff VR 14.7Kg	Z	1.0	0.02	60	12,000	critical
TAV° Benioff VR 14.7Kg	Z	1.0	0.02	60	24,000	critical
VUL° Benioff VR 14.7Kg	Z	1.0	0.02	60	12,000	critical

STATION INSTRUMENTATION

Station & Instruments	Comp.	To	Tg	Trace Speed mm/min	Approximate relative Magnification	Approximate damping
Rabaul Harbour Network (cont'd).						
°Signals from these stations are telemetered by land line to Helicorders (Geotech Mod. 2484) at the Central Observatory.						
°°Signals from this station are telemetered via VHF to its Helicorder at the Central Observatory.						
KRT - Keravat Outstation						
Benioff MC 50 Kg	Z	1.2	0.2	15	20% sensitivity	critical
Benioff MC 50Kg	N/E	1.2	0.2	15	10% sensitivity	critical
ULA -Ulamona Field Station						
Willmore portable	Z	0.6	0.25	60	3,000	underdamped
PIV - Piva Field Station						
Willmore portable	Z	0.6	0.25	60	3,000	underdamped
WAA - Waris Field Station						
Willmore portable	Z	0.6	0.25	60	3,000	underdamped
LAG - Cape Gloucester Field Station						
Willmore portable	Z	0.6	0.25	60	3,000	underdamped

N.B. These field stations consist of a permanent building in which instruments are installed when necessary.

Details of emergency field stations, within the Territory will be listed when in operation.

TBL - Tabele Observatory						
Benioff VR 107.5Kg (PAPUA)	Z	1.0	0.2	60	1,350	critical
ESA - Esa'ala Observatory						
Benioff VR 107.5Kg	Z	1.0	0.2	15	36,000	critical
Benioff VR 107.5Kg	N,E	1.0	0.2	15	18,000	critical
Benioff VR 107.5Kg	Z/N/E	1.0	60.0	30	50% sensitivity	critical
AGF - Agenahambo Station						
Willmore portable	Z	0.6	0.25	60	3,000	underdamped

VR Variable Reluctance

MC Moving-coil

Relative magnification curves of seismograph systems installed in the stations controlled by the Rabaul Central Observatory are listed once a month on the P.E.A.

PRESENTATION OF DATA

(reviewed in November, 1967.)

All times are reduced to Greenwich Mean Time (GMT), which is 10 hours behind Eastern Standard Time.

At RABAUL and Harbour Network, the time signal is marked every minute on each seismogram record from the Observatory crystal chronometer. Second marks from Radio signal VNG (Australia) are recorded on World-wide Standard System S.P.-N. component only according with the W.W.S.S. programme, at six hour intervals. Primary time is provided by W.W.S.S. equipment and secondary time by a Labtronic crystal chronometer with the accuracy of ± 5 ms per day compared with VNG (Australia) with the aid of a chronoscope.

At TBL and AGE, the time signal is derived from a spring driven chronometer (Mercer) and marked each minute on records. Time accuracy is determined by comparison with signals from WWVH daily. Linear correction is applied to the daily drift.

On all seismogram records time increases from left to right and time break is upward.

At RAB* and Harbour Network the recording drum of each seismograph is driven by a 110VAC 60 H_z synchronous motor.
The 110VAC is frequently regulated by a crystal chronometer.

* The Omori recording drum is driven by a nonregulated 50 Hz frequency supply.

At ESA and KRT power for recorder motors is frequency regulated by a crystal chronometer at 50 Hz. Power for AGE and TBL and field stations is supplied by a 50 Hz free running oscillator.

Direction of Motion.

Upward direction of ground motion corresponds to upward trace motion on vertical seismogram records. Direction of component of ground motion to North or East corresponds to upward trace motion on horizontal seismogram records.

Vertical trace motion from impulsive onset of longitudinal waves or compressional or dilatational ground movement is indicated by "N" or "E" accompanied by N.S.E. or W. as per trace motion amplitude on horizontal seismogram records, to represent vectorially the direction of ground motion. "+" or "-" indicates upward or downward motion of the ground respectively, from a wave not known to be of the longitudinal type.

Accuracy of readings:

When readings are given with a decimal figure, they are to 1/10 of a second. other readings have been made to the nearest half second.

Crustal Phases:

Pg, Sg Crustal phases, other than Pn and Sn for local and near earthquakes.

Felt Intensity:

Information on maximum intensities of shocks reported felt is included. Intensities are given in Roman numerals based on the Modified Mercalli Scale, of 1931

Determination of Epicentre:

Where no source is cited, the determination of epicentral distance and origin time for local and regional earthquakes, is carried out at the Central Observatory, Rabaul, from the S-P travel times assuming a normal depth of the focus.

Geographical Designation of Epicentre:

The regional names which follow the co-ordinates of epicentres located at the Central Observatory are meant only to supplement the co-ordinates and normally follow well-known geographical rather than geological features. Use is made of the full degree blocks according to the method defined by E.A. Flinn and E.R. Engadhl in - " A PROPOSED BASIS FOR GEOGRAPHICAL AND SEISMIC REGIONALIZATION", Seismic Data Laboratory Report No. 101, U.I.D. Inc, Alexandria, Virginia, 1964, adopted by the U.S.C.G.S. for computer requirements.

Magnitude Definition and Determination.

ML - Local Magnitude (Richter, 1935) is calculated from the recorded trace amplitude of the Wood-Anderson torsion seismographs of stated physical constants (installed at the Observatory in November, 1967).

Maximun trace amplitude (0 to peak) expressed in millimetres and tenths is measureddirectly on both components. Magnitude is determined independently and the arithmetic mean taken. M_L values are given to the tenth of a unit.

The station correction factor is assumed to be zero until better known.

M_S - Surface Wave Magnitude (Gutemberg & Richter, 1956) is calculated from the amplitude of surface waves of period near 20 seconds for shallow distant earthquakes.

M_B Body Wave Magnitude is calculated from the ratio of amplitude over period for body waves on S.P.-Z of World-wide Seismograph System only when depth is known. The magnification factor for the standard seismograph is taken into account.

m -Unified magnitude (Gutemberg & Richter, 1956) has the following relation to M_L , M_S , and M_B.

$$m = 1.7 + 0.8\ M_L - 0.01\ M_L^2$$

$$m = M_B \text{ (without correction)}$$

$$m = 2.5 + 0.63\ M_S$$

Local Magnitude of earthquakes recorded at RAB with a clear S-P interval is tabulated on a Day-Distance (in Central Angle Degrees) graph which is added to the PEA monthly.

Symbols:

i. - impulsive and sharply defined beginning of a phase.

e. - emergent and poorly defined beginning of phase.

T. - Period in seconds.

A. - Peak-to- Trough trace amplitude in millimetres.

GM. - Ground Motion.

Dist. - Epicentral Distance in central angle degrees.

H. - Origin Time.

h. - Focal depth in Kilometres.

CBM - Confused by microseisms.

PRESENTATION OF DATA (CONTINUED).

Remarks:

Local - Typical signature of an earthquake with epicentre within 0.9°

Near - Typical signature of an earthquake with epicentre between 0.9° and 9°.

Distant - Typical signature of an earthquake with epicentre between 9° and 45°.

Teleseism - Typical signature of an earthquake with epicentre more than 45°.

Traces - Any recorded disperse waves or very weak unknown earthquake phases.

Local and Near earthquakes will be classified Regional, and Distant earthquakes will be grouped with Teleseisms if sheer waves and their reflections are unidentifiable.

G.W. D'ADDARIO
Vulcanologist-in-Charge.

			T. sec	A mm	GM	Dist	H.	Remarks.
16th July,1968.								
KRT	iPZ	101047		16.0	d			
KRT	iPZ	101918						
KRT	iPZ	140203½			d			
KRT	iPZ	142326			d			
17th July, 1968,								
RAB	ePZ/	052955			u	29°		
	ePPZ/	3024						
	eSPPN/	3134						
	ePPcPZ/	3330						
	eSPcPE/	3343						
	eSE/	3439						
	ePcSZ/	3626						
	eLqZ/	39						
	eLrZ/	3758						
	MZ/	4104						
RAB	i(P)Z	084425.7	0.3	5.0	d	¼°	084409	M_L= 3.9
	iSE	38.0						
TAV	iPZ	24.9	0.4	9.5	d			
VUL	iPZ	25.0			u			
KRT	iPZ	25			d	1°	084407	
	iSE	38½						
RAB	ePZ	112713½	0.4	1.0	u	1¼°	112652	M_L= 3.5
	eSE	29						
RAB	iPZ	122507.0	0.5	13.0	u	1°	1224(40)	Near
	iSE	20.0						
WAN	iPZ	06.7	0.6	8.6	u			
RAL	iPZ	06.9	0.5	8.0	u			
VUL	iPZ	06.0	0.5	9.5	u			
KRT	iPZ	04	1.0	3.5	u			
RAB	iPZ	132229.3	0.7	1.6	d	1°	132220	
	iSE	42.8						
KRT	iPZ	27	0.4	1.5	d			Near
RAB	eZ/	233144				+		Traces

			T. sec	A. mm	GM	Dist	H	Remarks
18th July, 1968. - Microseismic activity from 0001 - 1200/2000 - 2400								
RAB	eZ/	002352			-			Traces
RAB	iPZ	003144.3	0.9	3.3	d			
RAB	iPZ	112629.0	0.5	4.0	d			
RAB	iPZ	223506	0.4	4.2	u	1¾°	223437	M_L=3.5
	iSE	28.7						
KRT	iPZ	05.6	0.2	3.2	u	1¾°	223438	
	iSN	26.4						
RAB	iPZ	233724.4	0.5	7.0	u	1¾°	233656	M_L= 4.1
	(e)SE/	46						
KRT	iPZ	22	0.3	2.6	u	1¾°	233652	
	iSN	44½						
19th July, 1968.								
RAB	(i)PZ	050632.2	0.6	3.0	d	47°		
	ePcPZ/	0802						
	ePPZ/	0828						
	ePPPZ/	0904						
	iSN/	1324						
	eLqN	2644						
	eI[illegible]	2830						
RAB	(i)PZ	0645(44.3)	[illegible]	3.0	d			C.B.M.
RAB	(i)PZ	092456	0.8	1.5	d	16½°		
	ePPZ/	2510						
	ePPPZ/	18						
	eSE/	2758						
	PcPZ/	2952						
	MZ/	3156						
RAB	(i)PZ	115726.7	[illegible]	2.0	u	1½°	115719	M_L= 3.3
	iSE	46.2						
RAB	iPZ	115844.4	0.5	6.0	u	5½°	115721	M_L=5.8
	iSE	5948.4						
RAB	(i)PZ	152606.0	0.2	2.9	d	1¾°	152559	M_L= 3.9
	iSN	28.4						
RAB	iPZ	170219.3	0.5	8.8	u			
WAN	iPZ	19.0	0.5	4.0	d			
PAL	iPZ	18.9	0.7	2.0	d			
TAV	iPZ	19.0	0.8	13.9	u			
KRT	iPZ	2[illegible]			u			
RAB	ePZ	172329	[illegible]	4.0	d	1¾°	172300	M_L= 3.9
	iSN	51						
RAL	iPZ	29.0	0.9	3.2	d			
TAV	iPZ	28.3	0.4	2.4	d			
VUL	iPZ	28.0	0.5	7.0	d			
KRT	iPZ	27			d	1½°	172302	
	iSN	46						

19th July 1968 continued:		T. sec	A. mm	GM	Dist	H	Remarks.
RAB iPZ	191754.5	0.3	2.0	d	1½°	191729	M_L= 3.9 Regional
iSN	1814.0						
RAB (E)Z	205229	(0.4)	1.0	d	1¼°	205229	M_L=3.6
iSN	46.8						
RAB ePZ/	232804			+			Traces
20th July,1968.							
RAB (i)PZ	075753.8	0.7	2.0	u	1°	075736	
iSE	5807.0						
RAB iPZ	190534.4	0.5	35.0	d	1¼°	190511	M_L=4.0 local
iSE/	52.0						
WAN iPZ	34.0	0.7	20.0	d			
SUL iPZ	34.2	0.2	8.0	d			
RAL iPZ	34.1	0.5	20.3	d			
TAV iPZ	34.1	0.8	9.0	d			
VUL iPZ	34.1			d			
KRT iPZ	35½		9.0	d	1¼°	190513	
iSN	51½						
21st July, 1968. KRT - Microseismic activity from 0001-1200/2000-24000							
RAB eiPZ	055241.5	0.5	11.0	d	2¾°	055158	M_L=5.5
iZ	42.6						
eSN	5314						
SUL iPZ	5241.8		1.0	d			
RAL iPZ	42.0	1.0	6.5	d			
TAV iPZ	43.0	1.3	4.4	u			
VUL iPZ	42.2			u			
KRT ePZ	44			u	2½°	055204	
iSE	5314½						
RAB iPZ	061011.0		9.8	d	2½°	060929	M_L=5.4
eSN	43						
KRT iPZ	12			d	2¾°	060930	
iSE	45						
RAB iPZ	071223.0	0.5	2.0	d			Distant
RAB ePZ	123424½	0.5	2.0	d			Distant
RAB ePZ	173739			u	55°		
ePPZ/	3949						
eSN/	4518						
RAB iPZ	220649.8			u			Distant
RAB i(P)Z	221721.0			u	(9¼)°	2215(07)	
eSE/	1905						

			T sec	A mm	GM	Dist	H	Remarks.
21st July,1968 continued:								
RAB	iPZ	223628.0	0.5	4.0	d	1½°	223600	M_L= 4.4
22nd July, 1968.								
RAB	iPZ	011241.3	0.4	3.1	d	1¼°	011219	M_L= 3.9
	iSN	58.4						
WAN	iPZ	41.2	0.4	5.0	u			
SUL	iPZ	41.0	0.4	4.0	u			
RAL	iPZ	41.0	0.5	11.0	u			
TAV	iPZ	40.1	0.1	9.3	d			
VUL	iPZ	40.1	0.3	21.0	d			
RAB	eZ/	053033			+			Traces
RAB	iPZ	054753.0	0.5	9.8	u	2°		M_L=4.9
	iSE/	4816					054723	
WAN	iPZ	52.8	0.4	2.7	u			
RAL	iPZ	52.9	0.5	22.8	d			
TAV	iPZ	51.4	0.2	4.8	d			
VUL	iPZ	52.0	0.5	10.9	u			
RAB	iPZ	155023.0	0.5	6.8	d	1¼°	155000	M_L= 4.1
	iSN	40.0						
WAN	iPZ	155022.9	0.3	15.0	d			
SUL	iPZ	23.0	0.4	8.0	u			
RAL	iPZ	22.2	0.5	11.0	d			
TAV	iPZ	22.2	0.5	21.9	d			
VUL	iPZ	22.0	0.4	11.0	d			
KRT	iPZ	22½			d			near
RAB	ePZ	180331	1.0	1.1	u	23°		
	ePPZ/	0414						
	iSN/	0740						
	eLqE/	0858						
	eLrZ/	0958						
KRT	iPZ	0331	1.0	1.0	u			Distant
RAB	iPZ	203244.6	0.5	4.8	u	1½°	223218	M_L= 4.1
	iSN	3303.0						
WAN	iPZ	44.7	0.1	4.9	u			
RAL	iPZ	44.8	0.7	2.0	d			
TAV	iPZ	45.0	0.3	2.0	d			
VUL	iPZ	44.1	0.2	8.0	u			

			T sec	A mm	GM	Dist	H	Remarks.
23rd July 1968.								
RAB	iPZ	080752.3	0.5	2.0	u	3°	080706	
	iSN	0827.0						
VUL	iPZ	51.9	0.5	3.5	u			
RAB	iPZ	163410.5	0.4	3.8	d	1°	163353	M_L=3.7
	iSN	23.0						
TAV	iPZ	09.5	0.2	5.0	d			
VUL	iPZ	10.9	0.3	6.7	u			
KRT	iPZ	12		2.0	d.	1°	163358	
	iSE	26						
RAB	eZ	190044			+			Traces
RAB	ePZ	204222	1.0	1.0	d			Distant
TAV	iPZ	22.5	0.5	3.1	u			
VUL	iPZ	21.5	0.4	8.9	u			
ESA'ALA								
8th July, 1968.								
ESA	Nil recorded							
9th July, 1968.								
ESA	Nil recorded							
10th July, 1968.								
ESA	ePZ	004554½	1.0	0.5	d			Teleseism
	iPZ	101912	0.3	0.3	u			Regional
	ePZ	112754			d			Teleseism
11th July, 1968.								
ESA	ePZ	101022			d			Regional
12th July, 1968.								
ESA	ePZ	005327½	0.5	1.0	u			Teleseism
	ePZ	040517½	0.5	0.3	u			Teleseism
	ePZ	070247½			u			Regional
	ePZ	235156			u			Local
13th July, 1968.								
ESA	iPZ	042133½			d			Regional
	iPZ	063913			u			Regional
14th July, 1968	Nil recorded							
15th July, 1968.								
ESA	iPZ	041758	0.8	1.0	u			Regional
	iPZ	045724	0.5	0.8	d			Teleseism

			T sec	A mm	GM	Dist	H	Remarks.
TABELE								
26th June, 1968.								
TBL	ePZ	181115	0.4	1.0	d	½°	181104	
	iSZ	23						
	iPZ	234045½	0.3	1.0	d			local
27th June, 1968.								
TBL	Nil recorded							
28th June, 1968.								
TBL	eiPZ	072139½	0.5	1.0	(u)			near
	iZ	42						
	ePZ	181613			d			Regional
29th June, 1968.								
TBL	Nil recorded							
30th June, 1968.								
TBL	e(P)Z	093909			d			Distant
1st July, 1968.								
TBL	iPZ	064055	o.3	4.0	d	¾°	064040	
	eSZ	4106½						
	ePZ	105246	0.4	1.0	d			Teleseism
2nd July, 1968.								
TBL	eiPZ	184142	0.4	1.0	u			(Near)
	iZ	44						
	iZ	4206						
3rd July, 1968.								
TBL	Nil recorded							
4th July, 1968.								
TBL	ePZ	121001	0.3	1.0	u			Near
5th July, 1968								
TBL	ePZ	113608½	0.8	1.0	u			Distant
	iPZ	204012	0.5	3.0	d			Regional
6th July, 1968.								
TBL	ePZ	193138½	0.5	1.0	d			Distant
7th July, 1968.								
TBL	ePZ	035024	0.3	1.0	u			Regional
8th July, 1968.								
TBL	iPZ	080018	0.3	3.0	d	1¾°	075949	
	iSZ	40						
9th July, 1968.								
TBL	Nil recorded.							

Rabaul Central Observatory
26th July, 1968.

G.W.D'ADDARIO
Volcanologist-in-Charge

PEA JULY -68 NO.31

TERRITORY OF PAPUA AND NEW GUINEA
GEOLOGICAL AND VOLCANOLOGICAL BRANCH
VOLCANOLOGICAL SECTION.

PRELIMINARY EARTHQUAKE ANALYSIS
RABAUL CENTRAL OBSERVATORY
1968.

Rabaul	RAB	From: 24th.July,1968 To: 30th.July,1968
Rabaul Harbour Network	WAN SUL RAL TAV VUL	From: 24th.July,1968 To: 30th.July,1968
Keravat	KRT	From: 23rd.July,1968 To: 30th.July,1968
Esa'ala	ESA	From: To:
Tabele	TBL	From: 10th.July,1968 To: 17th.July,1968
Agenahambo	AGE	From: To:
Waris	WAA	Not operational
Ulamona	ULA	Not operational
Piva	PIV	Not operational
Cape Gloucester	LAG	Not operational

STATION PERSONNEL

RAB Central Observatory, Rabaul.

Volcanologist-in-Charge	G.W. D'Addario
Volcanologist	R.F. Heming
Seismologist	M. Mancini
Seismogram Readers	D.J. Cook, H.M.Carrick
Senior Technical Officer	N.O. Myers
Technical Officer	R.J. Conway
Volcanological Assistants	L. Topue, M. Gaiam, E. Ravian.
Technical Assistant	P. Daimbari
Trainee Volcanological Assistants	B. Talai, M.Salaiau, C. Matupit.
Secretary	H. James.

KRT Keravat Outstation.

Observer (part-time)	G.E. Chorick

TBL Tabele Observatory

Observer	V. Kaita.

ESA Esa'ala Observatory

Observer	F. Dira

AGE Agenahambo Outstation

Observer (part-time)	B. Kirke

The Rabaul Preliminary Earthquake Analysis (PEA) is produced by the staff under the direction of the Volcanologist-in-Charge from whom additional information and photocopies of seismogram records from all stations may be obtained on request.

Please address all communications to:-

Volcanologist-in-Charge
Central Observatory,
P.O. Box 386,
RABAUL. T.N.G.

SEISMOGRAPH STATIONS

Station	Code	South Latitude	East Longitude	Elev. (m)	Foundation
(NEW GUINEA)					
Rabaul	RAB	04°11'28.6"	152°10'11.4"	183.5	Basalt Flow
Wanliss Street	WAN*	04°11'39.6"	152°10'32.5"	25.0	Basalt Flow
Sulphur Creek	SUL*	04°13'09.8"	152°10'33.3"	8.5	Unconsolidated volcanic ash
Rabalanakaia	RAL*	04°13'13.0"	152°12'07.0"	91.0	Unconsolidated volcanic ash
Tavurvur	TAV*	04°13'52.2"	152°13'12.9"	27.0	Andesite Flow
Vulcan	VUL*	04°16'58.2"	152°08'44.6"	332.3	Unconsolidated volcanic ash
Kerevat	KRT	04°21'10.5"	152°03'06"	20.0	Alluvium
Ulamona	ULA	04°59'24.0"	151°16'30.0"	17.0	Lapilli Tuff
Tebolo	TBL	04°06'04.67"	145°00'41.37"	179.5	Basalt Flow
Wau	WAA	04°07'00"	145°06'00"	48.0	Lapilli Tuff
Piva	PIV	06°12'00"	155°03'30"	60.0	Alluvium
Cape Gloucester	LAG	04°27'20"	148°26'[illegible]0"	24.0	Lapilli Tuff
(PAPUA)					
Agenshambo	AGE	08°48'49"	148°05'56"	303.0	Unconsolidated volcanic ash
Esa'ala	ESA	09°44'18.2"	150°48'50.7"	46.4	Granite Gneiss

* Rabaul Harbour Network

STATION INSTRUMENTATION

Station & Instruments	Comp.	To	Tg	Trace Speed mm/min	Approximate relative Magnification	Approximate damping
(NEW GUINEA)						
Rabaul Central Observatory RAB						
World-Wide Standard	Z	1.0	0.74	60	12,500	critical
	N,E	1.0	0.74	60	6,250	critical
	Z/N/E/	15.0	100.0	15	750	critical
Benioff VR 14.7Kg	Zh	1.0	0.02	180+	4,000	critical

+ Recording is triggered by the onset of any earthquake with pre-determined minimum amplitude. Recorder is stopped automatically by hour break pulse.

Omori 15Kg	No	3.6	-	24	12	10.1 air
Omori 15Kg	Eo	3.8	-	24	10	10.1 air
Wood Anderson Torsion	Na,Ea	0.8	-	60	2,800	critical
Rabaul Harbour Network						
Readings from the Harbour Network are entered in the PEA only for large earthquakes, with impulsive and sharply defined onset of phases.						
WAN° Benioff VR 14.7Kg	Z	1.0	0.02	60	12,000	critical
SUL° Benioff VR 14.7Kg	Z	1.0	0.02	60	6,000	critical
NS2 Accelerograph						
RAL° Benioff VR 14.7Kg	Z	1.0	0.02	60	12,000	critical
TAV° Benioff VR 14.7Kg	Z	1.0	0.02	60	24,000	critical
VUL° Benioff VR 14.7Kg	Z	1.0	0.02	60	12,000	critical

STATION INSTRUMENTATION

Station & Instruments	Comp.	To	Tg	Trace Speed mm/min	Approximate relative Magnification	Approximate damping
Rabaul Harbour Network (cont'd).						
°Signals from these stations are telemetered by land line to Helicorders (Geotech Mod. 2484) at the Central Observatory.						
°°Signals from this station are telemetered via VHF to its Helicorder at the Central Observatory.						
KRT - Keravat Outstation						
Benioff MC 50 Kg	Z	1.2	0.2	15	20% sensitivity	critical
Benioff MC 50Kg	N/E	1.2	0.2	15	10% sensitivity	critical
ULA -Ulamona Field Station						
Willmore portable	Z	0.6	0.25	60	3,000	underdamped
PIV - Piva Field Station						
Willmore portable	Z	0.6	0.25	60	3,000	underdamped
WAA - Waris Field Station						
Willmore portable	Z	0.6	0.25	60	3,000	underdamped
LAG - Cape Gloucester Field Station						
Willmore portable	Z	0.6	0.25	60	3,000	underdamped

N.B. These field stations consist of a permanent building in which instruments are installed when necessary.

Details of emergency field stations, within the Territory will be listed when in operation.

TBL - Tabele Observatory						
Benioff VR 107.5Kg (PAPUA)	Z	1.0	0.2	60	1,350	critical
ESA - Esa'ala Observatory						
Benioff VR 107.5Kg	Z	1.0	0.2	15	36,000	critical
Benioff VR 107.5Kg	N,E	1.0	0.2	15	18,000	critical
Benioff VR 107.5Kg	Z/N/E	1.0	60.0	30	50% sensitivity	critical
AGE - Agenahambo Station						
Willmore portable	Z	0.6	0.25	60	3,000	underdamped

VR Variable Reluctance

MC Moving-coil

Relative magnification curves of seismograph systems installed in the stations controlled by the Rabaul Central Observatory are listed once a month on the P.E.A.

PRESENTATION OF DATA

(reviewed in November, 1967.)

All times are reduced to Greenwich Mean Time (GMT), which is 10 hours behind Eastern Standard Time.

At RABAUL and Harbour Network, the time signal is marked every minute on each seismogram record from the Observatory crystal chronometer. Second marks from Radio signal VNG (Australia) are recorded on World-wide Standard System S.P.-N. component only according with the W.W.S.S. programme, at six hour intervals. Primary time is provided by W.W.S.S. equipment and secondary time by a Labtronic crystal chronometer with the accuracy of ± 5 ms per day compared with VNG (Australia) with the aid of a chronoscope.

At TBL and AGE, the time signal is derived from a spring driven chronometer (Mercer) and marked each minute on records. Time accuracy is determined by comparison with signals from WWVH daily. Linear correction is applied to the daily drift.

On all seismogram records time increases from left to right and time break is upward.

At RAB* and Harbour Network the recording drum of each seismograph is driven by a 110VAC 60 H_z synchronous motor.
The 110VAC is frequently regulated by a crystal chronometer.

* The Omori recording drum is driven by a nonregulated 50 Hz frequency supply.

At LSA and KRT power for recorder motors is frequency regulated by a crystal chronometer at 50 Hz. Power for AGE and TBL and field stations is supplied by a 50 Hz free running oscillator.

Direction of Motion.

Upward direction of ground motion corresponds to upward trace motion on vertical seismogram records. Direction of component of ground motion to North or East corresponds to upward trace motion on horizontal seismogram records.

Vertical trace motion from impulsive onset of longitudinal waves of compressional or dilatational ground movement is indicated by "u" or "d" accompanied by N.S.E. or W. as per trace motion amplitude on horizontal seismogram records, to represent vectorially the direction of ground motion. "+" or "-" indicates upward or downward motion of the ground respectively, from a wave not known to be of the longitudinal type.

Accuracy of readings:

When readings are given with a decimal figure, they are to 1/10 of a second, other readings have been made to the nearest half second.

Crustal Phases:

Px, Sx Crustal phases, other than Pn and Sn for local and near earthquakes.

Felt Intensity:

Information on maximum intensities of shocks reported felt is included. Intensities are given in Roman numerals based on the Modified Mercalli Scale, of 1931.

Determination of Epicentre:

Where no source is cited, the determination of epicentral distance and origin time for local and regional earthquakes, is carried out at the Central Observatory, Rabaul, from the S-P travel times assuming a normal depth of the focus.

Geographical Designation of Epicentre:

The regional names which follow the co-ordinates of epicentres located at the Central Observatory are meant only to supplement the co-ordinates and normally follow well-known geographical rather than geological features. Use is made of the full degree blocks according to the method defined by E.A. Flinn and E.R. Engadhl in - " A PROPOSED BASIS FOR GEOGRAPHICAL AND SEISMIC REGIONALIZATION", Seismic Data Laboratory Report No. 101, U.I.D. Inc, Alexandria, Virginia, 1964, adopted by the U.S.C.G.S. for computer requirements.

Magnitude Definition and Determination.

ML - Local Magnitude (Richter, 1935) is calculated from the recorded trace amplitude of the Wood-Anderson torsion seismographs of stated physical constants (installed at the Observatory in November, 1967).

Maximun trace amplitude (O to peak) expressed in millimetres and tenths is measureddirectly on both components. Magnitude is determined independently and the arithmetic mean taken. $M_L$values are given to the tenth of a unit.

The station correction factor is assumed to be zero until better known.

M_S - Surface Wave Magnitude (Gutemberg & Richter, 1956) is calculated from the amplitude of surface waves of period near 20 seconds for shallow distant earthquakes.

M_B Body Wave Magnitude is calculated from the ratio of amplitude over period for body waves on S.P.-Z of World-wide Seismograph System only when depth is known. The magnification factor for the standard seismograph is taken into account.

m -Unified magnitude (Gutemberg & Richter, 1956) has the following relation to M_L , M_S , and M_B.

$$m = 1.7 + 0.8\ M_L - 0.01\ M_L^2$$

$$m = M_B \text{ (without correction)}$$

$$m = 2.5 + 0.63\ M_S$$

Local Magnitude of earthquakes recorded at RAB with a clear S-P interval is tabulated on a Day-Distance (in Central Angle Degrees) graph which is added to the PEA monthly.

Symbols:

i. - impulsive and sharply defined beginning of a phase.

e. - emergent and poorly defined beginning of phase.

T. - Period in seconds.

A. - Peak-to- Trough trace amplitude in millimetres.

GM. - Ground Motion.

Dist. - Epicentral Distance in central angle degrees.

H. - Origin Time.

h. - Focal depth in Kilometres.

CBM - Confused by microseisms.

PRESENTATION OF DATA (CONTINUED).

Remarks:

Local - Typical signature of an earthquake with epicentre within 0.9°

Near - Typical signature of an earthquake with epicentre between 0.9° and 9°.

Distant - Typical signature of an earthquake with epicentre between 9° and 45°.

Teleseism - Typical signature of an earthquake with epicentre more than 45°.

Traces - Any recorded disperse waves or very weak unknown earthquake phases.

Local and Near earthquakes will be classified Regional, and Distant earthquakes will be grouped with Teleseisms if sheer waves and their reflections are unidentifiable.

G.W. D'ADDARIO
Vulcanologist-in-Charge.

24th July, 1968.			T. sec	A. mm	GM	Dist.	H.	Remarks
RAB	Strong microseismic activity associated with moderate wind between 0300-2237 hours.							
KRT	Strong microseismic activity between 0001-1100/2000-2400							
RAB	eZ/	231050			+			Traces
RAB	eZ/	055306			+			Traces
RAB	iPZ	080655.5	0.5	2.8		1½°	080629	M_L =4.2
	iSN/	0716.0						C.B.M.
RAB	iPZ	081449.2	0.4	6.4	d			Regional
TAV	iPZ	081448.5	0.4	5.0	u			
VUL	iPZ	081448.0	0.4	10.8	u			
RAB	iPZ	113636	0.4	10.0	u			Local
VUL	iPZ	113634.5			u			Local
KRT	iPZ	34	0.2	2.8	u			Local
RAB	iPZ	200338	0.5	14.0	u	1°	200309	M_L =3.8
	eSE/	52						
VUL	iPZ	200337.0	0.3	18.3	d			
KRT	iPZ	37		8.4	d	1°	200318	
	iSN	51						
25th July, 1968.								
RAB	Strong microseismic activity all day.							
RAB	eZ/	064832			+			Traces
RAB	iPZ	073024.2			d	38°		C.B.M.
	iPPZ/	3156						
	iSN/	3608						Superimposed shock
	iLqE/	3823						
	iLrZ/	4138						
WAN	iPZ	25	0.1	6.9	d			
TAV	iPZ	25			d			
VUL	iPZ	55.9			d			
RAB	i(P)Z	1053(22.0)	0.3	1.5	d	4¼°		C.B.M.
	iSN/	5413.0					105215	
KRT	ePZ	5321½	0.5	2.6	u			Near
KRT	iPZ	131412	0.3	3.9	d	1¼°	131349	
	iSN	29						
KRT	iPZ	142255	0.3	2.6	d	1¾°	142226	
	iSN	2317						
KRT	iPZ	182617	0.2	2.6	d	1¾°	182548	
	iSN	39						

			T. sec	A. mm	GM	Dist	H.	Remarks.
26th July, 1968.								
RAB	Strong microseismic activity associated with heavy wind. Average TO.6 A5.0 Wood-Anderson record unreadable.							
RAB	eZ/	064514			+			Traces.
RAB	iPZ	123802.0			d	2°	123730	
	iSE/	26						
WAN	iPZ	3801.7			d			Felt - Rabaul 2-3 04°11'S 152°10'E
SUL	iPZ	3801.8			d			
RAL	iPZ	3801.5			d			
TAV	iPZ	3801.4			d			
VUL	iPZ	3800.8			d			
KRT	iPZ	3755			d			
RAB	iPZ	162816.4	0.6	73.0	d	1¼°	162755	
	iSE/	32						
WAN	iPZ	2816.1			d			Felt - Rabaul - 2-3
SUL	iPZ	2816.1			d			04°11'S 152°10'E
RAL	iPZ	2816.1			d			
TAV	iPZ	2816.0			d			
VUL	ipz	2815.2			d			
KRT	iPZ	162811½			d			
RAB	iPZ	205514.4	0.5	8.0	d			Regional
VUL	iPZ	5514.5	0.4	4.0	d			
RAB	eZ/	235924						Traces.
27th July, 1968.								
RAB	Strong microseismic activity on records.							
RAB	iPZ	015054.0	0.5	(4.0)	d			(Regional)
RAB	iPZ	031317.5	(0.4)	(5.0)	d			Regional
KRT	iPZ	17	0.4	2.0	d	1°	031258	
	eSN	31						
RAB	e(P)Z	110515.0	0.5	1.8	d			(Regional)
RAB	e(P)Z	184340.0	0.5	2.5	d			Regional
KRT	iPZ	39			d	1¼°	184318	
	iSN	55						
28th July, 1968.								
KRT	Microseismic activity from 0001-1000/2000-2400							
RAB	eZ/	111102.4			+			(Distant)
TAV	iPZ	132945.0	0.2	4.0	d			
VUL	iPZ	45.0	0.6	5.0	u			
KRT	ePZ	44	0.2	2.4	u	1°	132925	
	iSN	58						

			T. sec	A. mm	GM	Dist	H.	Remarks.
28th July,1968, cont.								
RAB	i(P)Z	212248.0	0.7	2.0	u	67°		
	iPPZ/	2417.6						
	iSN/	3126.0						
	iSSN/	3548.0						
RAB	ePZ	233357	0.5	2.0	d	2°	233327	
	eSN/	3420						
29th July,1968.								
RAB	Strong microseismic activity							
RAB	ePZ/	111902			d	38°		
	PcPZ/	2124						
	eSE/	2451						
	ScPN/	2504						
	PcSZ/	06						
RAB	iPZ	133057.8	0.5	2.0	u	1½°	133032	M_L = 5.0
	iSN	3117.0						
WAN	iPZ	3158.0	0.5	4.5	d			
TAV	iPZ	59.0	0.8	8.4	d			
VUL	iPZ	58.7	0.7	6.0	u			
RAB	ePZ	151013	0.5	1.0	u	6½°	150836	
	eSN	1128						
KRT	ePZ	151013½			u	6½°	150836	
	iSN	1128						
RAB	iPZ	235640.6	0.5	4.0	u	19°		
	iSN/	000016						
WAN	iPZ	5640.6	1.0	4.8	u			
RAL	iPZ	5641.0	0.8	5.0	u			
TAV	iPZ	5641.4	1.0	11.0	u			
VUL	iPZ	5640.4	0.8	11.6	u			
KRT	iPZ	40	2.0	12.4	u			
30th July,1968.								
RAB	ePZ	041713	0.5	1.0	d			Distant
RAB	iPZ	054357.8	0.4	3.0	u	5½°	054235	
	iSN	4402.0						
VUL	iPZ	4357.5	0.6	5.8	u			
RAB	ePZ	151044	0.5	1.5	d	6½°	150909	
	eSN	1158						
KRT	iPZ	151044			d			
RAB	ePZ	154104½	0.4	1.5	d	2½°	154026	
	eSN	33						
KRT	iPZ	154059	0.2	1.5	d	2¼°	154021	
	eSE	4126						
RAB	iPZ	182910.0	0.3	1.5	d	3°	182824	
	iZ	12.6						
	iSN	45.5						
KRT	iPZ	182909	0.4	1.4	d	3°	182822	
	iSE	45						
RAB	ePZ	205748	1.0	2.0	d			Distant

			T. sec.	A. mm	GM	Dist	H	Remarks.
TABELE - 10th July, 1968.								
TBL	ePZ	192527½	0.5	1.0	u	(1¼°)	1925(07)	
	e(S)Z	42						
11th July, 1968.								
TBL	Nil Recorded							
12th July, 1968.								
TBL	Nil recorded							
13th July, 1968.								
TBL	iPZ	053948	0.7	2.5	u			Near
	iZ	51						
	iZ	58						
TBL	iPZ	063023	0.3	1.0	d	½°	063013	
	iSZ	33						
14th July, 1968.								
TBL	iPZ	161638	0.4	4.0	d			Regional
15th July, 1968.								
TBL	ePZ	081846	0.4	1.0	u			Regional
16th July, 1968.								
TBL	Nil recorded							
17th July, 1968.								
TBL	ePZ	052847	0.5	1.0	u			Distant
	iZ	51						

Rabaul Central Observatory
2nd August, 1968.

G.W.D'ADDARIO
Volcanologist-in-Charge.

PEA JUL-68 No. 32.

TERRITORY OF PAPUA AND NEW GUINEA
GEOLOGICAL AND VOLCANOLOGICAL BRANCH
VOLCANOLOGICAL SECTION

PRELIMINARY EARTHQUAKE ANALYSIS
RABAUL CENTRAL OBSERVATORY
1968

Rabaul	RAB	From: JUL. 31. 1968 To: AUG. 6. 1968
Rabaul Harbour Network	WAN SUL RAL TAV VUL	From: JUL. 31. 1968 To: AUG. 6. 1968
Keravat	KRT	From: JUL. 31. 1968 To: AUG. 5. 1968
Esa'ala	ESA	From: To:
Tabele	TBL	From: To:
Agenahambo	AGE	From: To:
Waris	WAA	Not operational
Ulamona	ULA	Not operational
Piva	PIV	Not operational
Cape Gloucester	LAG	Not operational

STATION PERSONNEL

RAB Central Observatory, Rabaul.

Volcanologist-in-Charge	G.W. D'Addario
Volcanologist	R.F. Heming
Seismologist	M. Mancini
Seismogram Readers	D.J. Cook, H.M.Carrick
Senior Technical Officer	N.O. Myers
Technical Officer	R.J. Conway
Volcanological Assistants	L. Topue, M. Gaiam, E. Ravian.
Technical Assistant	P. Daimbari
Trainee Volcanological Assistants	B. Talai, M.Salaiau, C. Matupit.
Secretary	H. James.

KRT Keravat Outstation.

Observer (part-time)	G.E. Chorick

TBL Tabele Observatory

Observer	V. Kaita.

ESA Esa'ala Observatory

Observer	F. Dira

AGE Agenahambo Outstation

Observer (part-time)	B. Kirke

The Rabaul Preliminary Earthquake Analysis (PEA) is produced by the staff under the direction of the Volcanologist-in-Charge from whom additional information and photocopies of seismogram records from all stations may be obtained on request.

Please address all communications to:-

Volcanologist-in-Charge
Central Observatory,
P.O. Box 386,
RABAUL. T.N.G.

SEISMOGRAPH STATIONS

Station (NEW GUINEA)	Code	South Latitude	East Longitude	Elev. (m)	Foundation.
Rabaul	RAB	04°11'28.6"	152°10'11.4"	183.5	Basalt Flow
Wanliss Street	WAN*	04°11'39.6"	152°10'32.5"	25.0	Basalt flow
Sulphur Creek	SUL*	04°13'09.8"	152°10'33.3"	8.5	unconsolidated volcanic ash
Rabalanakaia	RAL*	04°13'13.0"	152°12'07.0"	91.0	unconsolidated volcanic ash
Tavurvur	TAV*	04°13'52.10"	152°13'12.99"	27.0	Andesite flow
Taviliu	VUL*	04°16'58.2"	152°08'44.6"	332.3	unconsolidated volcanic ash
Keravat	KRT	04°21'10.5	152°03'06	20.0	Alluvium
Tabele	TBL	04°06'04.67"	145°00'41.37"	179.5	Basalt flow
Waris	WAA	04°07'00"	145°06'00"	48.0	Lapilli Tuff
Piva	PIV	06°12'00"	155°03'30	60.0	Alluvium
Cape Gloucester	LAG	04°27'20"	148°26'00"	24.0	Lapilli Tuff
Ulamona (PAPUA)	ULA	04°59'24.0"	151°16'30.0"	17.0	Lapilli Tuff
Agenahambo	AGE	08°48'49"	148°05'56"	303.0	unconsolidated volcanic ash
Esa'ala	ESA	09°44'18.2"	150°48'50.7"	46.4	Granite Gneiss

* Rabaul Harbour Network.

STATION INSTRUMENTATION

Station & Instruments (NEW GUINEA)	Comp.	To.	Tg.	Trace Speed mm/min	Approximate relative Magnification	Approximate damping.
Rabaul Central Observatory RAB						
World-wide Standard	Z	1.0	0.74	60	12,500	Critical
	N.E.	1.0	0.74	60	6,250	Critical
	Z/N/E	15.0	100.0	15	750	Critical
Benioff VR 14.7Kg	Zh	1.0	0.02	180+	4,000	Critical
+ Recording is triggered by the onset of any earthquake with pre-determined minimum amplitude. Recorder is stopped automatically by hour break pulse.						
Omori 15Kg	No	3.6	-	24	12	10.1 Air
Omori 15Kg	Eo	3.8	-	24	10	10.1 Air
Wood-Anderson Torsion	Na,Ea	0.8	-	60	2,800	Critical
Rabaul Harbour Network						
Readings from the Harbour Network are entered in the PEA only for large earthquakes, with impulsive and sharply defined onset of phases.						
WAN° Benioff VR 14.7Kg	Z	1.0	0.02	60	5,240	Critical
SUL° Benioff VR 14.7Kg	Z	1.0	0.02	60	2,850	Critical
RAL° Benioff VR 14.7Kg	Z	1.0	0.02	60	8,075	Critical
TAV° Benioff VR 14.7Kg	Z	1.0	0.02	60	20,900	Critical
VUL° Benioff VR 14.7Kg	Z	1.0	0.02	60	5,000	Critical

STATION INSTRUMENTATION

Station & Instruments	Comp.	To	Tg	Trace Speed mm/min	Approximate relative Magnification	Approximate damping
Rabaul Harbour Network (cont'd).						
°Signals from these stations are telemetered by land line to Helicorders (Geotech Mod. 2484) at the Central Observatory.						
°°Signals from this station are telemetered via VHF to its Helicorder at the Central Observatory.						
KRT - Keravat Outstation						
Benioff MC 50 Kg	Z	1.2	0.2	15	20% sensitivity	critical
Benioff MC 50Kg	N/E	1.2	0.2	15	10% sensitivity	critical
ULA -Ulamona Field Station						
Willmore portable	Z	0.6	0.25	60	3,000	underdamped
PIV - Piva Field Station						
Willmore portable	Z	0.6	0.25	60	3,000	underdamped
WAA - Waris Field Station						
Willmore portable	Z	0.6	0.25	60	3,000	underdamped
LAG - Cape Gloucester Field Station						
Willmore portable	Z	0.6	0.25	60	3,000	underdamped

N.B. These field stations consist of a permanent building in which instruments are installed when necessary.

Details of emergency field stations, within the Territory will be listed when in operation.

TBL - Tabele Observatory						
Benioff VR 107.5Kg (PAPUA)	Z	1.0	0.2	60	1,350	critical
ESA - Esa'ala Observatory						
Benioff VR 107.5Kg	Z	1.0	0.2	15	36,000	critical
Benioff VR 107.5Kg	N,E	1.0	0.2	15	18,000	critical
Benioff VR 107.5Kg	Z/N/E	1.0	60.0	30	50% sensitivity	critical
AGE - Agenahambo Station						
Willmore portable	Z	0.6	0.25	60	3,000	underdamped

VR Variable Reluctance

MC Moving-coil

Relative magnification curves of seismograph systems installed in the stations controlled by the Rabaul Central Observatory are listed once a month on the P.E.A.

PRESENTATION OF DATA

(reviewed in November, 1967.)

All times are reduced to Greenwich Mean Time (GMT), which is 10 hours behind Eastern Standard Time.

At RABAUL and Harbour Network, the time signal is marked every minute on each seismogram record from the Observatory crystal chronometer. Second marks from Radio signal VNG (Australia) are recorded on World-wide Standard System S.P.-N. component only according with the W.W.S.S. programme, at six hour intervals. Primary time is provided by W.W.S.S. equipment and secondary time by a Labtronic crystal chronometer with the accuracy of ± 5 ms per day compared with VNG (Australia) with the aid of a chronoscope.

At TBL and AGE, the time signal is derived from a spring driven chronometer (Mercer) and marked each minute on records. Time accuracy is determined by comparison with signals from WWVH daily. Linear correction is applied to the daily drift.

On all seismogram records time increases from left to right and time break is upward.

At RAB* and Harbour Network the recording drum of each seismograph is driven by a 110VAC 60 H_z synchronous motor.
The 110VAC is frequently regulated by a crystal chronometer.

* The Omori recording drum is driven by a nonregulated 50 Hz frequency supply.

At ESA and KRT power for recorder motors is frequency regulated by a crystal chronometer at 50 Hz. Power for AGE and TBL and field stations is supplied by a 50 Hz free running oscillator.

Direction of Motion.

Upward direction of ground motion corresponds to upward trace motion on vertical seismogram records. Direction of component of ground motion to North or East corresponds to upward trace motion on horizontal seismogram records.

Vertical trace motion from impulsive onset of longitudinal waves of compressional or dilatational ground movement is indicated by "u" or "d" accompanied by N.S.E. or W. as per trace motion amplitude on horizontal seismogram records, to represent vectorially the direction of ground motion. "+" or "-" indicates upward or downward motion of the ground respectively, from a wave not known to be of the longitudinal type.

Accuracy of readings:

When readings are given with a decimal figure, they are to 1/10 of a second, other readings have been made to the nearest half second.

Crustal Phases:

Px, Sx Crustal phases, other than Pn and Sn for local and near earthquakes.

Felt Intensity:

Information on maximum intensities of shocks reported felt is included. Intensities are given in Roman numerals based on the Modified Mercalli Scale, of 1931.

Determination of Epicentre:

Where no source is cited, the determination of epicentral distance and origin time for local and regional earthquakes, is carried out at the Central Observatory, Rabaul, from the S-P travel times assuming a normal depth of the focus.

Geographical Designation of Epicentre:

The regional names which follow the co-ordinates of epicentres located at the Central Observatory are meant only to supplement the co-ordinates and normally follow well-known geographical rather than geological features. Use is made of the full degree blocks according to the method defined by E.A. Flinn and E.R. Engadhl in - " A PROPOSED BASIS FOR GEOGRAPHICAL AND SEISMIC REGIONALIZATION", Seismic Data Laboratory Report No. 101, U.I.D. Inc, Alexandria, Virginia, 1964, adopted by the U.S.C.G.S. for computer requirements.

Magnitude Definition and Determination

ML - Local Magnitude (Richter, 1935) is calculated from the recorded trace amplitude of the Wood-Anderson torsion seismographs of stated physical constants (installed at the Observatory in November, 1967).

Maximum trace amplitude (0 to peak) expressed in millimetres and tenths is measureddirectly on both components. Magnitude is determined independently and the arithmetic mean taken. M_L values are given to the tenth of a unit.

The station correction factor is assumed to be zero until better known.

M_S - Surface Wave Magnitude (Gutemberg & Richter, 1956) is calculated from the amplitude of surface waves of period near 20 seconds for shallow distant earthquakes.

M_B Body Wave Magnitude is calculated from the ratio of amplitude over period for body waves on S.P.-Z of World-wide Seismograph System only when depth is known. The magnification factor for the standard seismograph is taken into account.

m -Unified magnitude (Gutemberg & Richter, 1956) has the following relation to M_L , M_S , and M_B.

$$m = 1.7 + 0.8\ M_L - 0.01\ M_L^2$$

$$m = M_B \text{ (without correction)}$$

$$m = 2.5 + 0.63\ M_S$$

Local Magnitude of earthquakes recorded at RAB with a clear S-P interval is tabulated on a Day-Distance (in Central Angle Degrees) graph which is added to the PEA monthly.

Symbols:

i. - impulsive and sharply defined beginning of a phase.

e. - emergent and poorly defined beginning of phase.

T. - Period in seconds.

A. - Peak-to-Trough trace amplitude in millimetres.

GM. - Ground Motion.

Dist. - Epicentral Distance in central angle degrees.

H. - Origin Time.

h. - Focal depth in Kilometres.

CEM - Confused by microseisms.

PRESENTATION OF DATA (CONTINUED).

Remarks:

Local - Typical signature of an earthquake with epicentre within 0.9°

Near - Typical signature of an earthquake with epicentre between 0.9° and 9°.

Distant - Typical signature of an earthquake with epicentre between 9° and 45°.

Teleseism - Typical signature of an earthquake with epicentre more than 45°.

Traces - Any recorded disperse waves or very weak unknown earthquake phases.

Local and Near earthquakes will be classified Regional, and Distant earthquakes will be grouped with Teleseisms if sheer waves and their reflections are unidentifiable.

G.W. D'ADDARIO
Vulcanologist-in-Charge.

TOTAL NUMBER OF EARTHQUAKES AS RECORDED AND CLASSIFIED AT EACH STATION FOR THE MONTH OF JULY.

LOCAL - -.9°					NEAR 0.9 - 9°					REGIONAL					DISTANT 9° - 45°					TELESEISM 45°- -					TRACES				
12	2	1	3	3	79	24	20	27	29	18	2		2	3	22	2		1	2	6					25				
5	6	2		3		1	5	1	36	3	12	2		1	2	3	3		9		6	1		1					

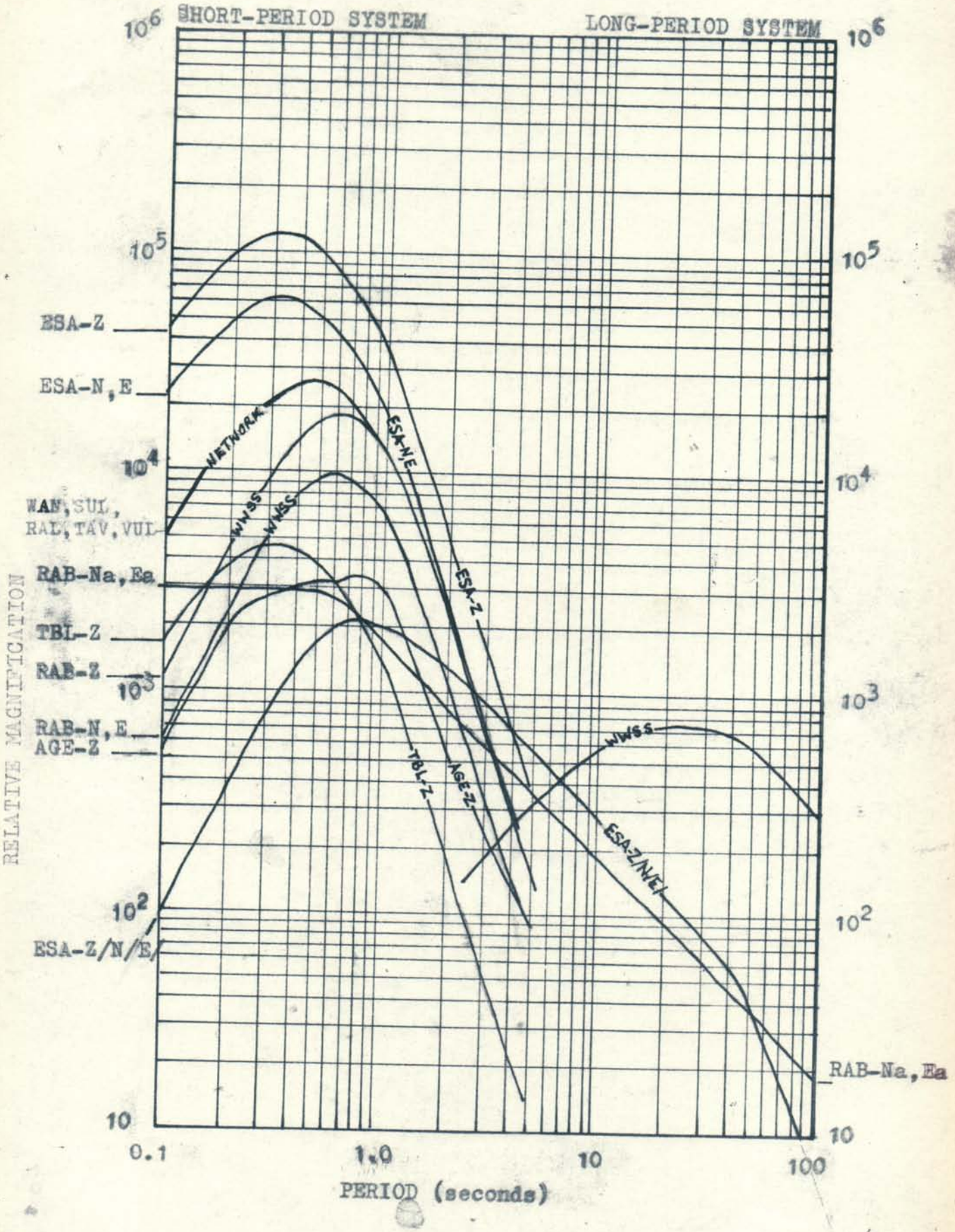
Harbour Network Station

Wanliss Street - WAN
Sulphur Creek - SUL
Rabalanakaia - RAL
Tavurvur - TAV
Taviliu - VUL

World-Wide Standard Stations

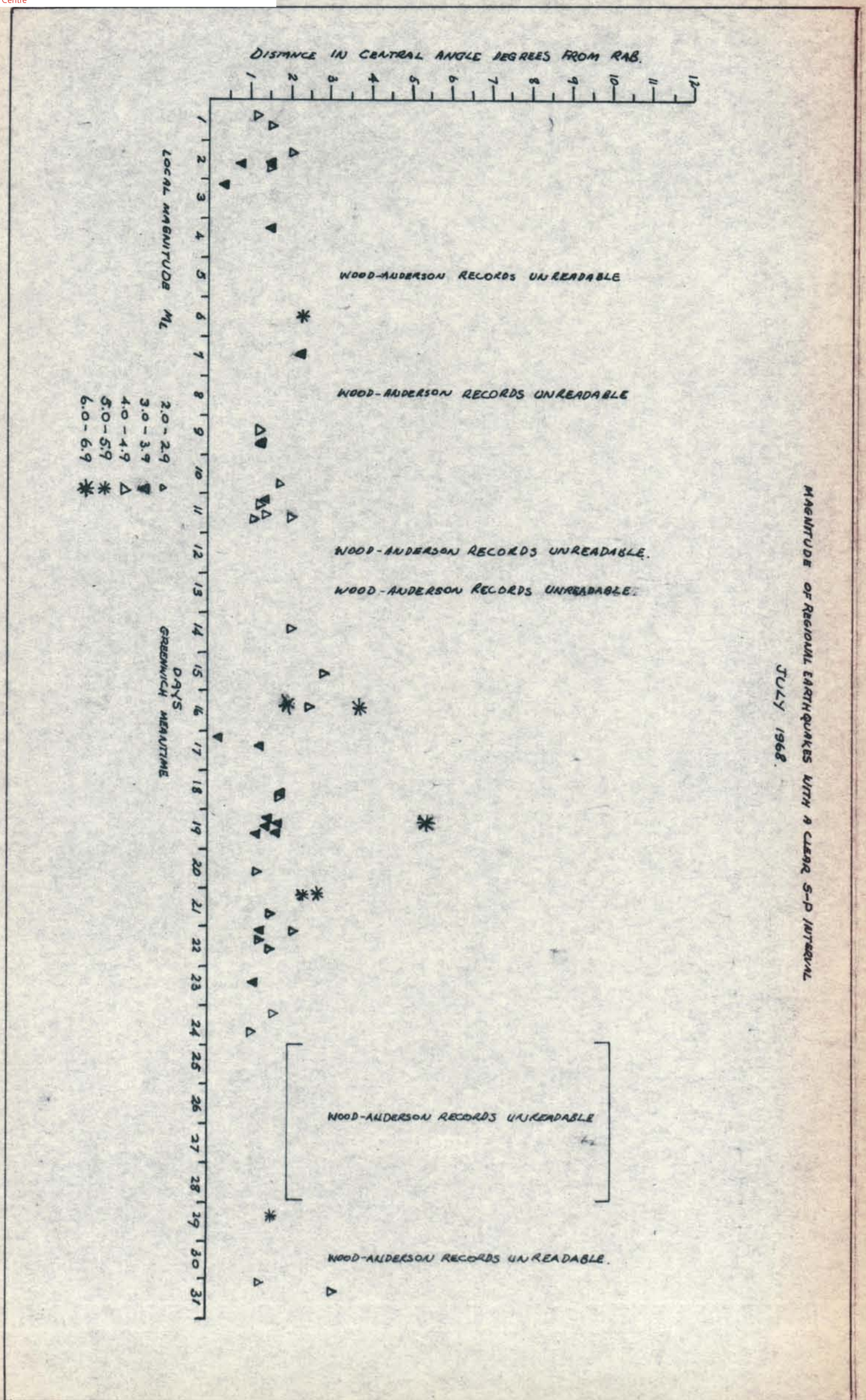
Rabaul - RAB
Keravat - KRT
Esa'ala - ESA
Agenahambo - AGE
Tabele - TBL

RAB	WAN	SUL	RAL	TAV
VUL	ESA AGE	TBL	AGE	KRT



FREQUENCY RESPONSE CURVES OF THE INSTRUMENTS

GWDA Nov.67



MAGNITUDE OF REGIONAL EARTHQUAKES WITH A CLEAR S-P INTERVAL

JULY 1968.

			T sec	A mm	GM	Dist	H	Remarks.
31st July,1968.								
RAB	L.P. E.W. record upside down							
RAB	eZ/	015748						Traces
RAB	iPZ	034910.8	0.3	4.0	d	1¼°	034848	M_l =4.2
RAB	iSN	28.0						
WAN	iPZ	10.7	0.3	2.3	d			
VUL	iPZ	10.0	0.4	5.2	d			
KRT	iPZ	034912½			d	1¼°	034852	
RAB	eZ/	070647			+			traces
RAB	iPZ	094303.2	0.3	2.0	d	1¼°	094242	
	iSE	19.0						
VUL	iPZ	03.0	0.3	3.4	d			
RAB	eiPZ	103248.0	0.3	2.0	d	3°	103202	M_L=4.7
	iZ	50.5						
	iSN	3323.3						
RAB	iPZ	125716.6	0.4	1.5	u	2½°	125634	
	iSN	48.4						
KRT	iPZ	125710½			u			
RAB	ePZ	135326½	0.5	1.0	u			Distant
RAB	ePZ	221227	0.4	1.0	d	1°	221211	
	iSN	38.8						
WAN	iPZ	27.4						
SUL	iPZ	27.6						
KRT	ePZ	221233			d	1°	221215	
	iSE	46						
RAB	iPZ	224615.0	0.3	10.0	d	1¼°	224552	
	iZ	17.7						
	iSN	32.5						
WAN	iPZ	14.5			d			
VUL	iPZ	13.7	0.3	6.0	d			
RAB	iPZ	235911.0	0.5	2.7	u	4°	235857	M_L= 5.2
	iSN	57.0						
1st August,1968. -								
KRT - Microseismic activity from 0001-1100/2000-2400								
RAB	iPZ	002111.8	0.7	1.0	d			
RAB	iPZ	014152.0	0.3	5.0	u	2°	014119	M_L=4.3
	iSN	4217.0						Regional
WAN	iPZ	4152.0	0.5	0.8	u			
RAL	iPZ	51.7	0.6	0.9	u			
VUL	iPZ	47.3	0.3	2.0	u			

1st August, 1968 cont.			T sec	A mm	GM	Dist.	H.	Remarks.
RAB	ePZ	024324	0.6	2.0	(u)	6¼°	024251	M_L=6.3
	iSN/	4436.0						
RAB	iPZ	055920.3	0.5	5.0	d	1½°	055854	Regional
	eSE/	40						
WAN	iPZ	20.5			u			
TAV	iPZ	20.0	0.3	2.0	u			
VUL	iPZ	19.3	0.3	4.4	d			
KRT	ePZ	18½			d	1¼°	055858	
	iSN	33½						
RAB	ePZ	074104.3	0.7	1.8	d			(Distant)
RAB	iPZ	103410.0	0.4	3.8	u	½°	103356	M_L=3.8
	iSN	20.4						Local
WAN	iPZ	09.6			u			
RAL	iPZ	09.2			u			
TAV	iPZ	09.0	0.3	4.0	u			
VUL	iPZ	10.0	0.5	1.4	u			
RAB	iPZ	133846.7	0.2	1.4	u	2¾°	133802	M_L= 4.6
	iSN	3920.7						Regional
RAL	iPZ	3848.0	0.8	1.0	u			
TAV	iPZ	45.4	0.3	1.4	u			
VUL	iPZ	46.0	0.5	3.0	d			
KRT	iPZ	47	0.2	1.0	d	3½°	133751	
	iSN	3929						
RAB	iPZ	152202.0	0.3	7.0	(u)	1¾°	152133	M_L= 4.0
	iSN	24.0						Regional
VUL	iPZ	01.0	0.5	9.3	d			
KRT	iPZ	152159			d	1½°	152134	
	iSN	2218						
RAB	eiPZ	202621			u	(36°)		Felt at Manila
	iSN/	3224						
WAN	iPZ	2621.1	1.0	2.8	u			Record hard to decipher. Superimposed shock.
SUL	iPZ	23.0	1.0	2.1	d			
RAL	iPZ	21.0	1.0	3.4	u			
TAV	iPZ	21.0	1.0	2.0	d			
VUL	iPZ	21.5	1.0	5.0	d			
KRT	eiPZ	22½			d			

			T. sec	A mm	GM	Dist	H	Remarks.
2nd August, 1968.								
RAB	Very strong microseismic activity associated with heavy wind.							
RAB	ePZ	034519	0.5	2.0	d			Regional
TAV	iPZ	21.7	0.3	3.0	u			
VUL	iPZ	22.1	0.5	10.0	u		034441	
	i(S)Z	53.8				2½°		
RAB	ePZ/	142118			u	(88°)		
	SKSE/	3140						
	SKKSE/	52						
	e(S)E/	58						
RAB	iPZ	182955.2	0.4	4.0	u	¾°	182940	M_L=3.5
	iSN	3006.0						
TAV	iPZ	2954.9	0.5	5.0	u			
	i(S)Z	3005.0				¾°	182941	
KRT	iPZ	2954.0			d	¾°	182940	
	iSZ	3004						
3rd August, 1968.								
RAB	Strong microseismic activity between 2217-0800 hours.							
RAB	ePZ	025640	0.4	2.0	d			Local
RAL	iPZ	40.5	0.6	6.0	u	1¼°	025619	
	iS	57.0						
TAV	iPZ	40.0	0.4		d	1¼°	025618	
	iS	57.5						
VUL	iPZ	40.7	0.2		d			
KRT	iPZ	41	0.4	4.0	u	1¼°	025618	
	iSN	58						
RAB	ePZ	050146½	0.5	2.2	u	34°		
	ePPZ/	0306						Philippine shock
	ePcPZ/	0416						
	eSE/	0706						
	eSSE/	1012						
	eScSE/	1158						
KRT	iPZ	0149			d			
RAB	iPZ	063206.2	1.0	5.0	u	36°		
	eSE/	3746						
	eScPN/	3808						
RAL	iPZ	3206.3	6.5	2.5	u			
TAV	iPZ	06.5	0.6	6.5	u			
VUL	iPZ	06.0	6.6	4.0	u			
RAB	ePZ	192602½	1.0	1.0	u			Distant
RAB	ePZ	211714	0.5	2.0	d			Regional

			T sec8	A mm	GM	Dist.	H	Remarks.
4th August,1968.								
RAB	Part of S-P-Z record exposed							
KRT	Microseismic activity from 0001-1100/1930-2400							
RAB	iSE	013329.2						
VUL	iPZ	013310.0	0.4	8.0	u	1½°	013248	M_L= 4.2
	iSZ	26.4						
KRT	iPZ	09			u	1¼°	013248	
	iSE	24½						
RAB	iSN	021920.0						
VUL	iPZ	021857.2	0.4	4.7	u	2°	021829	M = 3.8 L
	iSZ	1918.0						
KRT	iPZ	1849	0.3	1.8	u	2¼°	021812	
	iSE	1917						
RAB	iSE	025433.5						
VUL	iPZ	5256.2	0.4	2.0	u	(8½)°	0250(52)	M = 6.5 L
	i(S)Z	5432.0						
RAB	iPZ	080206.8	0.4	3.8	u	1°	080149	M = 3.6 L
	iSN	20.0						
RAB	eZ/	081804			-			trace
VUL	iPZ	085528.0	0.7	3.0				
KRT	iPZ	27.2			d			Distant
	iSN	5749						
RAB	iPZ	114703.7	0.9	11.0	u	26°		
	iSE/	5140						
	iSSN/	5252						
	eLQE/	5820						
	eLRZ/	120208						
WAN	iPZ	114703.5	0.8	3.3	u			
RAL	iPZ	04.0	0.7	3.1	u			
TAV	iPZ	03.7	0.7	6.1	d			
VUL	iPZ	03.5	0.7	6.2	u			
KRT	eiPZ	03.8						
VUL	iPZ	133359½	0.2	1.0	u	2°	133329	M_L= 4.0
	iSZ	3421.8						
KRT	iPZ	3404	0.4	1.4	d	2¼°	133330	
	iSE	30						
RAB	eZ/	154006			-			Trace
RAB	iPZ	164326.5	0.5	7.0	d	½°	164314	M_L= 3.4
	iSN	36.0						
TAV	iPZ	25.8	0.3	12.5	d			
VUL	iPZ	27.4	0.3	5.0	d			

			T sec	A mm	GM	Dist	H	Remarks.
4th August,1968. cont.								
KRT	iPZ	29		2.2	d	½°	164316	
	iSE	38½						
RAB	iPZ	181916.0	0.2	2.0	u	1¼°	181853	M_L=3.6
	iSN	33.3						
KRT	ePZ	14	0.2	2.4	d	1¼°	181853	
	iSN	30						
RAB	iSE/	182631.0						
WAN	iPZ	2531.0	0.6	2.0	d			
TAV	iPZ	31.5	0.5	3.0	d			
VUL	iPZ	182530.1	0.5	4.0	d	5½°	182405	M_L= 5.5
	iSN/	2636.5						
KRT	iPZ	2528	0.8	1.0	d	5½°	182406	
	i(S)N	2631						
RAB	ePZ	190346½	0.4	1.0	u	1¼°	190325	M_L= 3.5
	iSE	0403.0						
5th August,1968.								
RAB	Strong microseismic activity between 0130-1900 hours GMT.							
RAB	eZ/	004818						trace
RAB	eZ/	025310			-			traces
RAB	iPZ	050850.6			d	5½°	050726	
	iSE	0906.0						
WAN	iPZ	0850.1	0.4	28.3	d			
SUL	iPZ	50.0			d			
RAL	iPZ	50.1			d			
TAV	iPZ	50.0			d			
VUL	iPZ	49.5			d			
KRT	iPZ	0849.4			d			near
RAB	eZ/	150918						
RAB	iPZ	154520.2	0.6	2.0	d	2°	154450	M_L= 4.2
	iSN	43.0						
KRT	iPZ	20.0				2°	154450	
	iSN	43.0						
RAB	iPZ	162452.8	1.0	11.0	d	44°		
	iSE/	3137.0						
	iSSE/	3440.7						
	eLqE/	3544						
	eLrZ/	3718						
WAN	iPZ	2453.0	1.0	3.0	u			
SUL	iPZ	53.2	1.0	7.0	d			
RAL	iPZ	53.3	1.0	7.5	u			
TAV	iPZ	53.4	1.0	12.0	u			
KRT	iPZ	2453.8	1.0	4.5	d			Distant.

			T sec	A mm	GM	Dist	H	Remarks.
6th August,1968.								
RAB	Strong microseismic activity between 2311-1215 hours.							
RAB	eZ/	031354			-			trace
	ePZ/	050006			u			distant
RAB	eiPZ	064728	0.3	2.0	u	(1½)°	0647(62)	M_L= 4.4.
	i(S)E	48.0						
RAL	iPZ	4726.0	0.7	2.3	d	1½°	064661	
	iSZ	45.0						
TAV	iPZ	25.2	0.3	4.0	u	1½°	064658	
	iSZ	45.0						
VUL	iPZ	26.0	0.6	5.0	u	1¾°	064657	
RAB	iPZ	112944.0	0.4	4.0	d	1¾°	112915	
	iSN	3006						
WAN	iPZ	43.0	0.4	2.0	u	1¾°	112914	
	i(S)Z	3005.0						
RAL	iPZ	2943.0	0.7	4.0	u	1¾°	112914	
	iSZ	3005.3						
VUL	iPZ	2941.8	0.4	4.0	u	1½°	112914	
	iSZ	3003.0						
RAB	iPZ	133632.0	0.3	2.0	d	3°	133547	
	iZ	35.5						
	iZ	40.5						
	iSE	3706.0						
WAN	iPZ	3632.0			u			
RAL	iPZ	32.4	0.4	2.0	u			
TAV	iPZ	31.8	0.4	7.2	u			
VUL	iPZ	31.5	o.2	3.0	d			
RAB	iPZ	164041.2	0.4	2.0	d	2°	164011	M_L= 4.4
	iSE	4104.0						
RAL	iPZ	4041.2	0.3	3.4	u	1¾°	164013	
	iSZ	4102.0						
TAV	iPZ	4039.1	0.3	3.0	u	2°	164008	
	iSZ	4102.0						
VUL	iPZ	4039.0	0.3	2.0	u	2°	164006	
	iSZ	4104.0						

Central Observatory Rabaul
9th August,1968.

G.W.D'Addario
Volcanologist-in-Charge.

22 AUG 1968

PEA AUG-68 No.

TERRITORY OF PAPUA AND NEW GUINEA
GEOLOGICAL AND VOLCANOLOGICAL BRANCH
VOLCANOLOGICAL SECTION

PRELIMINARY EARTHQUAKE ANALYSIS
RABAUL CENTRAL OBSERVATORY
1968

Rabaul	RAB	From: AUG. 7. 1968 To : AUG. 13. 1968
Rabaul Harbour Network	WAN SUL RAL TAV VUL	From: AUG. 7. 1968 To : AUG. 13. 1968
Keravat	KRT	From: AUG. 6. 1968 To : AUG. 12. 1968
Esa'ala	ESA	From: JUL. 16. 1968 To : JUL. 22. 1968
Tabele	TBL	From: JUL. ~~24~~ 17. 1968 To : AUG. 6. 1968
Agenahambo	AGE	From: To :
Waris	WAA	Not operational
Ulamona	ULA	Not operational
Piva	PIV	Not operational
Cape Gloucester	LAG	Not operational

STATION PERSONNEL

RAB Central Observatory, Rabaul.

Volcanologist-in-Charge	G.W. D'Addario
Volcanologist	R.F. Heming
Seismologist	M. Mancini
Seismogram Readers	D.J. Cook, H.M.Carrick
Senior Technical Officer	N.O. Myers
Technical Officer	R.J. Conway
Volcanological Assistants	L. Topue, M. Gaiam, E. Ravian.
Technical Assistant	P. Daimbari
Trainee Volcanological Assistants	B. Talai, M.Salaiau, C. Matupit.
Secretary	H. James.

KRT Keravat Outstation.

Observer (part-time)	G.E. Chorick

TBL Tabele Observatory

Observer	V. Kaita.

ESA Esa'ala Observatory

Observer	F. Dira

AGE Agenahambo Outstation

Observer (part-time)	B. Kirke

The Rabaul Preliminary Earthquake Analysis (PEA) is produced by the staff under the direction of the Volcanologist-in-Charge from whom additional information and photocopies of seismogram records from all stations may be obtained on request.

Please address all communications to:-

Volcanologist-in-Charge
Central Observatory,
P.O. Box 386,
RABAUL. T.N.G.

SEISMOGRAPH STATIONS

Station (NEW GUINEA)	Code	South Latitude	East Longitude	Elev. (m)	Foundation.
Rabaul	RAB	04°11'28.6"	152°10'11.4"	183.5	Basalt Flow
Wanliss Street	WAN*	04°11'39.6"	152°10'32.5"	25.0	Basalt flow
Sulphur Creek	SUL*	04°13'09.8"	152°10'33.3"	8.5	unconsolidated volcanic ash
Rabalanakaia	RAL*	04°13'13.0"	152°12'07.0"	91.0	unconsolidated volcanic ash
Tavurvur	TAV*	04°13'52.18"	152°13'12.99"	27.0	Andesite flow
Taviliu	VUL*	04°16'58.2"	152°08'44.6"	332.3	unconsolidated volcanic ash
Keravat	KRT	04°21'10.5	152°03'06	20.0	Alluvium
Tabele	TBL	04°06'04.67"	145°00'41.37"	179.5	Basalt flow
Waris	WAA	04°07'00"	145°06'00"	48.0	Lapilli Tuff
Piva	PIV	06°12'00"	155°03'30	60.0	Alluvium
Cape Gloucester	LAG	04°27'20"	148°26'00"	24.0	Lapilli Tuff
Ulamona (PAPUA)	ULA	04°59'24.0"	151°16'30.0"	17.0	Lapilli Tuff
Agenahambo	AGE	08°48'49"	148°05'56"	303.0	unconsolidated volcanic ash
Esa'ala	ESA	09°44'18.2"	150°48'50.7"	46.4	Granite Gneiss

* Rabaul Harbour Network.

STATION INSTRUMENTATION

Station & Instruments (NEW GUINEA)	Comp.	To.	Tg.	Trace Speed mm/min	Approximate relative Magnification	Approximate damping.
Rabaul Central Observatory RAB						
World-wide Standard	Z	1.0	0.74	60	12,500	Critical
	N.E.	1.0	0.74	60	6,250	Critical
	Z/N/E	15.0	100.0	15	750	Critical
Benioff VR 14.7Kg	Zh	1.0	0.02	180+	4,000	Critical
+ Recording is triggered by the onset of any earthquake with pre-determined minimum amplitude. Recorder is stopped automatically by hour break pulse.						
Omori 15Kg	No	3.6	-	24	12	10.1 Air
Omori 15Kg	Eo	3.8	-	24	10	10.1 Air
Wood-Anderson Torsion	Na,Ea	0.8	-	60	2,800	Critical
Rabaul Harbour Network						
WAN° Benioff VR 14.7Kg	Z	1.0	0.02	60	5,240	Critical
SUL° Benioff VR 14.7Kg	Z	1.0	0.02	60	2,850	Critical
RAL° Benioff VR 14 7Kg	Z	1.0	0.02	60	8,075	Critical
TAV° Benioff VR 14.7Kg	Z	1.0	0.02	60	20,900	Critical
VUL° Benioff VR 14.7Kg	Z	1.0	0.02	60	5,000	Critical

Readings from the Harbour Network are entered in the PEA only for large earthquakes, with impulsive and sharply defined onset of phases.

Station & Instruments	Comp	To	Tg	Trace Speed mm/min	Approximate relative Magnification	Approximate damping
Rabaul Harbour Network (cont'd)						
o Signals from these stations are telemetered by land line to Helicorders (Geotech Mod. 2484) at the Central Observatory.						
oo Signals from this station are telemetered via VHF to its Helicorder at the Central Observatory.						
KRT Keravat Out-station						
Benioff MC 50Kg	Z	1.2	0.2	15	20% sensitivity	critical
Benioff MC 50Kg	N,E	1.2	0.2	15	10% sensitivity	critical
ULA Ulamona Field Station						
Willmore portable	Z	0.6	0.25	60	3,000	underdamped
PIV Piva Field Station						
Willmore portable	Z	0.6	0.25	60	3,000	underdamped
WAA Waris Field Station						
Willmore portable	Z	0.6	0.25	60	3,000	underdamped
LAG Cape Gloucester						
Willmore portable	Z	0.6	0.25	60	3,000	underdamped

N.B. These field stations consist of a permanent building in which instruments are installed when necessary.

Details of emergency field stations, within the Territory will be listed when in operation.

TBL Tabele Observatory						
Benioff VR 107.5Kg	Z	1.0	0.2	60	1,350	critical
(PAPUA)						
ESA Esa'ala Observatory						
Benioff VR 107.5Kg	Z	1.0	0.2	15	36,000	critical
Benioff VR 107.5Kg	N,E	1.0	0.2	15	18,000	critical
Benioff VR 107.5Kg	Z/N/E/	1.0	60.0	30	50% sensitivity	critical
AGE Agenahambo Station						
Willmore portable	Z	0.6	0.25	60	3,000	underdamped

VR Variable Reluctance

MC Moving-coil

Relative magnification curves of seismograph systems installed in the stations controlled by the Rabaul Central Observatory are listed once a month on the P.E.A.

PRESENTATION OF DATA

(reviewed in November, 1967)

All times are reduced to Greenwich Mean Time (GMT), which is 10 hours behind Eastern Standard Time.

At RAB and Harbour Network, the time signal is marked every minute on each seismogram record from the Observatory crystal chronometer. Second marks from radio signal VNG (Australia) are recorded on World-Wide Standard System S.P.-N component only according to the W.W.S.S. programme, at six hour intervals. Primary time is provided by W.W.S.S. equipment and secondary time by a Labtronic crystal chronometer with the accuracy of ± 5ms per day compared with VNG (Australia) with the aid of a chronoscope.

At TBL and AGE, the time signal is derived from a spring driven chronometer (Mercer) and marked each minute on records. Time accuracy is determined by comparison with signals from WWVH daily. Linear correction is applied to the daily drift.

On all seismogram records time increases from left to right and time break is upward.

At RAB* and Harbour Network the recording drum of each seismograph is driven by a 110VAC 60Hz synchronous motor. The 110VAC is frequency regulated by a crystal chronometer.

* The Omori recording drum is driven by a nonregulated 50Hz frequency supply.

At ESA and KRT power for recorder motors is frequency regulated by a crystal chronometer at 50Hz. Power for AGE and TBL and field stations is supplied by a 50Hz free running oscillator.

Direction of Motion

Upward direction of ground motion corresponds to upward trace motion on vertical seismogram records. Direction of component of ground motion to North or East corresponds to upward trace motion on horizontal seismogram records.

Vertical trace motion from impulsive onset of longitudinal waves of compressional or dilational ground movement is indicated by "u" or "d" accompanied by N,S,E or W as per trace motion amplitude on horizontal seismogram records, to represent vectorially the direction of ground motion. "+" or "-" indicates upward or downward motion of the ground respectively, from a wave not known to be of the longitudinal type.

Accuracy of Readings

When readings are given with a decimal figure, they are to 1/10 of a second, other readings have been made to the nearest half second.

Crustal Phases

Px, Sx Crustal phases, other than Pn and Sn for local and near earthquakes.

Felt Intensity

Information on maximum intensities of shocks reported felt is included. Intensities are given in Roman numerals based on the Modified Mercalli scale, of 1931.

Determination of Epicentre

Where no source is cited, the determination of epicentral distance and origin time for local and regional earthquakes is carried out at the Central Observatory Rabaul from the S-P travel times, assuming a normal depth of the focus.

Geographical Designation of Epicentre

The regional names which follow the co-ordinates of epicentres located at the Central Observatory are meant only to supplement the co-ordinates and normally follow well-known geographical rather than geological features. Use is made of the full degree blocks according to the method defined by E.A. Flinn and E.R. Engadhl in "A PROPOSED BASIS FOR GEOGRAPHICAL AND SEISMIC REGIONALIZATION", Seismic Data Laboratory Report No. 101, U.I.D. Inc., Alexandria, Virginia, 1964, adopted by the U.S.C.G.S. for computer requirements.

Magnitude Definition and Determination

M_L - Local Magnitude (Richter, 1935) is calculated from the recorded trace amplitude of the Wood-Anderson torsion seismographs of stated physical constants (installed at the Observatory in November, 1967).

Maximum trace amplitude (0 to peak) expressed in millimetres and tenths is measured directly on both components. Magnitude is determined independently and the arithmetic mean taken. M_L values are given to the tenth of a unit.

The station correction factor is assumed to be zero until better known.

M_S - Surface Wave Magnitude (Gutemberg & Richter, 1956) is calculated from the amplitude of surface waves of period near 20 seconds for shallow distant earthquakes.

M_B - Body Wave Magnitude is calculated from the ratio of amplitude over period for body waves on S.P.-Z of World-Wide Seismograph System only when depth is known. The magnification factor for the standard seismograph is taken into account.

m - Unified magnitude (Gutemberg & Richter, 1956) has the following relation to M_L, M_S, and M_B.

$$m = 1.7 + 0.8\ M_L - 0.01\ M^2_L$$
$$m = M_B \text{ (without correction)}$$
$$m = 2.5 + 0.63\ M_S$$

Local Magnitude of earthquakes recorded at RAB with a clear S-P interval is tabulated on a Day-Distance (in Central Angle Degrees) graph which is added to the PEA monthly.

Symbols

i - impulsive and sharply defined beginning of a phase.

e - emergent and poorly defined beginning of phase.

T - Period in seconds.

A - Peak-to-Trough trace amplitude in millimetres.

GM - Ground Motion.

Dist - Epicentral distance in central angle degrees.

H - Origin Time.

h - Focal depth in Kilometres.

CBM - Confused by microseisms.

PRESENTATION OF DATA
(cont'd)

Remarks

Local - Typical signature of an earthquake with epicentre within 0.9°.

Near - Typical signature of an earthquake with epicentre between 0.9° and 9°.

Distant - Typical signature of an earthquake with epicentre between 9° and 45°.

Teleseism - Typical signature of an earthquake with epicentre more than 45°.

Traces - Any recorded disperse waves or very weak unknown earthquake phases.

Local and Near earthquakes will be classified Regional, and Distant earthquakes will be grouped with Teleseisms if sheer waves and their reflections are unidentifiable.

G. W. D'ADDARIO
Vulcanologist-in-Charge

			T sec	A mm	GM	Dist	H	Remarks.
August 6th, 1968.								
KRT	- Microseismic activity from 0100-0855/1900-2400							
KRT	iPZ	112937	0.3	1.4	u	2°	112904	
	iSE	3002						
KRT	iPZ	133630			u			
KRT	iPZ	164038½				2¼°	164003	
	iSE	4105½						
RABAUL - 7th August, 1968.								
RAB	Strong microseismic activity between 2300-0700 Hours G.M.T.							
KRT	Strong microseismic activity between 0001-0900/1955-2400							
RAB	iPZ	000019.6	0.5	2.0	u	2¼°	235944	M_L=4.2
	iSN	47.0						
RAB	eZ/	040909			-			traces
RAB	ePZ	080946½	1.0	1.5	d			
RAB	ePZ	120734			-			traces
RAB	ePZ	121429	1.0	1.0	u			
RAB	iPZ	121930.5	0.4	20.5	d	1¼°	121909	M_L= 5.1
	iSN/	1947						
KRT	iPZ	25		15.0	d			
RAB	iPZ	180909	0.5	3.2	d	¾°	180844	
	iSN	20.5						
KRT	iPZ	04			d	1°	180846	
	iSN	17						
RAB	iPZ	001954.0	0.4	6.0	d	1½°	001928	M_L= 4.4
	iSE	2014.2						
KRT	iPZ	1951			d	1¼°	001927	
	iSN	2009						
8th August, 1968.								
KRT	Microseismic activity from 0001-0830/1930-2400							
RAB	eZ/	050254						traces
RAB	ePZ	083102½	0.6	1.0	d	(4½)	0829(56)	
	e(S)E	53						
RAB	ePZ	092706	1.0	1.0	d			Regional
RAB	iPZ	110219.0	0.4	1.0	d	1½°	110151	M_L= 3.8
	iSE	40.0						
TAV	iPZ	18.2	0.2	1.0	d	1½°	110152	
	iSZ	38.0						
KRT	iPZ	18½	0.3	2.4	u	1½°	110154	
	iSN	37						

			T sec	A mm	GM	Dist	H	Remarks.
8th August, continued.								
RAB	iPZ	124156.5	0.5	1.0	u	2½°	124114	M_L= 4.8
	eSE	4228						
KRT	ePZ	4159			u	2°	124128	
	iSN	4222						
RAB	iPZ	132305.5	0.4	3.0	d	2¼°	132230	M_L= 4.7
	iSN	32.0						
KRT	iPZ	04	0.2		d	2°	132233	
	iSE	27½						
RAB	iPZ	141201.5	0.8	8.0	u	2°	141129	M_L= 4.7
	iSE	25.0						
WAN	iPZ	01.2	0.2	1.3	u	2°	141131	
	eSZ	24.3						
RAL	iPZ	01.3	0.4	1.5	u	2°	141129	
	iSZ	25.5						
TAV	iPZ	01.2	0.3	3.5	u	2°	141129	
	eSZ	25						
KRT	iPZ	04		5.0	u	1¼°	141144	
	iSN	19						
RAB	iPZ	185013.0	0.3	1.0	d	1½°	184948	M_L= 3.7
	iSN	32.0						
RAL	iPZ	12.5	0.4	2.0	d	1½°	184948	
	iSZ	30.2						
TAV	iPZ	12.2	0.3	5.0	d	1¼°	184949	
	iSZ	29.5						
KRT	iPZ	14½	0.3	1.8	d	1½°	184949	
	iSN	33½						
9th August, 1968.								
KRT	strong microseismic activity from 0001-0930/2030-2400							
RAB	iPZ	004339.0	0.4	4.0	u	3°	004250	M_L= 4.5
	iSE	4416.0						
RAB	ePZ	013935	0.5	1.0	u	2¾°	013851	M_L= 4.4
	iSE	4007.8						
TAV	iPZ	013941.5	0.2	1.8	u	2°	013909	
	iSZ	4004.2						
RAB	eZ/	021312			-			trace
RAB	ePZ	032108.1	0.2	1.0	u	88°		
	iSE	3156.0						
RAB	iPZ	043718.0	0.3	2.0	u	1¼°	043655	M_L= 3.5
	iSE	34.0						
WAN	iPZ	043717.8	0.2	2.5	d			

9th August, 1968.			T sec	A mm	GM	Dist	H	Remarks.
TAV	iPZ	043718.0	0.2	1.0	u			
VUL	iPZ	17.2	0.2	5.0	u	2¼°	043640	
	iSZ	45.0						
RAB	iPZ	052307.0	0.5	3.0	d	3°	052218	M_L= 4.6
	eSN/	44						
WAN	iPZ	052307.0	0.5	2.0	d			Regional
RAL	iPZ	052307.0	0.5	1.0	u			
RAB	iPZ	080515.0	0.2	4.0	u	2¼°	080439	M_L= 3.8
	iSE	41.0						
WAN	iPZ	0514.6	0.1	2.0	d			
SUL	iPZ	14.0			d			
VUL	iPZ	0513.4	0.2	9.0	d	2¼°	080440	
	iSZ	38.4						
RAB	ePZ	104639	0.9	1.0	d			
RAB	eZ/	110020			+			Trace
RAB	eZ/	181710			+			Trace
RAB	ePZ	205852	0.2	1.0	u	1¼°	205828	M_L= 3.6
	iSN	5910.0						
RAB	ePZ	210533	0.3	1.8	u	¼°	210523	
	iSN/	40.0						
RAB	ePZ	214105		1.0	u			Distant
10th August, 1968.								
RAB	eiPZ	021239	0.5	18.0	u	8°	021043	M_L= 6.7
	iZ	40.1						
	iSNa	1409.0						
KRT	eiPZ	1239	1.0	1.5	u			
RAB	iPZ	025400.5	1.0	3.1	d			Distant
RAB	iPZ	041124.6	0.5	13..	u			Distant
RAB	iPZ	053429.9	0.5	3.1	u	1½°	053405	M_L= 4.0
	iSE	49.0						
WAN	iPZ	053430.5			u	1½°	053406	
	iSZ	49.2						
RAB	iPZ	055722.2	0.5	9.0	d	27°		
	iSE/	060156						

August 10th, 1968 cont.			T sec	A mm	GM	Dist	H	Remarks.
RAB	iPZ	081551.9	0.5	6.0	u	29°		
	iSE/	2029						
	eLqE	2205						
	eLrZ/	2352						
RAB	iPZ	100443.0	0.5	3.0	u	1½°	110417	M_L= 4.7
	iSE	0503.0						
RAB	eZ/	123525			+			Traces
RAB	ePZ	125111	0.5	1.9	u			
RAB	eZ/	130742			+			Traces
RAB	eZ/	153144			+			Traces
RAB	eZ/	155550			+			Traces
RAB	ePZ	164826½	1.0	3.5	d	38°		
	eSE/	5407						
	eLrZ/	5854						
RAB	eiPZ	171143½	0.5	9.0	u			
	iZ	46.9						
KRT	eiPZ	171144			u	1¾°	171115	
	eSN	1206						
RAB	iPZ	172649.2			u	1½°	172621	M_L= 4.8
	iSE/	2710						
WAN	iPZ	172649.1			u			
KRT	iPZ	49			u			
RAB	iPZ	173939.8	0.5	22.0	u	2°	173907	M_L= 5.1
	iSE	4005.0						
KRT	iPZ	3940			u			
RAB	iPZ	190354.8	0.5	5.0	d			
RAB	eiPZ	192352	0.5	3.1	u			
	iZ	54.0						
KRT	eiPZ	2353			u			
RAB	eZ/	195952			+			Traces
RAB	eiPZ	211008½	0.5	9.0	u	2°	210935	M_L= 5.0
	iZ	11.0						
	iSE	33.4						
SUL	iPZ	10.5	0.2	2.0	d			

			T sec	A mm	GM	Dist	H	Remarks.
11th August, 1968.								
KRT	Strong microseismic activity from 0001-0930 L.P. N/S galvonometer disturbed by the shock at 10-0212 hours.							
RAB	iPZ iSN	001356.8 1414.0	0.5	10.0	d	1¼°	001334	M_L= 3.9
WAN	iPZ	1356.6			u			
RAL	iPZ	56.0		1.2	u			
TAV	iPZ	55.9			d			
VUL	iPZ	56.5			d			
RAB	eZ/	010050			+			Traces
RAB	eZ/	025427			+			Traces
RAB	ePZ/ eSE/	090636 1038				24°		
RAB	ePZ	030055	0.5	1.0	u			Near
RAB	eZ/	095444			+			Traces
RAB	eZ/	114211			+			Traces
RAB	iPZ	124725.0	0.9	3.5	d			
KRT	iPZ	26	0.8	1.0	d			
RAB	ePZ eSE/	151323½ 1802			d	29°		
RAB	iPZ	185248.0	0.5	1.2	u			
RAB	eiPZ iSE/	200615½ 1048	0.5	3.1	d	25°		
12th August,1968.								
KRT-	Microseismic activity from 0001-1130/1900/2400							
RAB	eZ/	070910			+			Traces
RAB	iPZ iSN	114556.4 4616.0	0.3	1.2	d	1½°	114531	M_L= 3.7
RAB	ePZ iZ iZ iSN	122017 22 36 57.4	0.2	1.0	u	3¾°	121924	M_L= 4.8 Regional
TAV	iPZ iSZ	17.0 57.0	0.2	1.0	u	3¼°	121923	
VUL	iPZ iSZ	17.0 56.8	0.3	2.0	u	3¼°	121924	
RAB	ePZ	134922	0.6	2.0	u			Distant
KRT	iPZ	19	0.8	0.8	u			Distant
RAB	ePZ	141904½	0.2		d			Near

			T sec	A mm	GM	Dist	H	Remarks
12th August, 1968 (cont'd)								
TAV	iPZ	141905.0	0.2	2.0	u			
VUL	iPZ	05.0			d			
KRT	iPZ	02½			d	1½°	141836	
	eSN	22½						
RAB	iPZ	142330.0	0.2	19.0	u	¾°	142316	Local M_L = 4.3
	iSN/	40						(After shock)
WAN	iPZ	29.4	0.2	9.5	u	¾°	142315	
	iSZ	39.4						
SUL	iPZ	29.3	0.5	4.5	u	½°	142317	
	iSZ	38.8						
TAV	iPZ	29.0			d	½°	142317	
	iSZ	38.4						
VUL	iPZ	30.2			u	¾°	142315	
	iSZ	41.0						
KRT	iPZ	30½			u			Local
RAB	iPZ	175259.0	0.3	1.0	u			Distant
TAV	iPZ	58.4	0.4	1.0	d			
KRT	ePZ	5301	0.5	1.0	u			Distant
RAB	ePZ	181435	0.5	1.0	u			(Distant)
KRT	iPZ	35½		1.0	u			(Distant)
RAB	ePZ	182032			d			(Teleseism)
RAB	ePZ	200010	0.9	2.0	u			Teleseism
RAB	iPZ	204014.0	1.0	3.0	d			Teleseism
TAV	iPZ	14.2	1.0	2.0	d			
VUL	iPZ	14.5	1.0	3.0	d			
RAB	iPZ	210757.0	0.4	1.0	u	1¼°	210734	M_L = 3.6
	iSE	0814.2						Regional
WAN	iPZ	0757.0		1.0	u	1¼°	210734	
	iSZ	0814.0						
TAV	iPZ	0757.0	0.3	2.0	u	1¼°	210734	
	iSZ	0813.5						
VUL	iPZ	0756.0	0.5	5.4	u	1¼°	210736	
	iSZ	0811.0						
RAB	iPZ	223442.4	0.5	2.0	d	¾°	223427	M_L = 3.5
	iSE	54.0						(Local)
13th August, 1968.								
RAB	eZ/	002824			-			Traces
RAB	ePZ	003902	0.4	1.8	u	(25°)		
	e(S)E/	4356						
RAB	eiPZ	025825	0.5	1.0	d	(25°)		
	iZ	27.0						
	e(S)E/	0254						

			T sec	A mm	GM	Dist	H	Remarks
13th August, 1968 (Cont'd).								
RAB	ePZ	041105	0.5	1.0	u			Distant
RAB	eZ/	064838			-			Traces
RAB	iPZ	073221.2	0.3	1.8	u	2½°	073142	M_L= 4.2
	iZ	25.4						
	iSE	51.0						
RAB	iPZ	093635.0	0.4	2.8	u	3°	093548	
	eSN	3711						
RAB	iPZ	100420.6	0.3	1.2	u	1¼°	100358	M_L= 3.5
	iSN	38.0						
RAB	iPZ	124440.0	0.8	6.0	dESE	4°	124337	M_L= 5.7
	iZ	40.6						
	iZ	47.7						
	iSN/	4528.0						
WAN	iPZ	4439.8	0.4	3.0	d			
RAL	iPZ	40.0	0.4	2.0	d	4¼°	124335	
	iSZ	4530.0						
TAV	iPZ	4440.3	0.4	3.5	d	4¼°	124336	
	iSZ	4529.0						
VUL	iPZ	4439.0	0.5	3.0	d			
KRT	iPZ	37.0			d	4¼°	124333	
	iZ	37½						
	iSE	4525½						
RAB	ePZ	144315	0.3	1.0	d			Regional
RAB	iPZ	145030.2	0.2	7.6	d			Local
	iSE	34.6						
WAN	iPZ	30.2			d			Local
	iSZ	34.3						
RAL	iPZ	30.6	0.2	1.0	d			Local
TAV	iPZ	31.0	0.2	1.5	d			Local
VUL	iPZ	30.2			d			Local
KRT	eiPZ	29			d			Local
	iZ	29½						
	iSE	33½						
RAB	iPZ	182649.3	0.5	1.2	d	¾°	182634	M_L= 3.5
	iSE	2700.3						
TAV	iPZ	2647.5			d			Local
VUL	iPZ	48.3	0.2	1.6	d			Local
KRT	iPZ	49.0			d	1°	182631	
	iSE	2702						
RAB	ePZ	193934½	0.4	1.0	d	15°		
	iZ	39.4						
	eSN/	4229						
KRT	ePZ	3934			d			Distant

			T sec	A mm	GM	Dist	H	Remarks
13th August, 1968 (cont'd.)								
RAB	ePZ e(S)E/	213453 3527	0.8	1.5	u	(3°)	2134(08)	M_L = 4.1
VUL	iPZ	54.2	0.8	1.2	d			Regional

			T sec	A mm	GM	Dist	H	Remarks
ESA'ALA								
16th July, 1968.								
ESA	ePZ	101114			d			Regional
17th July, 1968.								
ESA	ePZ	052946	0.5	1.0	u			Distant
ESA	ePZ	084558	0.3	1.0	d			Regional
ESA	iPZ	122503			d			Regional
18th July, 1968.								
ESA	ePZ iZ	003149 52	0.6	1.0	d			Regional
ESA	iPZ	051120	0.5	1.0	d			Regional
ESA	iPZ	084132			u			Regional
ESA	iPZ	234619			u			Regional
ESA	iPZ	234730			u			Regional
19th July, 1968.								
ESA	iPZ	004048½			d			Local
ESA	iPZ	050551			u			(Teleseism)
ESA	ePZ	092448	0.7	2.0	d			Distant
ESA	ePZ	115845½			d			Regional
20th July, 1968.								
ESA	ePZ	075741			d			Regional
ESA	ePZ	104521	0.4	1.0	d			Regional
21st July, 1968.								
ESA	ePZ	055350	0.4	1.2	d			Regional
ESA	ePZ	061118½			d			Regional
ESA	ePZ	105834			d			Regional
ESA	iPZ	223653½			d			
22nd July, 1968.								
ESA	ePZ	012305	0.5	1.0	d			Regional
ESA	ePZ	072632	0.4	1.0	u			Regional

TABELE			T sec	A mm	GM	Dist	H	Remarks.
17th July, 1968.								
TBL	iPZ	122440	0.5	8.4	d			Regional
TBL	iPZ	132235	0.3	1.9	d			(Teleseism)
TBL	iPZ	175325	0.1	8.0	d			Regional
18th July, 1968.								
TBL	Nil Recorded							
19th July, 1968.								
TBL	Nil Recorded							
20th July, 1968.								
TBL	Nil Recorded							
21st July, 1968.								
TBL	ePZ	055343½			d			Distant
TBL	ePZ iSZ	220537 0620	0.3	1.4	d	3½°	220443	Regional
TBL	iPZ	221550	0.5	1.3	d			Regional (In coda of preceeding shock)
TBL	iPZ	222755	0.2	1.2	d			
22nd July, 1968.								
TBL	Nil Recorded							
23rd July, 1968.								
TBL	ePZ iSZ	204126½ 40	0.2	1.0	u	1°	204111	Local
TBL	iPZ iSZ	224656½ 4710½	0.2	1.1	d	1°	224640	Local
24th July, 1968.								
TBL	Nil Recorded							
25th July, 1968.								
TBL	ePZ	073111	0.5	1.0	d			Distant
26th July, 1968.								
TBL	Nil Recorded							
27th July, 1968.								
TBL	Nil Recorded							
28th July, 1968.								
TBL	iPZ	153216½	0.3	2.0	u			Local

			T sec	A mm	GM	Dist	H	Remarks.
TABELE- 28th July,1968 cont.								
TBL	iPZ e(S)Z	224507½ 30	0.3	4.0	d	(2°)	2244(37)	
29th July, 1968.								
TBL	ePZ eSZ	050308 19½	0.3	1.0	d	¾°	050253	
TBL	ePZ	133102	1.0	1.0	u			(Regional)
TBL	iPZ	144219½	0.3	4.0	d			Local
TBL	ePZ	232920	0.4	2.0	d			Regional
TBL	ePZ	235514	0.5	1.0	u			Distant
30th July,1968								
TBL	Nil Recorded							
31st July, 1968.								
TBL	Nil Recorded							
1st August, 1968.								
TBL	iPZ	073913½	0.3	1.0	u			Distant
TBL	ePZ	202527½			d			Distant
2nd August,1968.								
TBL	Nil Recorded							
3rd August, 1968.								
TBL	ePZ	050113½			d			Teleseism
TBL	iPZ	211640	0.4	4.0	u			Regional
4th August, 1968.								
TBL	iPZ	085534	0.2	1.0	d			Continuous felt tremor at Tabele between 0855-0904
TBL	iPZ	114603	0.5	1.0	d	Distant		
TBL	iPZ iSZ	182510 20	0.4	4.0	u	¾°	182500	
5th August,1968.								
TBL	Nil Recorded							
6th August, 1968.								
TBL	ePZ iSZ	161203½ 20	0.2	5.2	d	1¼°	161147	
TBL	iPZ iSZ	200212½ 20	0.2	4.0	u	½°	200206	

Rabaul Central Observatory
16th August,1968.

G.W. D'Addario
Volcanologist-inCharge.

PEA AUG-68 No.34.

TERRITORY OF PAPUA AND NEW GUINEA
GEOLOGICAL AND VOLCANOLOGICAL BRANCH
VOLCANOLOGICAL SECTION

PRELIMINARY EARTHQUAKE ANALYSIS
RABAUL CENTRAL OBSERVATORY
1968

Rabaul	RAB	From: AUG. 14. 1968 To : AUG. 20. 1968
Rabaul Harbour Network	WAN SUL RAL TAV VUL	From: AUG. 14. 1968 To : AUG. 20. 1968
Keravat	KRT	From: AUG. 14. 1968 To : AUG. 19. 19[illegible]
Esa'ala	ESA	From: JUL. 23. 1968 To : AUG. 4. 1968
Tabele	TBL	From: To :
Agenahambo	AGE	From: To :
Waris	WAA	Not operational
Ulamona	ULA	Not operational
Piva	PIV	Not operational
Cape Gloucester	LAG	Not operational

STATION PERSONNEL

RAB Central Observatory, Rabaul.

Volcanologist-in-Charge	G.W. D'Addario
Volcanologist	R.F. Heming
Seismologist	M. Mancini
Seismogram Readers	D.J. Cook, H.M.Carrick
Senior Technical Officer	N.O. Myers
Technical Officer	R.J. Conway
Volcanological Assistants	L. Topue, M. Gaiam, E. Ravian.
Technical Assistant	P. Daimbari
Trainee Volcanological Assistants	B. Talai, M.Salaiau, C. Matupit.
Secretary	H. James.

KRT Keravat Outstation.

Observer (part-time)	G.E. Chorick

TBL Tabele Observatory

Observer	V. Kaita.

ESA Esa'ala Observatory

Observer	F. Dira

AGE Agenahambo Outstation

Observer (part-time)	B. Kirke

The Rabaul Preliminary Earthquake Analysis (PEA) is produced by the staff under the direction of the Volcanologist-in-Charge from whom additional information and photocopies of seismogram records from all stations may be obtained on request.

Please address all communications to:-

Volcanologist-in-Charge
Central Observatory,
P.O. Box 386,
RABAUL. T.N.G.

SEISMOGRAPH STATIONS

Station (NEW GUINEA)	Code	South Latitude	East Longitude	Elev. (m)	Foundation.
Rabaul	RAB	04°11'28.6"	152°10'11.4"	183.5	Basalt Flow
Wanliss Street	WAN*	04°11'39.6"	152°10'32.5"	25.0	Basalt flow
Sulphur Creek	SUL*	04°13'09.8"	152°10'33.3"	8.5	unconsolidated volcanic ash
Rabalanakaia	RAL*	04°13'13.0"	152°12'07.0"	91.0	unconsolidated volcanic ash
Tavurvur	TAV*	04°13'52.18"	152°13'12.99"	27.0	Andesite flow
Taviliu	VUL*	04°16'58.2"	152°08'44.6"	332.3	unconsolidated volcanic ash
Keravat	KRT	04°21'10.5	152°03'06	20.0	Alluvium
Tabele	TBL	04°06'04.67"	145°00'41.37"	179.5	Basalt flow
Waris	WAA	04°07'00"	145°06'00"	48.0	Lapilli Tuff
Piva	PIV	06°12'00"	155°03'30	60.0	Alluvium
Cape Gloucester	LAG	04°27'20"	148°26'00"	24.0	Lapilli Tuff
Ulamona (PAPUA)	ULA	04°59'24.0"	151°16'30.0"	17.0	Lapilli Tuff
Agenahambo	AGE	08°48'49"	148°05'56"	303.0	unconsolidated volcanic ash
Esa'ala	ESA	09°44'18.2"	150°48'50.7"	46.4	Granite Gneiss

* Rabaul Harbour Network.

STATION INSTRUMENTATION

Station & Instruments (NEW GUINEA)	Comp.	To.	Tg.	Trace Speed mm/min	Approximate relative Magnification	Approximate damping.
Rabaul Central Observatory RAB						
World-wide Standard	Z	1.0	0.74	60	12,500	Critical
	N.E.	1.0	0.74	60	6,250	Critical
	Z/N/E/	15.0	100.0	15	750	Critical
Benioff VR 14.7Kg	Zh	1.0	0.02	180+	4,000	Critical
+ Recording is triggered by the onset of any earthquake with pre-determined minimum amplitude. Recorder is stopped automatically by hour break pulse.						
Omori 15Kg	No	3.6	-	24	12	10.1 Air
Omori 15Kg	Eo	3.8	-	24	10	10.1 Air
Wood-Anderson Torsion	Na,Ea	0.8	-	60	2,800	Critical
Rabaul Harbour Network						
Readings from the Harbour Network are entered in the PEA only for large earthquakes, with impulsive and sharply defined onset of phases.						
WAN° Benioff VR 14.7Kg	Z	1.0	0.02	60	5,240	Critical
SUL° Benioff VR 14.7Kg	Z	1.0	0.02	60	2,850	Critical
RAL° Benioff VR 14 7Kg	Z	1.0	0.02	60	8,075	Critical
TAV° Benioff VR 14.7Kg	Z	1.0	0.02	60	20,900	Critical
VUL° Benioff VR 14.7Kg	Z	1.0	0.02	60	5,000	Critical

Station & Instruments	Comp	To	Tg	Trace Speed mm/min	Approximate relative Magnification	Approximate damping
Rabaul Harbour Network (cont'd)						
o Signals from these stations are telemetered by land line to Helicorders (Geotech Mod. 2484) at the Central Observatory.						
oo Signals from this station are telemetered via VHF to its Helicorder at the Central Observatory.						
KRT Keravat Out-station						
Benioff MC 50Kg	Z	1.2	0.2	15	20% sensitivity	critical
Benioff MC 50Kg	N,E	1.2	0.2	15	10% sensitivity	critical
ULA Ulamona Field Station						
Willmore portable	Z	0.6	0.25	60	3,000	underdamped
PIV Piva Field Station						
Willmore portable	Z	0.6	0.25	60	3,000	underdamped
WAA Waris Field Station						
Willmore portable	Z	0.6	0.25	60	3,000	underdamped
LAG Cape Gloucester						
Willmore portable	Z	0.6	0.25	60	3,000	underdamped

N.B. These field stations consist of a permanent building in which instruments are installed when necessary.

Details of emergency field stations, within the Territory will be listed when in operation.

TBL Tabele Observatory						
Benioff VR 107.5Kg	Z	1.0	0.2	60	1,350	critical
(PAPUA)						
ESA Esa'ala Observatory						
Benioff VR 107.5Kg	Z	1.0	0.2	15	36,000	critical
Benioff VR 107.5Kg	N,E	1.0	0.2	15	18,000	critical
Benioff VR 107.5Kg	Z/N/E/	1.0	60.0	30	50% sensitivity	critical
AGE Agenahambo Station						
Willmore portable	Z	0.6	0.25	60	3,000	underdamped

VR Variable Reluctance

MC Moving-coil

Relative magnification curves of seismograph systems installed in the stations controlled by the Rabaul Central Observatory are listed once a month on the P.E.A.

PRESENTATION OF DATA

(reviewed in November, 1967)

All times are reduced to Greenwich Mean Time (GMT), which is 10 hours behind Eastern Standard Time.

At RAB and Harbour Network, the time signal is marked every minute on each seismogram record from the Observatory crystal chronometer. Second marks from radio signal VNG (Australia) are recorded on World-Wide Standard System S.P.-N component only according to the W.W.S.S. programme, at six hour intervals. Primary time is provided by W.W.S.S. equipment and secondary time by a Labtronic crystal chronometer with the accuracy of ± 5ms per day compared with VNG (Australia) with the aid of a chronoscope.

At TBL and AGE, the time signal is derived from a spring driven chronometer (Mercer) and marked each minute on records. Time accuracy is determined by comparison with signals from WWVH daily. Linear correction is applied to the daily drift.

On all seismogram records time increases from left to right and time break is upward.

At RAB* and Harbour Network the recording drum of each seismograph is driven by a 110VAC 60Hz synchronous motor. The 110VAC is frequency regulated by a crystal chronometer.

* The Omori recording drum is driven by a nonregulated 50Hz frequency supply.

At ESA and KRT power for recorder motors is frequency regulated by a crystal chronometer at 50Hz. Power for AGE and TBL and field stations is supplied by a 50Hz free running oscillator.

Direction of Motion

Upward direction of ground motion corresponds to upward trace motion on vertical seismogram records. Direction of component of ground motion to North or East corresponds to upward trace motion on horizontal seismogram records.

Vertical trace motion from impulsive onset of longitudinal waves of compressional or dilational ground movement is indicated by "u" or "d" accompanied by N,S,E or W as per trace motion amplitude on horizontal seismogram records, to represent vectorially the direction of ground motion. "+" or "-" indicates upward or downward motion of the ground respectively, from a wave not known to be of the longitudinal type.

Accuracy of Readings

When readings are given with a decimal figure, they are to 1/10 of a second, other readings have been made to the nearest half second.

Crustal Phases

Px, Sx Crustal phases, other than Pn and Sn for local and near earthquakes.

Felt Intensity

Information on maximum intensities of shocks reported felt is included. Intensities are given in Roman numerals based on the Modified Mercalli scale, of 1931.

Determination of Epicentre

Where no source is cited, the determination of epicentral distance and origin time for local and regional earthquakes is carried out at the Central Observatory Rabaul from the S-P travel times, assuming a normal depth of the focus.

Geographical Designation of Epicentre

The regional names which follow the co-ordinates of epicentres located at the Central Observatory are meant only to supplement the co-ordinates and normally follow well-known geographical rather than geological features. Use is made of the full degree blocks according to the method defined by E.A. Flinn and E.R. Engadhl in "A PROPOSED BASIS FOR GEOGRAPHICAL AND SEISMIC REGIONALIZATION", Seismic Data Laboratory Report No. 101, U.I.D. Inc., Alexandria, Virginia, 1964, adopted by the U.S.C.G.S. for computer requirements.

Magnitude Definition and Determination

M_L - Local Magnitude (Richter, 1935) is calculated from the recorded trace amplitude of the Wood-Anderson torsion seismographs of stated physical constants (installed at the Observatory in November, 1967).

Maximum trace amplitude (0 to peak) expressed in millimetres and tenths is measured directly on both components. Magnitude is determined independently and the arithmetic mean taken. M_L values are given to the tenth of a unit.

The station correction factor is assumed to be zero until better known.

M_S - Surface Wave Magnitude (Gutemberg & Richter, 1956) is calculated from the amplitude of surface waves of period near 20 seconds for shallow distant earthquakes.

M_B - Body Wave Magnitude is calculated from the ratio of amplitude over period for body waves on S.P.-Z of World-Wide Seismograph System only when depth is known. The magnification factor for the standard seismograph is taken into account.

m - Unified magnitude (Gutemberg & Richter, 1956) has the following relation to M_L, M_S, and M_B.

$$m = 1.7 + 0.8\ M_L - 0.01\ M^2_L$$
$$m = M_B \text{ (without correction)}$$
$$m = 2.5 + 0.63\ M_S$$

Local Magnitude of earthquakes recorded at RAB with a clear S-P interval is tabulated on a Day-Distance (in Central Angle Degrees) graph which is added to the PEA monthly.

Symbols

i - impulsive and sharply defined beginning of a phase.

e - emergent and poorly defined beginning of phase.

T - Period in seconds.

A - Peak-to-Trough trace amplitude in millimetres.

GM - Ground Motion.

Dist - Epicentral distance in central angle degrees.

H - Origin Time.

h - Focal depth in Kilometres.

CBM - Confused by microseisms.

PRESENTATION OF DATA
(cont'd)

Remarks

Local - Typical signature of an earthquake with epicentre within 0.9°.

Near - Typical signature of an earthquake with epicentre between 0.9° and 9°.

Distant - Typical signature of an earthquake with epicentre between 9° and 45°.

Teleseism - Typical signature of an earthquake with epicentre more than 45°.

Traces - Any recorded disperse waves or very weak unknown earthquake phases.

Local and Near earthquakes will be classified Regional, and Distant earthquakes will be grouped with Teleseisms if sheer waves and their reflections are unidentifiable.

G. W. D'ADDARIO
Vulcanologist-in-Charge

			T sec	A mm	GM	Dist	H	Remarks
RABAUL								
14th August, 1968., KRT: Microseismic activity from 0001-0930/1930-2400								
RAB	eZ/	003442			-			Traces
RAB	iPZ	012223.5		2.0	d			Distant
RAB	eZ/	041316			-			Trace
RAB	iPZ	080332.8			d			Distant
SUL	iPZ	30.0	0.4	1.5	d			
RAB	iPZ	100245.4	0.6	2.0	u			Teleseism
RAB	iPZ	111533.2	0.5	5.0	u	1¼°	111527	M_L=3.8
	iSE	50						
WAN	iPZ	33.0		2.0	u	1¼°	111511	
	iSZ	49.5						
SUL	iPZ	33.5	0.3	1.0	d	1¼°	111512	
	iSZ	50.2						
RAL	iPZ	32.8	0.3	2.0	d	1¼°	111511	
	iSZ	48.8						
TAV	iPZ	32.0	0.2	4.2	u	1¼°	111511	
	iSZ	48.6						
VUL	iPZ	32.0	0.2	9.0	d	1¼°	111510	
	iSZ	48.0						
KRT	iPZ	31	0.3	3.0	d	1¼°	111510	
	iSN	47						
RAB	iPZ	162914.4	0.8	1.0	d			Teleseism
RAB	ePZ	195206	0.4	1.0	d	6¾°	195026	M_L=5.4
	iSN	5323.0						
RAB	ePZ	204912	0.7	1.0	d			Teleseism
RAB	iPZ	222051.0	1.0	6.0	d	½°	222038	M_L=3.4
	iSE	2100.5						
15th August, 1968.								
RAB	iPZ	040445.0	0.5	3.0	u	3°	040402	M_L=4.9
	iSE	0519.0						
RAB	ePZ	041930	0.5	1.5	d	32°		
	eSE	2450						
RAB	ePZ	065715½	0.5	1.2	d	39°		
	ePcSZE	70308						
	eSZE	0313						
	eSSZEN	0652						
	eSSSSZNE	0736						
	ePKKSN	2457						
RAB	ePZ	114700½	0.8	2.0	d	31°		
	eSN/	5213						
WAN	iPZ	4701.0			d			

			T sec	A mm	GM	Dist	H	Remarks
15th August, 1968 continued.								
RAB	iPZ eSE	161951.2 2029	0.4	1.7	d	3¼°	161901	M_L=4.2
RAB	ePZ/ iSN/ ePcPZ/ eLqN/	174516 4822.0 4952 5250			u	17°		
RAB	eiPZ iZ iZ iS!E	192107 09.2 12.0 53.0	0.5	2.0	u	4°	192007	M_L=5.7
WAN	iPZ iSZ	07.0 53.0	1.0	1.0	d	4°		
SUL	iPZ iSZ	07.0 54.0	0.3	0.7	d	4°	192006	
RAL	iPZ iSZ	06.5 54.8	0.5	1.5	d	4°		
VUL	iPZ iSZ	06.4 54.0	0.7	7.0	d	4°		
RAB	ePZ iSE	194711 4806.0	0.3	1.0	u	4½°	194600	M_L=5.0
RAB	iP!Z eSN/	195654.2 5710	0.5	10.0	uNW	1¼°	195633	M_L=5.6
WAN	iPZ	5654.0			u			
SUL	iPZ	53.9		3.5	u			
RAL	iPZ	53.8		20.0	u			
TAV	iPZ	53.7		51	u			
VUL	iPZ	54.2			u			
RAB	iPZ eSN/	213229.0 3744	0.4	2.0	d	30°		
16th August, 1968.								
RAB	iPZ iSE	042719.8 40.5	0.4	4.0	d	1½°	042652	
WAN	iPZ	19.5	0.2	2.0	d			
RAL	iPZ	19.3	0.4	2.8	d			
TAV	iPZ	19.2			d			
RAB	eiPZ iZ iSE	075810½ 12.5 43.2	0.3	1.4	u	2¾°	075827	M_L=5.3
TAV	iPZ	09.8	0.2	3.0	u			
VUL	iPZ	10.0	0.2	1.0	u			

			T sec	A m	GM	Dist	H	Remarks
16th August, 1968 continued.								
RAB	ePZ eSN	104718 5344	0.8	2.0	d	43°		
RAB	ePZ	111416	0.5	2.0	u			Distant
RAB	ePZ	113959	0.5	1.8	u			Distant
RAB	iPZ iSN	150142.3 55.0	0.4	4.0	d	1°	150125	M_L=3.3
WAN	iPZ iSZ	42.43 55.0	0.2	2.3	d	1°	150125	
RAL	iPZ iSZ	42.4 55.2	0.3	2.0	d	1°	150125	
TAV	iPZ iSZ	42.5 55.0	0.2	4.0	d	1°	150125	
VUL	iPZ	44.0	0.2	2.0	d			
KRT	iPZ	45			d			
RAB	iPZ iS!E	160024.5 41.0	0.4	10.0	d	1¼°	160003	M_L=4.5
WAN	iPZ iSZ	24.5 39.0	0.2	2.0	d	1°	160005	
SUL	iPZ	24.6	0.2	1.0	d			
RAL	iPZ iSZ	24.7 39.7	0.3	5.0	d	1¼°	160004	
TAV	iPZ	25.0	0.4	2.0	d			
VUL	iPZ	23.5	0.4	3.0	d			
KRT	iPZ i(S)E	21 39	1.0	7.0	d	(1½°)	1559(56)	
RAB	iPZ iS!N	181705.8 18.0	0.4	38.0	d	1°	181650	M_L=4.4
WAN	iPZ	05.6			d			
SUL	iPZ	05.7			d			
RAL	iPZ	05.5			d			
TAV	iPZ	05.0			d			
VUL	iPZ	04.7	0.3	10.6	d			
KRT	iPZ	04			d			Local
RAB	eZ/	191754			-			Traces
17th August, 1968.								
RAB	iPZ iSE/ eLqE/ eLrZ/	040612.2 1042 1220 1336	0.5	7.5	d	29°		
KRT	iPZ	0612		2.5	d			Distant

			T sec	A mm	GM	Dist	H	Remarks
17th August, 1968 (cont'd).								
RAB	eZ/	121732			+			Traces
RAB	eZ/	133430			+			Traces
RAB	eZ/	180954			-			Traces
RAB	iPZ	181403.2	0.4	12.0	d	1°	181347	M_L = 3.9
	iSE	15.4						
WAN	iPZ	03.0	0.1	3.0	d	¾°	181345	
	iSZ	16.0						
RAL	iPZ	03.0		9.5	d	¾°	181348	
	iSZ	14.2						
TAV	iPZ	02.5	0.4	11.7	d			
VUL	iPZ	02.3		4.7	d			
KRT	iPZ	02.2	0.4	12.4	d	¾°	181348	
	iSE	12.4						
RAB	ePZ	185252				43°		
	eSE/	5906						
KRT	iPZ	5715½	0.3	4.2	u			Distant
	iSN	5801½						
RAB	eZ/	215233			+			Traces
RAB	ePZ	215644½	0.4	1.5	d	1½°	215616	
	eSE	5705						
TAV	iPZ	5643.0	0.2	8.5	d	1½°		
	iSZ	5702.5						
VUL	iPZ	5643.9	0.2	12.7	d	1½°	215616	
	iSZ	5705.0						
KRT	iPZ	5644.2	0.3	4.5	u	1½°	215619	
	iSN	5703.0						
18th August, 1968.								
RAB	eZ/	021618			+			Traces
RAB	ePZ	053249	0.4	2.0	u	4½°	053140	
	eSE/	3342						
RAB	ePZ	054930	0.5	2.0	u	28°		
	eSE/	5404						
RAB	eZ/	072807			+			Traces
RAB	iPZ	101541.6	0.4	3.0	u	½°	101533	
	eSN	49						
KRT	iPZ	42	0.3	4.2	u	¼°	101534	
	iSN	48						
RAB	ePZ	120411½	0.6	1.8	d			Distant
RAB	ePZ	152219½	0.4	1.0	d	13¾°		
	iZ	23.2						
	eSN/	2452						
KRT	ePZ	2219	0.8	1.4	d			Distant

			T sec	A mm	GM	Dist	H	Remarks
18th August, 1968, (cont'd).								
RAB	ePZ eSN/	181224½ 1528	1.0	1.0	d	17°		
KRT	ePZ	1226			d			Distant
RAB	iPZ iZ iZ eSE	184044.5 45.0 46.6 4239	0.6	2.6	u	10¼°	183816	
KRT	iPZ	4044.5	1.5	8.0	u			
RAB	iPZ	190225.0	0.5	4.0	u			Distant In coda of preceding shock
KRT	eiPZ iZ	23 23½			u			
RAB	ePZ	205025½	0.8	1.0	u			Distant
RAB	ePZ iSE	212159 2241.0	0.4	1.2	d	3½°	212104	M_L= 5.0
19th August, 1968.								
RAB	eZ/	010510			+			Traces
RAB	iPZ i(S)E	074101.9 14.0	0.4	1.2	u	(½°)	0740(53)	M_L= 3.4
WAN	iPZ i(S)Z	01.9 13.0		2.5	d	(¾°)	0740(46)	
RAL	iPZ i(S)Z	01.8 12.9			u	(¾°)	0740(47)	
VUL	iPZ	02.0		1.0	u			
RAB	iZ FZ	141321.9 1849	0.6	1.0				Ship movement in harbour
RAB	ePZ e(S)N/	154910 5514	0.5	1.0	d	(40°)		
RAL	iPZ	4910.3	0.8	2.0	d			
TAV	iPZ	10.0	0.7	3.0	d			
VUL	iPZ	11.0	0.8	9.0	d			
KRT	eiPZ iZ	11 11.7	1.0	6.0	d			
RAB	ePZ	170844	0.9	0.5	d			(Distant)
RAB	eZ/	172703			+			Traces
RAB	iPZ iSE	182426.5 38.8	0.3	1.7	d	1°	182410	M_L= 3.1
WAN	iPZ i(S)Z	26.0 39.3		1.0	d	(1°)	1824(08)	
TAV	iPZ i(S)Z	25.8 39.5	0.2		d	(1°)	1824(07)	

			T sec	A mm	GM	Dist	H	Remarks
19th August, 1968. (cont'd).								
VUL	iPZ	182427.0		2.5	d	(1°)	1824(11)	
	i(S)Z	39.4						
KRT	iPZ	28	0.3	4.4	u	1¼°	182407	
	iSN	43						
RAB	eZ/	185416			+			Traces
RAB	iPZ	204016.1			u			(Distant)
RAB	ePZ	211340½	0.8	0.5	u	4½°	211230	
	iSE	1434.5						
20th August, 1968.								
RAB	iPZ	015214.5	0.5	6.8	u	½°	105205	M_L= 3.4
	iSE	21.4						
WAN	iPZ	14.2	0.2	3.8	u	½°	015203	
	iSZ	22.0						
SUL	iPZ	14.0			u	½°	015202	
	iSZ	23.8						
RAL	iPZ	15.3			u	½°	015206	
	iSZ	22.0						
TAV	iPZ	15.8	0.2	2.0	u	½°	015206	
	iSZ	23.2						
VUL	iPZ	16.0	0.3	17.0	u	½°	015206	
	iSZ	22.8						
RAB	eZ/	045317			+			Traces
RAB	iPZ	060715.4	0.5	13.0	d	1°	060658	M_L= 3.5
	iSE	28.0						
WAN	iPZ	15.0	0.3	8.7	d			
SUL	iPZ	15.0			u			
RAL	iPZ	14.8		14.8	d			
TAV	iPZ	14.5			d			
VUL	iPZ	15.4	0.4		d			
RAB	iPZ	081206.2	0.5	2.1	d	2°	081136	M_L= 4.1
	iSE	29.0						
WAN	iPZ	06.0	0.2	0.6	u	2°	081135	
	iSZ	29.0						
SUL	iPZ	07.2			d			
RAL	iPZ	06.0		3.0	u	2°	081136	
	iSZ	29.0						
TAV	iPZ	05.0	0.2	2.5	u	2°	081134	
	iSZ	28.0						
VUL	iPZ	06.2	0.5	12.6	u	2°	081134	
	iSZ	30.2						
RAB	iPZ	111930.6	1.0	4.2	d	14°		
	eSE/	2209						
	eLqN/	22						
	eLrZ/	2305						

			T sec	A mm	GM	Dist	H	Remarks
20th August, 1968, (cont'd).								
WAN	iPZ	111931.0	0.9	1.0	u			
SUL	iPZ	32.0			u			
RAL	iPZ	31.5	1.0	2.0	u			
TAV	iPZ	31.0	1.0	2.8	d			
VUL	iPZ	32.0	1.0	3.8	u			
RAB	iPZ	160410.7	0.5	1.2	d	2¼°	160335	M_L= 4.4
	iSE	38.0						
WAN	iPZ	13.0	0.2	0.9	d	2°	160341	
	iSZ	37.5						
SUL	iPZ	13.0			u	2°	160341	
	iSZ	37.0						
RAL	iPZ	13.0			d	2°	160342	
	iSZ	36.0						
TAV	iPZ	13.2			(u)	2°	160340	
	iSZ	38.4						
VUL	iPZ	11.8	0.3	2.5	d	2°	160340	
	iSZ	36.0						
RAB	iPZ	200741.7	0.5	2.0	d	5½°	200620	M_L= 5.3
	iSE	0844.6						

			T sec	A mm	GM	Dist	H	Remarks
ESA'ALA								
23rd July, 1968.								
ESA	ePZ	011315			u			Regional
24th July, 1968.								
ESA	ePZ	113632	0.5	0.8	d			Regional
25th July, 1968.								
ESA	iPZ	044746			d			Local
ESA	iPZ	071427			u			Regional
ESA	eiPZ iZ	073001½ 03	0.5	1.0	u			Distant
Maintenance carried out from 26th July until 30th July.								
31st July, 1968.								
ESA		Nil recorded						
1st August, 1968.								
ESA	ePZ/	002054			u			Distant
ESA	eZ/	024316			+			Traces
ESA	ePZ/	202639			d			Teleseism
2nd August, 1968.								
ESA	e(P)Z/ e(S)E/	142137 2611			d	(68°)		
3rd August, 1968.								
ESA	ePZ	050219	0.4	1.0	d			Teleseism
ESA	ePZ	063225	0.6	1.0	d			Teleseism
ESA	eZ/	192604			-			Traces
ESA	iPZ iSE/	211706½ 1803½	0.4	1.0	d	5°	211552	
4th August, 1968.								
ESA	ePZ	025253½	0.7	1.0	u			Near
ESA	ePZ eSN/	085613½ 5735	0.3	1.0	d	7¼°	085427	
ESA	ePZ iZ/ e(S)N/	114714½ 18 5201	0.4	1.0	u	(28½°)		
ESA	iPZ iSN/	182523 2617	0.4	1.0	d	4½°	182413	

Rabaul Central Observatory,
23rd August, 1968.

(G.W. D'ADDARIO)
Volcanologist-in-Charge

PEA AUG-68 No. 35

TERRITORY OF PAPUA AND NEW GUINEA
GEOLOGICAL AND VOLCANOLOGICAL BRANCH
VOLCANOLOGICAL SECTION

PRELIMINARY EARTHQUAKE ANALYSIS
RABAUL CENTRAL OBSERVATORY
1968

Rabaul	RAB	From: AUG. 20. 1968 To : AUG. 27. 1968
Rabaul Harbour Network	WAN SUL RAL TAV VUL	From: AUG. 20. 1968 To : AUG. 27. 1968
Keravat	KRT	From: AUG. 20. 1968 To : AUG. 27. 1968
Esa'ala	ESA	From: To : AUG. 5. 1968
Tabele	TBL	From: AUG. 12. 1968 To :
Agenahambo	AGE	From: To :
Waris	WAA	Not operational
Ulamona	ULA	Not operational
Piva	PIV	Not operational
Cape Gloucester	LAG	Not operational

STATION PERSONNEL

RAB Central Observatory, Rabaul.

Volcanologist-in-Charge	G.W. D'Addario
Volcanologist	R.F. Heming
Seismologist	M. Mancini
Seismogram Readers	D.J. Cook, H.M.Carrick
Senior Technical Officer	N.O. Myers
Technical Officer	R.J. Conway
Volcanological Assistants	L. Topue, M. Gaiam, E. Ravian.
Technical Assistant	P. Daimbari
Trainee Volcanological Assistants	B. Talai, M.Salaiau, C. Matupit.
Secretary	H. James.

KRT Keravat Outstation.

Observer (part-time)	G.E. Chorick

TBL Tabele Observatory

Observer	V. Kaita.

ESA Esa'ala Observatory

Observer	F. Dira

AGE Agenahambo Outstation

Observer (part-time)	B. Kirke

The Rabaul Preliminary Earthquake Analysis (PEA) is produced by the staff under the direction of the Volcanologist-in-Charge from whom additional information and photocopies of seismogram records from all stations may be obtained on request.

Please address all communications to:-

Volcanologist-in-Charge
Central Observatory,
P.O. Box 386,
RABAUL. T.N.G.

SEISMOGRAPH STATIONS

Station (NEW GUINEA)	Code	South Latitude	East Longitude	Elev. (m)	Foundation.
Rabaul	RAB	04°11'28.6"	152°10'11.4"	183.5	Basalt Flow
Wanliss Street	WAN*	04°11'39.6"	152°10'32.5"	25.0	Basalt flow
Sulphur Creek	SUL*	04°13'09.8"	152°10'33.3"	8.5	unconsolidated volcanic ash
Rabalanakaia	RAL*	04°13'13.0"	152°12'07.0"	91.0	unconsolidated volcanic ash
Tavurvur	TAV*	04°13'52.18"	152°13'12.99"	27.0	Andesite flow
Taviliu	VUL*	04°16'58.2"	152°08'44.6"	332.3	unconsolidated volcanic ash
Keravat	KRT	04°21'10.5	152°03'06	20.0	Alluvium
Tabele	TBL	04°06'04.67"	145°00'41.37"	179.5	Basalt flow
Waris	WAA	04°07'00"	145°06'00"	48.0	Lapilli Tuff
Piva	PIV	06°12'00"	155°03'30	60.0	Alluvium
Cape Gloucester	LAG	04°27'20"	148°26'00"	24.0	Lapilli Tuff
Ulamona (PAPUA)	ULA	04°59'24.0"	151°16'30.0"	17.0	Lapilli Tuff
Agenahambo	AGE	08°48'49"	148°05'56"	303.0	unconsolidated volcanic ash
Esa'ala	ESA	09°44'18.2"	150°48'50.7"	46.4	Granite Gneiss

* Rabaul Harbour Network.

STATION INSTRUMENTATION

Station & Instruments (NEW GUINEA)	Comp.	To.	Tg.	Trace Speed mm/min	Approximate relative Magnification	Approximate damping.
Rabaul Central Observatory RAB						
World-wide Standard	Z	1.0	0.74	60	12,500	Critical
	N.E.	1.0	0.74	60	6,250	Critical
	Z/N/E/	15.0	100.0	15	750	Critical
Benioff VR 14.7Kg	Zh	1.0	0.02	180+	4,000	Critical
+ Recording is triggered by the onset of any earthquake with pre-determined minimum amplitude. Recorder is stopped automatically by hour break pulse.						
Omori 15Kg	No	3.6	-	24	12	10.1 Air
Omori 15Kg	Eo	3.8	-	24	10	10.1 Air
Wood-Anderson Torsion	Na,Ea	0.8	-	60	2,800	Critical
Rabaul Harbour Network						
Readings from the Harbour Network are entered in the PEA only for large earthquakes, with impulsive and sharply defined onset of phases.						
WAN° Benioff VR 14.7Kg	Z	1.0	0.02	60	5,240	Critical
SUL° Benioff VR 14.7Kg	Z	1.0	0.02	60	2,850	Critical
RAL° Benioff VR 14 7Kg	Z	1.0	0.02	60	8,075	Critical
TAV° Benioff VR 14.7Kg	Z	1.0	0.02	60	20,900	Critical
VUL° Benioff VR 14.7Kg	Z	1.0	0.02	60	5,000	Critical

Station & Instruments	Comp	To	Tg	Trace Speed mm/min	Approximate relative Magnification	Approximate damping
Rabaul Harbour Network (cont'd)						
o Signals from these stations are telemetered by land line to Helicorders (Geotech Mod. 2484) at the Central Observatory.						
oo Signals from this station are telemetered via VHF to its Helicorder at the Central Observatory.						
KRT Keravat Out-station						
Benioff MC 50Kg	Z	1.2	0.2	15	20% sensitivity	critical
Benioff MC 50Kg	N,E	1.2	0.2	15	10% sensitivity	critical
ULA Ulamona Field Station						
Willmore portable	Z	0.6	0.25	60	3,000	underdamped
PIV Piva Field Station						
Willmore portable	Z	0.6	0.25	60	3,000	underdamped
WAA Waris Field Station						
Willmore portable	Z	0.6	0.25	60	3,000	underdamped
LAG Cape Gloucester						
Willmore portable	Z	0.6	0.25	60	3,000	underdamped

N.B. These field stations consist of a permanent building in which instruments are installed when necessary.

Details of emergency field stations, within the Territory will be listed when in operation.

TBL Tabele Observatory						
Benioff VR 107.5Kg	Z	1.0	0.2	60	1,350	critical
(PAPUA)						
ESA Esa'ala Observatory						
Benioff VR 107.5Kg	Z	1.0	0.2	15	36,000	critical
Benioff VR 107.5Kg	N,E	1.0	0.2	15	18,000	critical
Benioff VR 107.5Kg	Z/N/E/	1.0	60.0	30	50% sensitivity	critical
AGE Agenahambo Station						
Willmore portable	Z	0.6	0.25	60	3,000	underdamped

VR Variable Reluctance

MC Moving-coil

Relative magnification curves of seismograph systems installed in the stations controlled by the Rabaul Central Observatory are listed once a month on the P.E.A.

PRESENTATION OF DATA

(reviewed in November, 1967)

All times are reduced to Greenwich Mean Time (GMT), which is 10 hours behind Eastern Standard Time.

At RAB and Harbour Network, the time signal is marked every minute on each seismogram record from the Observatory crystal chronometer. Second marks from radio signal VNG (Australia) are recorded on World-Wide Standard System S.P.-N component only according to the W.W.S.S. programme, at six hour intervals. Primary time is provided by W.W.S.S. equipment and secondary time by a Labtronic crystal chronometer with the accuracy of ± 5ms per day compared with VNG (Australia) with the aid of a chronoscope.

At TBL and AGE, the time signal is derived from a spring driven chronometer (Mercer) and marked each minute on records. Time accuracy is determined by comparison with signals from WWVH daily. Linear correction is applied to the daily drift.

On all seismogram records time increases from left to right and time break is upward.

At RAB* and Harbour Network the recording drum of each seismograph is driven by a 110VAC 60Hz synchronous motor. The 110VAC is frequency regulated by a crystal chronometer.

* The Omori recording drum is driven by a nonregulated 50Hz frequency supply.

At ESA and KRT power for recorder motors is frequency regulated by a crystal chronometer at 50Hz. Power for AGE and TBL and field stations is supplied by a 50Hz free running oscillator.

Direction of Motion

Upward direction of ground motion corresponds to upward trace motion on vertical seismogram records. Direction of component of ground motion to North or East corresponds to upward trace motion on horizontal seismogram records.

Vertical trace motion from impulsive onset of longitudinal waves of compressional or dilational ground movement is indicated by "u" or "d" accompanied by N,S,E or W as per trace motion amplitude on horizontal seismogram records, to represent vectorially the direction of ground motion. "+" or "-" indicates upward or downward motion of the ground respectively, from a wave not known to be of the longitudinal type.

Accuracy of Readings

When readings are given with a decimal figure, they are to 1/10 of a second, other readings have been made to the nearest half second.

Crustal Phases

Px, Sx Crustal phases, other than Pn and Sn for local and near earthquakes.

Felt Intensity

Information on maximum intensities of shocks reported felt is included. Intensities are given in Roman numerals based on the Modified Mercalli scale, of 1931.

Determination of Epicentre

Where no source is cited, the determination of epicentral distance and origin time for local and regional earthquakes is carried out at the Central Observatory Rabaul from the S-P travel times, assuming a normal depth of the focus.

Geographical Designation of Epicentre

The regional names which follow the co-ordinates of epicentres located at the Central Observatory are meant only to supplement the co-ordinates and normally follow well-known geographical rather than geological features. Use is made of the full degree blocks according to the method defined by E.A. Flinn and E.R. Engadhl in "A PROPOSED BASIS FOR GEOGRAPHICAL AND SEISMIC REGIONALIZATION", Seismic Data Laboratory Report No. 101, U.I.D. Inc., Alexandria, Virginia, 1964, adopted by the U.S.C.G.S. for computer requirements.

Magnitude Definition and Determination

M_L - Local Magnitude (Richter, 1935) is calculated from the recorded trace amplitude of the Wood-Anderson torsion seismographs of stated physical constants (installed at the Observatory in November, 1967).

Maximum trace amplitude (0 to peak) expressed in millimetres and tenths is measured directly on both components. Magnitude is determined independently and the arithmetic mean taken. M_L values are given to the tenth of a unit.

The station correction factor is assumed to be zero until better known.

M_S - Surface Wave Magnitude (Gutemberg & Richter, 1956) is calculated from the amplitude of surface waves of period near 20 seconds for shallow distant earthquakes.

M_B - Body Wave Magnitude is calculated from the ratio of amplitude over period for body waves on S.P.-Z of World-Wide Seismograph System only when depth is known. The magnification factor for the standard seismograph is taken into account.

m - Unified magnitude (Gutemberg & Richter, 1956) has the following relation to M_L, M_S, and M_B.

$$m = 1.7 + 0.8\ M_L - 0.01\ M^2_L$$
$$m = M_B \text{ (without correction)}$$
$$m = 2.5 + 0.63\ M_S$$

Local Magnitude of earthquakes recorded at RAB with a clear S-P interval is tabulated on a Day-Distance (in Central Angle Degrees) graph which is added to the PEA monthly.

Symbols

i - impulsive and sharply defined beginning of a phase.

e - emergent and poorly defined beginning of phase.

T - Period in seconds.

A - Peak-to-Trough trace amplitude in millimetres.

GM - Ground Motion.

Dist - Epicentral distance in central angle degrees.

H - Origin Time.

h - Focal depth in Kilometres.

CBM - Confused by microseisms.

PRESENTATION OF DATA
(cont'd)

Remarks

Local - Typical signature of an earthquake with epicentre within 0.9°.

Near - Typical signature of an earthquake with epicentre between 0.9° and 9°.

Distant - Typical signature of an earthquake with epicentre between 9° and 45°.

Teleseism - Typical signature of an earthquake with epicentre more than 45°.

Traces - Any recorded disperse waves or very weak unknown earthquake phases.

Local and Near earthquakes will be classified Regional, and Distant earthquakes will be grouped with Teleseisms if sheer waves and their reflections are unidentifiable.

G. W. D'ADDARIO
Vulcanologist-in-Charge

			T sec	A mm	GM	Dist	H	Remarks
RABAUL								
21st August, 1968.								
RAB	iPZ	023631.8	0.4	2.5	d	1¼°	023610	
	iSE	48.5						
RAB	iPZ	024358.5	0.5	2.5	u	1½°	024332	M_L= 4.1
	iSE	4419.0						
WAN	iPZ	4358.0	0.3	2.9	u	1½°	024330	
	iSZ	19.2						
VUL	iPZ	57.0	0.5	11.0	d	1¾°	024329	
	iSZ	4417.8						
RAB	iPZ	064216.5	0.5		u	¾°	064201	M_L= 3.8
	iSE	27.5						
WAN	iPZ	16.4			u			
SUL	iPZ	16.3			u			
RAL	iPZ	16.3	0.3	13.0	u			
TAV	iPZ	16.2			u			
VUL	iPZ	17.8	0.4	2.7	u			
KRT	ePZ	18½			d			
RAB	ePZ	141219	0.5	2.5	u	1½°	141151	M_L= 4.1
	iSE	40.9						
WAN	iPZ	19.3			d	1¾°	141250	
	iSZ	41.4						
RAL	iPZ	24.7			u	1°	141207	
	iSZ	38.0						
TAV	iPZ	24.0	0.3	17.0	u	1°	141206	
	iSZ	38.3						
VUL	iPZ	18.5	0.5	4.2	d	1¾°	141249	
	iSZ	40.3						
RAB	ePZ	180402	0.6	3.0	u	41°		
	iPPZ/	0544						
	ecPZ/	0608						
	eSE/	0954						
	eLqE/	1328						
	eLrZ/	1448						
WAN	ePZ	0402½	1.0	1.5	u			
RAL	ePZ	03½	1.0	1.4	u			
TAV	ePZ	02½	1.0	2.2	d			
VUL	ePZ	03	1.0	3.1	d			
KRT	iPZ	02	0.8	4.4	u			
RAB	ePZ	191507	0.6	38.2	d	1¼°	191448	M_L= 3.9
	iSE	21.0						
WAN	iPZ	08.0	0.6	19.0	d			
SUL	iPZ	08.2	0.3	10.4	d			
RAL	iPZ	08.0	0.6	14.0	d			
TAV	iPZ	08.0	0.6	20.3	d			
VUL	iPZ	07.4	0.8	31.9	d			
KRT	iPZ	08.	0.8	13.4	d	1°	191448	
	iSE	18½						

			T sec	A mm	GM	Dist	H	Remarks
21st August, 1968.								
RAB	iPZ	192659.0	0.4	18.0	d	1½°	192634	M_L= 4.2
	iSE	2718.0						
WAN	iPZ	2658.8	0.4	5.2	d	1½°	192633	
	iSZ	2717.6						
SUL	iPZ	2658.4	0.4	7.0	d	1½°	192632	
	iSZ	2718.0						
RAL	iPZ	2658.8	0.5	11.4	d	1½°	192633	
	iSZ	2717.2						
TAV	iPZ	2658.3	0.4		d			
VUL	iPZ	59.8	0.4	9.5	d	1½°	192632	
	iSZ	2719.2						
KRT	iPZ	01		0.4	d	1¾°	192633	
	iSE	22						
22nd August, 1968.								
RAB	iPZ	022226.5	0.5	3.5	u	2¼°	022148	
	iSE	56.0						
RAB	eZ/	065910			-			Traces
RAB	eZ/	075222			-			Traces
RAB	ePZ	113703	0.6	1.5	u	8¼°	113503	
	eSE/	3836						
RAB	ePZ	141004½	1.0	1.5	u	(62°)		
	eSE/	184						
RAB	ePZ	162421	0.5	2.0	u	5°		
	eSE/	2525						
KRT	ePZ	23.2	0.4	1.0	u			
RAB	iPZ	162720.5	0.5	48.0	d	2¼°	1626(36)	In coda of preceding shock.
	i(S)E	55.0						
TAV	iPZ	21.0	0.4	11.5	d	(2¼°)	1626(38)	
	i(S)Z	54.0						
VUL	iPZ	19.8		27.0	u			
KRT	iPZ	17.6		12.0	u			
23rd August, 1968.								
RAB	iPZ	054707.0	0.5	5.0	d			Local
WAN	iPZ	07.0	0.2		u			
RAL	iPZ	06.3			d			
TAV	iPZ	07.3		3.0	u			
VUL	iPZ	06.0						
RAB	ePZ	064956½	1.0	3.0	d			Distant
WAN	ePZ	56			d			
RAL	ePZ	57			u			
TAV	ePZ	57½	1.0	4.0	u			
VUL	ePZ	57½		1.8	u			

23rd August.(cont'd).			T sec	A mm	GM	Dist	H	Remarks
RAB	eiPZ	084438.2	1.0	6.0	d			Distant
WAN	iPZ	38.5			d			
RAL	iPZ	39	1.0	3.0	u			
TAV	iPZ	39	1.0	5.8	d			
VUL	iPZ	39	1.0	3.0	u			
RAB	iPZ	090614.0	0.3	2.0	u	3°	090528	
	iSE	49.0						
WAN	iPZ	13.8		1.0	u	3°	090529	
	iSZ	48.2						
RAL	iPZ	12.8			d	3°	090527	
	iSZ	48.2						
TAV	iPZ	12.2			d	3°	090525	
	iSZ	48.0						
VUL	iPZ	12.9	0.5	1.8	u	3°	090525	
	iSZ	49.3						
RAB	iPZ	114827.8	0.4	19.5	u			
WAN	iPZ	27.8			d			
SUL	iPZ	27.8			d			
RAL	iPZ	27.8		16.0	d			
TAV	iPZ	27.4			u			
VUL	iPZ	26.5		13.0	u			
KRT	iPZ	25.8			u			
RAB	iPZ	133406.8	0.3	1.0	d			
WAN	iPZ	07.0	0.1		d			
SUL	iPZ	07.8		1.0	d			
RAL	iPZ	07.2		1.0	d			
TAV	iPZ	07.2	0.2	1.0	d			
VUL	iPZ	06.2			d			
KRT	iPZ	04.4			u	2¼°	133327	
	iSE	33.2						
RAB	iZ	134309.2						Ship moving
	FZ	5049						in harbour.
RAB	iPZ	141718.8	0.4	6.0	u	¼°	141709	
	iSE	24.8						
WAN	iPZ	18.5	0.1	5.0	u	¼°	141710	
	iSZ	24.6						
SUL	iPZ	19.1		1.0	d	¼	141711	
	iSZ	25.0						
RAL	iPZ	19.0	0.1	1.9	u	¼°	141711	
	iSZ	25.0						
TAV	iPZ	19.3	0.2	3.5	u	¼°	141711	
	iSZ	25.0						
VUL	iPZ	20.0	0.2	3.0	d	¼°	141712	
	iSZ	25.3						
RAB	iPZ	225450.9		1.0	d			Distant

			T sec	A mm	GM	Dist	H	Remarks
24th August, 1968.								
RAB	iPZ	123249.8	0.5		u			Regional
RAB	eZ/	125132			-			Traces
RAB	iPZ	130654.0	0.3	2.0	d	2¾°	130612	
	eSN	0726						
RAB	iPZ	132533.7	0.7		u			Regional
RAB	ePZ	151426	0.5	0.6	d			Teleseism
RAB	iPZ	161529.0	0.4	0.5	u			Regional
RAB	iPZ	164038.8	0.3	1.0	d	2¾°	163954	M_L= 4.2
	iSE	4113.0						
TAV	iPZ	4041.0	0.2	2.2	u			
VUL	iPZ	39.2	0.2	1.5	u	(2½°)	1640(00)	
	i(S)Z	4109.3						
RAB	eZ/	190339			+			Traces
25th August, 1968								
RAB	ePZ	000430	0.5	1.9	u	(29°)		
RAB	iPZ	091544.5	0.6	2.8	u			Teleseism
RAB	ePZ	124107	0.5	2.0	d	1¼°	124046	
	iSN	23.8						
TAV	iPZ	05.8			u	1¼°	124045	
	iSZ	21.0						
VUL	iPZ	05.8	0.5	3.2	u	1¼°	124045	
	iSZ	20.5						
RAB	ePZ	132846	0.7	2.0	u			Distant
TAV	ePZ	42½			u			
VUL	ePZ	43½			u			
RAB	ePZ	151424	0.3	1.4	u	1¼°	151400	
	iSN	42.5						
TAV	iPZ	23.0	0.3	8.0	u	1¼°	151400	
	iSZ	39.8						
VUL	iPZ	23.7	0.5	6.2	u	1½°	151358	
	iSZ	42.0						
RAB	ePZ	153416	0.5	3.0	d			Distant
RAB	iPZ	160415.0	0.5	2.2	u	2¼°	160342	
	iSN	40.0						
TAV	iPZ	14.8	0.6	8.0	d			
VUL	iPZ	14.4	0.5	11.4	u			
KRT	iPZ	13.5	0.2	4.0	d	2°	160343	
	iSE	36.5						

			T sec	A mm	GM	Dist	H	Remarks
26th August, 1968.								
RAB	iPZ	014119.4	0.5	11.0	u	2½°	014043	M_L=5.4
	eSE/	46						
WAN	iPZ	19.2	0.4	2.0	u			Felt-Rabaul
RAL	iPZ	19.1	0.5	1.0	u			04°11"S 152°10"E
TAV	iPZ	19.0	0.5	3.5	u			Int. 1-11
VUL	iPZ	18.3	0.3	3.0	u			
RAB	iPZ	014459.0	0.5	12.0	d	2°	014429	M_L=5.1
	iSN	4522.0						
WAN	iPZ	4459.0	0.2	4.0	d	1¾°	014430	
	iSZ	4521.5						
RAB	iPZ	022428.5	0.3	5.0	u	2°	022356	
	iSN	52.0						
RAB	ePZ	043900½	0.4	4.0	u	2°	043827	
	eSE/	26						
KRT	ePZ	3859						
RAB	ePZ	054612½	0.3	2.0	u	2¼°	054538	
	eSE/	38						
WAN	iPZ	14.4	0.3	3.0	u	2¼°	054538	
	iSZ	38.0						
TAV	iPZ	14.0	0.2	2.0	u	2°	054541	
	iSZ	39.3						
VUL	iPZ	12.0	0.3	5.0	d	2°	054539	
	iSZ	37.0						
RAB	eZ/	092444			+			Trace ~~Teleseism~~ C.B.M.
RAB	iPZ	115242.5	0.5	29.0	d			Local
	iSN	46.0						
WAN	iPZ	42.0			d			
RAL	iPZ	42.6			d			
TAV	iPZ	43.0			d			
VUL	iPZ	42.0			d			
KRT	iPZ	40.5						
RAB	eiPZ	140243	0.3	1.0	d	2°	140210	M_L=4.0
	iZ	44.0						
	iSN	0308.0						
KRT	iPZ	0239.9			d	2°	140208	
	iSE	0304.3						
RAB	iPZ	162354.0	0.3	1.5	u	2½°	162316	M_L=4.5
	iSE	2423.0						
VUL	ePZ	2354	0.4	1.2	d	2¼°	162318	
	iSZ	2421.0						
KRT	iPZ	2353.4			d	2¼°	162320	
	iSE	2418.1						
RAB	eZ/	192742			+			Traces

			T sec	A mm	GM	Dist	H	Remarks
27th August, 1968.								
RAB	eZ/	000218			+			Traces
RAB	iPZ	004043	0.5	3.0	d	2¼°	004010	
	iSE	4108.5						
TAV	ePZ	4041.5						
VUL	ePZ	40.6			d	2¼°	004007	
	iSZ	4106.0						
TAV	iPZ	034752.9	0.4	0.7	d	2¾°	034708	
	iSZ	4826.7						
VUL	iPZ	4752.8	0.4	1.0	u	2¾°	034708	
	eSZ	4826½						
RAB	ePZ	035556	0.4	1.0	d	2¾°	035510	
	iSE	5631.8						
TAV	ePZ	5557						
VUL	iPZ	57.0	0.5	2.0	u			
TAV	ePZ	062800.8	0.3	1.2	d	1¾°	062734	
	iSZ	21.0						
WAN	ePZ	075717.5						
	eSZ	34.5						
RAL	ePZ	17.8				1¼°		
	iSZ	32.5						
TAV	iPZ	17.5	0.3	2.7	d	1¼°	075658	
	iSZ	32.2						
VUL	iPZ	17.0	0.4	1.4	d	1¼°		
**	iSZ	31.8						
TAV	ePZ	171420	0.2	0.9	u	1¼°	171354	
	iSZ	40.4						
VUL	ePZ	20	0.3	0.4	u			
**								
RAB	ePZ	135001	0.5	5.8	u	20°		
	eSN	5330						
WAN	ePZ	5001		2.8	d			Distant
RAL	ePZ	01½	0.8	3.0	d			
TAV	ePZ	02	1.0	4.5	d			
VUL	ePZ	02	0.8	3.5	d			
RAB	ePZ	214549.0	0.5	6.4	u	2¼°	214513	
	iSN	4616.0						
WAN	iPZ	4549.0	0.7	2.0	u	2¼°	214515	
	iSZ	4614.8						
RAL	iPZ	4549.0	0.5	5.4	u	2¼°		
	iSZ	4614.5						
TAV	iPZ	4549.0	0.4	6.8	u	2¼°	214515	
	eSZ	4615						
VUL	iPZ	4548.0	0.5	10.5	u	2¼°	214515	
	eSZ	4613						

			T sec	A mm	GM	Dist	H	Remarks
ESA'ALA								
5th August, 1968.								
ESA	ePZ	050952	0.2	0.8	u	2½°	050910	
	iSN/	1024						
ESA	ePZ	162527½	0.5	2.0	d	45°		
	eSE/	3206						
	eSPZ/	15						
	eSSE/	3520						
6th August, 1968.								
ESA	iPZ	024108½	0.4	1.4	d	1¼°	024048	
	eSN/	23						
ESA	iPZ	133704			u	4½°	133455	6.4°S 154°E Solomon Islands
	iSE/	57						
ESA	iPZ	161321½			d			Regional
ESA	iPZ	225036			u			Local
	iSN/	41						
7th August, 1968.								
ESA	iPZ	033331½			u			Regional
ESA	ePZ	080926	0.5	0.7	d			Regional
ESA	ePZ	122107			d	1½°	201239	
	eSN/	28						
8th August, 1968.								
ESA	ePZ	050338	0.7	1.0	d	1°	050322	
	eSN/	50						
ESA	ePZ	083124			u			Regional
ESA	ePZ	141240			d			Regional
ESA	iPZ	204653			u	¼°	204645	
	iSN/	59½						
9th August, 1968.								
ESA	iPZ	004344½	0.3	1.0	d	3½°	004252	
	iSN/	4424						
ESA	iPZ	052315½	0.3	2.0	d	3½°	052220	
	iSE/	57						
ESA	iPZ	162919½			u	½°	162907	
	iSE/	28½						
10th August, 1968.								
ESA	eiPZ	021243	0.8	2.0	u			Near
	iZ	44						
ESA	ePZ	025110	0.5	0.3	u			Near

			T sec	A mm	GM	Dist	H	Remarks
10th August, 1968. (cont'd)								
ESA	ePZ	025556	0.6	0.8	d			Distant
ESA	iPZ	041128	0.7	1.0	u			Distant
ESA	iPZ	055728	0.6	1.0	u			Distant
ESA	ePZ	081555	0.6	1.0	d			Distant
ESA	ePZ	101132½	0.7	1.0	d			Near
ESA	iPZ	121944½			(u)			Regional
ESA	ePZ	155115	0.8	1.0	u			Distant
ESA	ePZ	164844	0.5	0.8	u			Distant
ESA	ePZ eSN/	172723 2810			d	4°	172622	
ESA	iPZ iSN/	190328 0438	0.3	1.0	u	6°	190202	
ESA	ePZ	192328	0.8	1.0	d			Near
ESA	iPZ	211053	0.3	2.0	u			Regional
11th August, 1968.								
Willmore record paper loaded upside down								
12th August, 1968.								
ESA	iPZ	104310	0.2	2.0	u			Regional
ESA	ePZ	134926	0.5	1.0	u			Distant
ESA	ePZ	181416	0.6	1.2	d			Distant
ESA	ePZ	204053	0.6	1.5	d			Teleseism

Rabaul Central Observatory,
30th August, 1968.

(G.W. D'ADDARIO)
Volcanologist-in-Charge

17 SEP 1968

PEA AUG-68 No. 36.

TERRITORY OF PAPUA AND NEW GUINEA
GEOLOGICAL AND VOLCANOLOGICAL BRANCH
VOLCANOLOGICAL SECTION

PRELIMINARY EARTHQUAKE ANALYSIS
RABAUL CENTRAL OBSERVATORY
1968

Rabaul	RAB	From: AUG. 28. 1968 To : SEP. 3. 1968
Rabaul Harbour Network	WAN SUL RAL TAV VUL	From: AUG. 28. 1968 To : SEP. 3. 1968
Keravat	KRT	From: AUG. 28. 1968 To : SEP. 3. 1968
Esa'ala	ESA	From: To :
Tabele	TBL	From: To :
Agenahambo	AGE	From: To :
Waris	WAA	Not operational
Ulamona	ULA	Not operational
Piva	PIV	Not operational
Cape Gloucester	LAG	Not operational

STATION PERSONNEL

RAB Central Observatory, Rabaul.

Volcanologist-in-Charge	G.W.D'Addario
Volcanologist	R.F.Heming
Seismologist	M.Mancini
Seismogram	D.J.Cook, R.A.Page
Senior Technical Officer	N.O.Myers
Technical Officer	R.J.Conway
Volcanological Assistants	L.Topue, M.Gaiam, E.Ravian.
Technical Assistant	P.Daimbari
Trainee Volcanological Assistants	B.Talai, M.Salaiau, C.Matupit
Secretary	H.James

KRT Keravat Outstation.

Observer (part-time)	G.E.Chorick

TBL Tabele Observatory.

Observer	V.Kaita

ESA Esa'ala Observatory.

Observer	F.Dira

AGE Agenahambo Outstation.

Observer (part-time)	B.Kirke

The Rabaul Preliminary Earthquake Analysis (PEA) is produced by the staff under the direction of the Volcanologist-in-Charge from whom additional information and photocopies of seismogram records from all stations may be obtained on request.

Please address all communications to:-

Volcanologist-in-Charge
Central Observatory,
P.O. Box 386,
RABAUL. T.N.G.

SEISMOGRAPH STATIONS

Station (NEW GUINEA)	Code	South Latitude	East Longitude	Elev. (m)	Foundation.
Rabaul	RAB	04°11'28.6"	152°10'11.4"	183.5	Basalt Flow
Wanliss Street	WAN*	04°11'39.6"	152°10'32.5"	25.0	Basalt Flow
Sulphur Creek	SUL*	04°13'09.8"	152°10'33.3"	8.5	Unconsolidated volcanic ash
Rabalanakaia	RAL*	04°13'13.0"	152°12'07.0"	91.0	unconsolidated volcanic ash
Tavurvur	TAV*	04°13'52.18"	152°13'12.99"	27.0	Andesite flow
Taviliu	VUL*	04°16'58.2"	152°08'44.6"	332.2	Unconsolidated volcanic ash
Keravat	KRT	04°21'10.5"	152°03'06"	20.0	Alluvium
Tabele	TBL	04°06'04.67"	145°00'41.37"	179.5	Basalt Flow
Waris	WAA	04°07'00"	145°06'00"	48.0	Lapilli Tuff
Piva	PIV	06°12'00"	155°03'30"	60.0	Alluvium
Cape Gloucester	LAG	04°27'20"	148°26'00"	24.0	Lapilli Tuff
Ulamona (PAPUA)	ULA	04°59'24.0"	151°16'30.0"	17.0	Lapilli Tuff
Agenahambo	AGE	08°48'49"	148°05'56"	303.0	Unconsolidated volcanic ash
Esa'ala	ESA	09°44'18.2"	150°48'50.7"	46.4	Granite Gneiss

* Rabaul Harbour Network.

Station Instrumentation

Station & Instruments	Comp.	To.	Tg.	Trace speed mm/min	Approximate relative Magnification	Approximate damping
(NEW GUINEA)						
Rabaul Central Observatory RAB						
World-wide Standard	Z	1.0	0.74	60	12,500	Critical
	N.E.	1.0	0.74	60	6,250	Critical
	Z/N/E/	15.0	100.0	15	750	Critical
Benioff VR 14.7Kg	Zh	1.0	0.02	180+	4,000	Critical
+ Recording is triggered by the onset of any earthquake with pre-determined minimum amplitude. Recorder is stopped automatically by hour break pulse.						
Omori 15Kg	No	3.6	-	24	12	10.1 Air
Omori 15Kg	Eo	3.8	-	24	10	10.1 Air
Wood-Anderson Torsion	Na,Ea	0.8	-	60	2,800	Critical
Rabaul Harbuor Network						
Readings from the Harbour Network are entered in the PEA only for large earthquakes, with impulsive and sharply defined onset of phases.						
WAN° Benioff VR 14.7Kg	Z	1.0	0.02	60	5,240	Critical
SUL° Benioff VR 14.7Kg	Z	1.0	0.02	60	2,850	Critical
RAL° Benioff VR 14.7Kg	Z	1.0	0.02	60	8,075	Critical
TAV° Benioff VR 14.7Kg	Z	1.0	0.02	60	20,900	Critical
VUL° Benioff VR 14.7Kg	Z	1.0	0.02	60	5,000	Critical

Station & Instruments	Comp	To	Tg	Trace Speed mm/min	Approximate relative Magnification	Approximate damping
Rabaul Harbour Network (cont'd)						
° Signals from these stations are telemetered by land line to Helicorders (Geotech Mod. 2484) at the Central Observatory.						
°° Signals from this station are telemetered via VHF to its Helicorder at the Central Observatory.						
KRT Keravat Out-station						
Benioff MC 50Kg	Z	1.2	0.2	15	20% sensitivity	critical
Benioff MC 50Kg	N,E	1.2	0.2	15	10% sensitivity	critical
ULA Ulamona Field Station						
Willmore portable	Z	0.6	0.25	60	3,000	underdamped
PIV Piva Field Station						
Willmore portable	Z	0.6	0.25	60	3,000	underdamped
WAA Waris Field Station						
Willmore portable	Z	0.6	0.25	60	3,000	underdamped
LAG Cape Gloucester						
Willmore portable	Z	0.6	0.25	60	3,000	underdamped

N.B. These field stations consist of a permanent building in which instruments are installed when necessary.

Details of emergency field stations, within the Territory will be listed when in operation.

TBL Tabele Observatory						
Benioff VR 107.5Kg (PAPUA)	Z	1.0	0.2	60	1,350	critical
ESA Esa'ala Observatory						
Benioff VR 107.5Kg	Z	1.0	0.2	15	36,000	critical
Benioff VR 107.5Kg	N,E	1.0	0.2	15	18,000	critical
Benioff VR 107.5Kg	Z/N/E/	1.0	60.0	30	50% sensitivity	critical
AGE Agenahambo Station						
Willmore portable	Z	0.6	0.25	60	3,000	underdamped

VR Variable Reluctance

MC Moving-coil

Relative magnification curves of seismograph systems installed in the stations controlled by the Rabaul Central Observatory are listed once a month on the P.E.A.

PRESENTATION OF DATA

(reviewed in November, 1967)

All times are reduced to Greenwich Mean Time (GMT), which is 10 hours behind Eastern Standard Time.

At RAB and Harbour Network, the time signal is marked every minute on each seismogram record from the Observatory crystal chronometer. Second marks from radio signal VNG (Australia) are recorded on World-Wide Standard System S.P.=N component only according to the W.W.S.S. programme, at six hour intervals. Primary time is provided by W.W.S.S. equipment and secondary time by a Labtronic crystal chronometer with the accuracy of $\pm$ 5ms per day compared with VNG (Australia) with the aid of a chronoscope.

At TBL and AGE, the time signal is derived from a spring driven chronometer (Mercer) and marked each minute on records. Time accuracy is determined by comparison with signals from WWVH daily. Linear correction is applied to the daily drift.

On all seismogram records time increases from left to right and time break is upward.

At RAB* and Harbour Network the recording drum of each seismograph is driven by a 110VAC 60Hz synchronous motor. The 110VAC is frequency regulated by a crystal chronometer.

* The Omori recording drum is driven by a nonregulated 50Hz frequency supply.

At ESA and KRT power for recorder motors is frequency regulated by a crystal chronometer at 50Hz. Power for AGE and TBL and field stations is supplied by a 50Hz free running oscillator.

Direction of Motion

Upward direction of ground motion corresponds to upward trace motion on vertical seismogram records. Direction of component of ground motion to North or East corresponds to upward trace motion on horizontal seismogram records.

Vertical trace motion from impulsive onset of longitudinal waves of compressional or dilational ground movement is indicated by "u" or "d" accompanied by N,S,E, or W as per trace motion amplitude on horizontal seismogram records, to represent vectorially the direction of ground motion. "+" or "-" indicates upward or downward motion of the ground respectively, from a wave not known to be of the longitudinal type.

Accuracy of Readings

When readings are given with a decimal figure, they are to 1/10 of a second, other readings have been made to the nearest half second.

Crustal Phases

Px, Sx, Crustal phases, other than Pn and Sn for local and near earthquakes.

Felt Intensity

Information on maximum intensities of shocks reported felt is included. Intensities are given in Roman numerals based on the Modified Mercalli scale, of 1931.

Determination of Epicentre

Where no souce is cited, the determination of epicentral distance and origin time for local and regional earthquakes is carried out at the Central Observatory Rabaul from the S-P travel times, assuming a normal depth of the focus.

Geographical Designation of Epicentre

The regional names which follow the co-ordinates of epicentres located at the Central Observatory are meant only to supplement the co-ordinates and normally follow well-known geographical rather than geological features. Use is made of the full degree blocks according to the mehtod defined by E.A. Flinn and E.R. Engadhl in "A PROPOSED BASIS FOR GEOGRAPHICAL AND SEISMIC REGIONALIZATION", Seismic Data Laboratory Report NO. 101, U.I.D. Inc., Alexandria, Virginia, 1964, adopted by the U.S.C.G.S. for computer requirements.

Magnitude Definition and Determination

M_L - Local Magnitude (Richter, 1935) is calculated from the recorded trace amplitude of the Wood-Anderson torsion seismographs of stated physical constants (installed at the Observatory in November, 1967).

Maximum trace amplitude (0 to peak) expressed in millimetres and tenths is measured directly on both components. Magnitude is determined independantly and the arithmetic mean taken. M_L values are given to the tenth of a unit.

The station correction factor is assumed to be zero until better known.

M_S - Surface Wave Magnitude (Gutemberg & Richter, 1956) is calculated from the amplitude of surface waves of period near 20 seconds for shallow distant earthquakes.

M_B - Body Wave Magnitude is calculated from the ratio of amplitude over period for body waves on S.P.-Z of World-Wide Seismograph System only when depth is known. The magnification factor for the standard seismograph is taken into account.

m - Unified magnitude (Gutemberg & Richter, 1956) has the following relation to M_L , M_S, and M_B.

$$m = 1.7 + 0.8\ M_L - 0.01\ M^2_L$$

$$m = M_B \text{ (without correction)}$$

$$m = 2.5 + 0.63\ M_S$$

Local Magnitude of earthquakes recorded at RAB with clear S-P interval is tabulated on a Day-Distance (in Central Angle Degrees) graph which is added to the PEA monthly.

Symbols

i - impulsive and sharply defined beginning of a phase.

e - emergent and poorly defined beginning of a phase.

T - Period in seconds.

A - Peak-to-Trough trace amplitude in millimetres.

GM - Ground Motion.

Dist - Epicentral distance in central angle degrees.

H - Origin time.

h - Focal depth in kilometres.

CBM - Confused by microseisms.

PRESENTATION OF DATA
(cont'd)

Remarks

Local - Typical signature of an earthquake with epicentre within 0.9°.

Near - Typical signature of an earthquake with epicentre between 0.9° and 9°.

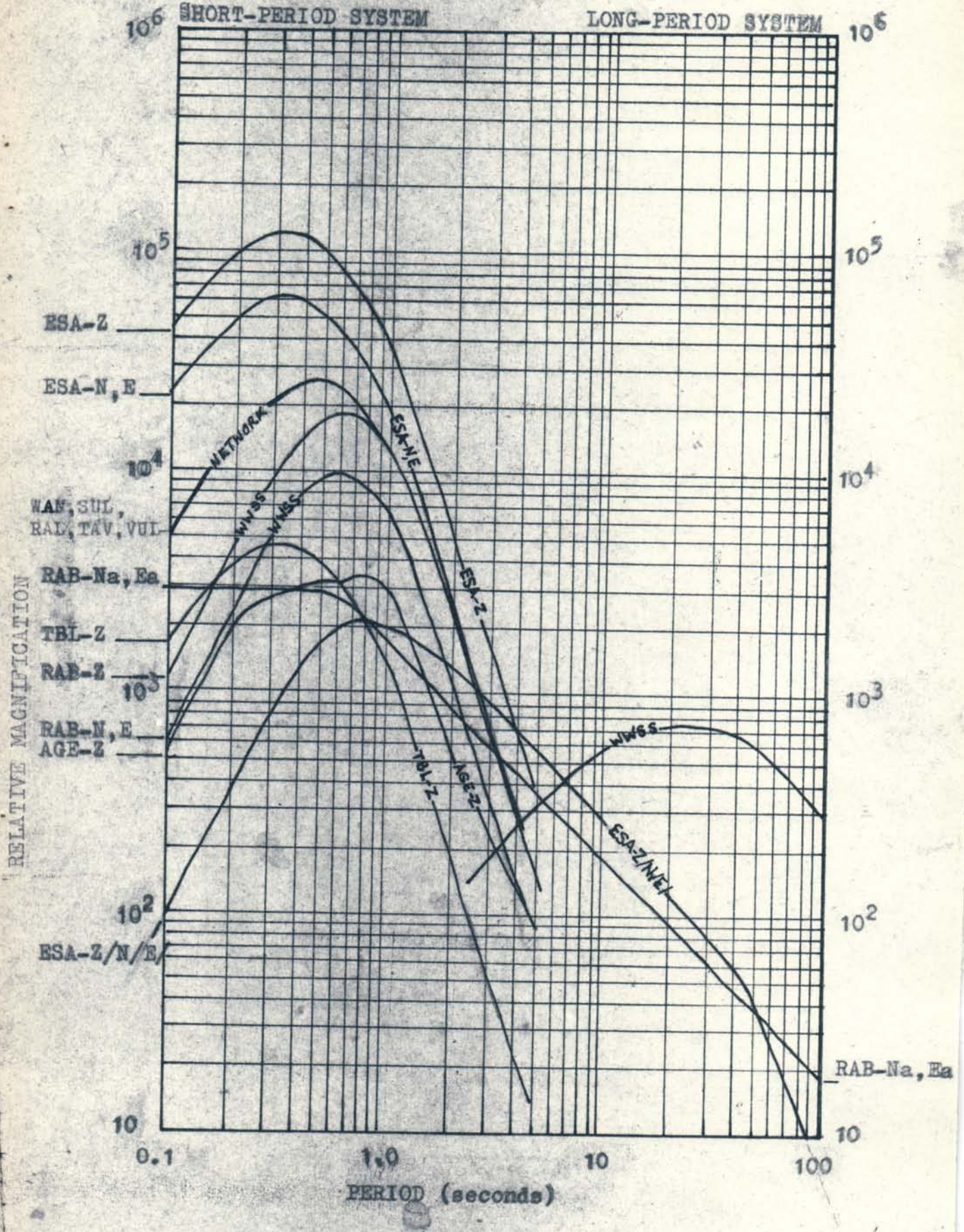
Distant - Typical signature of an earthquake with epicentre between 9° and 45°.

Teleseism - Typical signature of an earthquake with epicentre more than 45°.

Traces - Any recorded disperse waves or very weak unknown earthquake phases.

Local and Near earthquakes will be classified Regional, and Distant earthquakes willbe grouped with Teleseisms if sheer waves and their reflections are unidentifiable.

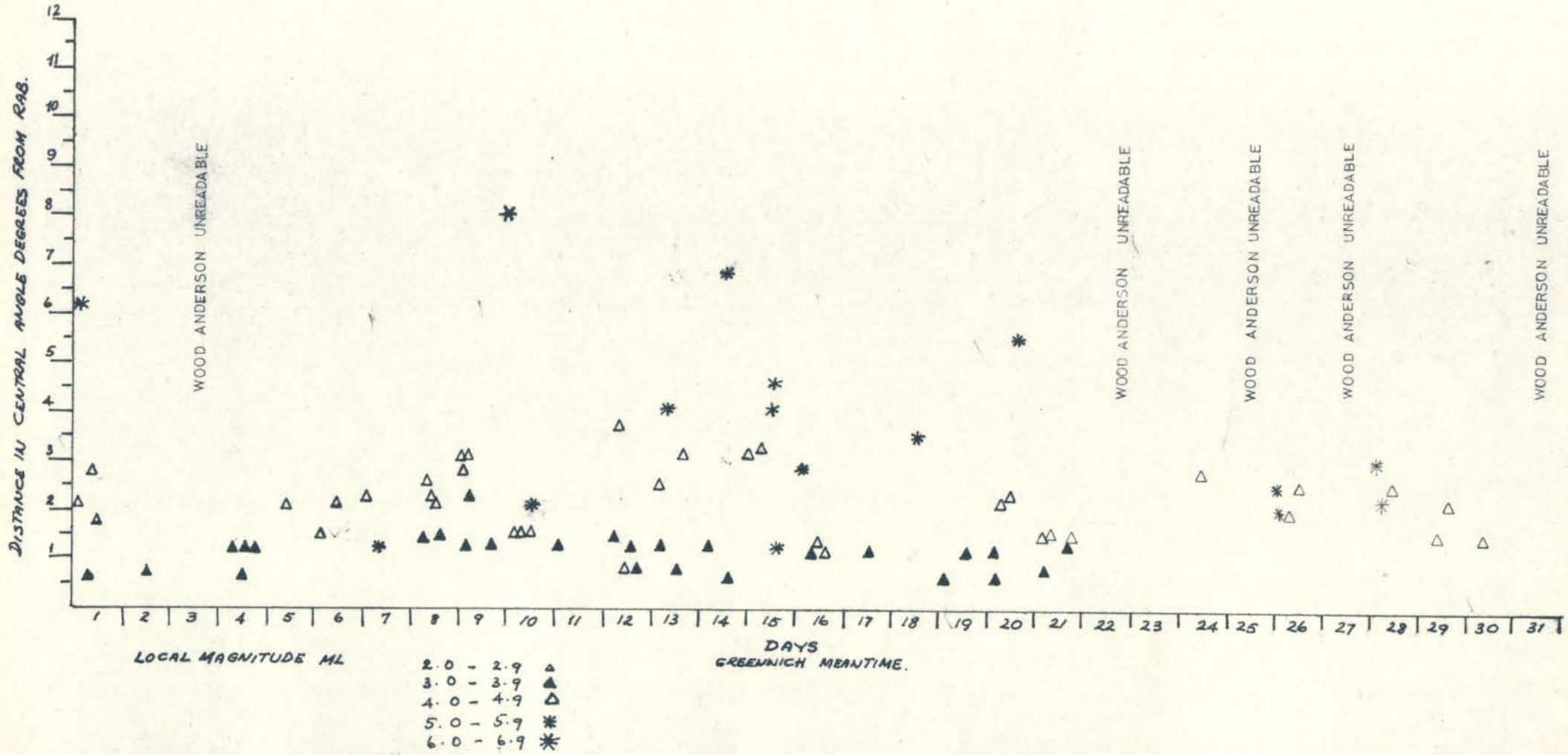
G. W. D'ADDARIO
Vulcanologist-in-Charge



FREQUENCY RESPONSE CURVES OF THE INSTRUMENTS

GWDA Nov.67

MAGNITUDE OF REGIONAL EARTHQUAKES WITH A CLEAR S-P INTERVAL.
AUGUST, 1968.



TOTAL NUMBER OF EARTHQUAKES AS RECORDED AND CLASSIFIED AT EACH STATION FOR THE MONTH OF AUGUST 1968.

LOCAL - 0 -.9°					NEAR 0.9° - 9°					REGIONAL					DISTANT 9° - 45°					TELESEISM 45° - -					TRACES				
18	10	4	10	9	50	14	4	11	26	73	23	11	22	28	62	9	3	9	12	14	1	1	1	2	47				
13	9			10	27	13			27	33	9			30	12	4	1		11	2	5					1			

Harbour Network Stations

Wanliss Street - WAN
Sulphur Creek - SUL
Rabalanakaia - RAL
Tavurvur - TAV
Taviliu - VUL

World-Wide Standard Station

Rabaul - RAB

Permanent Outstations

Keravat - KRT
Esa'ala - ESA
Agenahambo - AGE
Tabele - TBL

RAB	WAN	SUL	RAL	TAV
VUL	ESA	TBL	AGE	KRT

			T sec	A mm	GM	Dist	H	Remarks
RABAUL								
28th August, 1968.								
RAB	ePZ iZ iSE	000346 49.2 0421.0	0.5	2.0	d	3°	000300	M_L=5.3
WAN	ePZ iSZ	0347½ 0421.4			d	3°	000302	
SUL	ePZ	0345			d			
RAL	iPZ iSZ	46.6 0420.5	0.8	2.6	d	3°	000302	
TAV	iPZ	0345.3	0.4	4.0	d			
VUL	iPZ iSZ	45.5 0420.6	0.3	3.0	d	3°	000300	
KRT	iPZ iSE	0346.3 0422.3		4.0	u	3°	000259	
RAB	iPZ iZ iSN	052550.0 50.7 2616.0	0.4	1.2	u	2¼°	052516	M_L=5.1
WAN	iPZ iSZ	2549.7 2616.0	0.5	2.3	u	2¼°	052515	
RAL	eiPZ iSZ	2550 2615.4	0.4	3.0	u	2¼°	052516	
VUL	ePZ iSZ	2549 2614.0	0.5	5.0	u	2°	052515	
KRT	iPZ	2548.2	0.5	11.8	d			
RAB	ePZ eSN/ eScPN/ ePcSZ/	115621½ 0108 0305 08	1.0	1.0	d	27°		
WAN	ePZ	5621½			u			
TAV	ePZ	19½			u			
VUL	iPZ	21.7	1.0	1.0	u			
KRT	ePZ	21½			u			
RAB	ePZ iSN	124928½ 55.5	0.5	1.3	u	2¼°	124852	
KRT	iPZ iSN	24.5 51.4	0.3	5.0	d	2¼°	124849	
RAB	ePZ	150946	0.6	1.0	d			Distant
RAB	ePZ iZ eSN/	152944 47.6 3110	0.5	1.0	u	7½°	152753	Felt-Madang 05°13'S 145°48'E Intensity 1V.
VUL	ePZ	2945½	0.3	2.0	u			
KRT	ePZ	43	1.0	2.2	d			
RAB	ePZ iSN	173852 3920.6	0.5	1.0	d	2½°	173814	M_L=4.0

			T sec	A mm	GM	Dist	H	Remarks
28th August, 1968 (cont'd)								
TAV	iPZ iSZ	173849.9 3918.4	0.4	1.4	d	2½°	173812	
VUL	ePZ iSZ	3849 3919.8			d	2½°	173808	
KRT	iPZ iSN	3848.2 3916.4	0.4	2.2	d	2¼°	173811	
RAB	eiPZ iZ eSN/	204918 20.4 5456	1.0	1.5	d	35°		
KRT	iPZ	20.0			d			
RAB	iPZ iSN	214358.0 4405.0	0.3	12.0	u	½°	214349	
RAL	iPZ	4358.6	0.2	5.4	u			
VUL	iPZ	59.4	0.2	5.0	u			
29th August, 1968								
RAB	ePZ	014311	0.5	3.0	u			Distant
RAB	iPZ iSN	035709.0 17.0	0.4	1.5	d	½°	035658	
VUL	ePZ	11	0.3	5.0	u			
RAB	eZ/	081238			-			Traces
RAB	eiPZ iZ eSN/	142802 03.0 2926	0.3	2.0	u	7½°	142613	
TAV	ePZ	2802½	0.5	1.0	d			
VUL	ePZ	01½	0.6	2.0	u			
KRT	iPZ	02.6	0.8	3.2	u			
RAB	eZ/	162348			-			Traces
RAB	iPZ iZ	211509.3 16.0	1.0	1.5	d			Distant
TAV	ePZ	09½	1.0	1.2	d			
RAB	eZ/	232826			+			Traces
RAB	iPZ iSN	235210.7 30.0	0.3	7.6	d	1½°	235146	M_L=4.6
KRT	iPZ iSE	10.0 30.6	0.4	14.8	d	1½°	235144	
RAB	iPZ iSE	235825.4 54.8	0.5	4.0	u	2¼°	235747	M_L=4.9
KRT	iPZ iSE	22.7 49.0	0.3	7.5	u	2¼°	235748	

			T sec	A mm	GM	Dist	H	Remarks
30th August, 1968.								
RAB	iPZ	024802.0			d	2°	024730	C.B.M.
	iSE	26.0						
KRT	iPZ	024759.2	0.5	10.6	d	2¼°	024724	
	iSE	4826.5						
RAB	eZ/	030520			-			Traces
RAB	iPZ	051733.2			d	1°	051716	
	iSNa	46.0						
KRT	iPZ	051734.6	0.2	5.8	d	1¼°	051714	
	iSE	49.2						
RAB	ePZ/	062404				(42°)		
	e(S)E	3016						
RAB	eZ/	122437			+			Traces
RAB	iPZ	133240.0	0.5	7.2	u	4½°	133130	
	iSN/	3334.0						
KRT	iPZ	3238.2	0.5	7.5	u	4½°	133128	
	iSE	3334.2						
RAB	iPZ	163808.7			d	1½°	163743	M_L=4.4
	iSE/	28.0						
KRT	iPZ	09.4	0.4	10.0	d	1½°	163746	
	iZ	10.1						
	iSE	27.4						
31st August, 1968								
RAB	ePZ	044609			u	3½°	044515	C.B.M.
	eSE/	50						
KRT	iPZ	08.2	0.5	3.8	u			
RAB	ePZ	110046	0.4	3.5	u	23°		
	ePPZ/	0120						
	eSN/	0408						
	eLqN/	1224						
RAB	ePZ/	085428			d			Distant C.B.M.
RAB	iPZ	130909.0	0.5	3.0	d			Regional
VUL	iPZ	11.5	0.5	1.0	d			
KRT	iPZ	10.9	0.4	3.2	d	1¾°	130942	
	iSE	33.0						
RAB	iPZ	141357.3	0.5	5.0	d			Regioal
TAV	iPZ	57.0	0.2	2.0	d	4°	141254	
	iSZ	1445.0						
VUL	iPZ	1357.1	0.2	1.5	d			
KRT	iPZ	57.2	0.2	5.2	u	4¼°	141255	
	iSE	1435.0						
RAB	iPZ	194458.5	0.4	22.0	u	1½°	194434	
	eSN/	4516						
WAN	iPZ	4458.2			u			
SUL	iPZ	56.0			u			
RAL	iPZ	58.0			u			

			T sec	A mm	GM	Dist	H	Remarks
31st August, 1968 cont'd								
TAV	iPZ	194457.8			u			
VUL	iPZ	57.3			u			
KRT	iPZ	56.6	0.4	24.6	u			
1st September, 1968.								
Very strong microseismic activity throughout the day.								
RAB	iPZ eSE/	054430.2 55			d	2°	054357	C.B.M.
WAN	iPZ	30.8			d			C.B.M.
RAL	iPZ	30.8			d			
TAV	iPZ	30.1	0.6	16.2	d			
VUL	iPZ	29.7	0.3	25.0	d			
KRT	iPZ iSE	27.4 53.5	0.3	13.0	d	2¼°	054353	
RAB	eZ/	060834			-			Traces
RAB	eZ/	074056			-			Traces
RAB	ePZ/ eSN/	074450 5143				49°		
RAB	ePZ/ eSN/	141156 1218				1¾°	141127	
KRT	iPZ	141154.0	0.4	1.2	u			
RAB	iPZ eSE/	143131.0 56.0	0.4	15.0	d	2°	143058	
WAN	iPZ iSZ	30.8 57.0	0.4	9.1	d	2¼°	143056	
SUL	iPZ iSZ	31.1 57.0	0.3	8.2	d	2¼°	143057	
RAL	iPZ iSZ	30.9 55.4	0.5	19.0	d	2°	143057	
TAV	iPZ iSZ	30.5 56.5	0.5	14.0	d	2¼°	143056	
VUL	iPZ iSZ	30.0 55.2	0.4	31.0	d	2°	143057	
KRT	iPZ iSE	29.4 53.8			d	2°	143058	
RAB	iPZ ISN	171558.6 1617.0	0.5	5.8	u	1½°	171533	
WAN	iPZ iSZ	1558.5 1617.9		2.6	d	1½°	171533	
SUL	iPZ iSZ	1558.6 1617.6		2.8	d	1½°	171533	
RAL	iPZ	1558.6	0.2	9.0	u			
TAV	iPZ iSZ	58.0 1615.4	0.3	12.0	d	1¼°	171535	
VUL	iPZ iSZ	1557.7 1615.0	0.3	8.8	u	1¼°	171535	

			T sec	A mm	GM	Dist	H	Remarks
1st September, 1968 (cont'd)								
KRT	iPZ	171557.3	0.3	4.6	d	1½°	171532	
	iSE	1615.0						
RAB	eZ/	214346			-			Traces
RAB	iPZ	235634.2	0.5	13.2	u	2°	235604	M_L=4.5
	iSN/	57.0						
WAN	iPZ	33.7			d			
RAL	iPZ	33.8			d			
TAV	iPZ	33.7			d			
VUL	iPZ	33.8			d			
2nd September, 1968								
Very strong microseismic activity throughout the day.								
RAB	iPZ	073116.0	0.5	24.0	d	1½°	073052	M_L=5.0
	iSN/	34.0						
WAN	iPZ	16.3			d			
SUL	iPZ	16.2			d			
RAL	iPZ	16.1			d			
TAV	iPZ	16.0			d			
VUL	iPZ	15.5			d			
RAB	iPZ	073459.5	0.5	22.5	d	1½°	073436	M_L=4.2
	iSN/	3517.0						In coda of preceding shock.
RAB	iPZ	115540.7	0.5	93.0	d	1¼°	115518	M_L=4.7
	iSN/	58.0						
WAN	iPZ	40.5			d			
SUL	iPZ	40.7			d			
RAL	iPZ	40.3			d			
TAV	iPZ	40.0			d			
VUL	iPZ	39.9			d			
RAB	iPZ	150349.1	0.5	15.0	d	1¼°	150326	M_L=4.4
	iSN/	0406.0						
WAN	iPZ	0348.9			d			
TAV	iPZ	48.8			d			
VUL	iPZ	48.4			d			
RAB	eZ/	161731			+			Traces
RAB	eZ/	193936			+			Traces
NOTE:								
KRT 2nd September,1968								
KRT	iPZ	073116.0			d			
KRT	iPZ	115539.6	0.2	10.7	d			
KRT	iPZ	150348.0	0.3	2.6	d	1¼°	150326	

			T sec	A mm	GM	Dist	H	Remarks
3rd September, 1968.								
RAB	eZ/	002650			+			Traces C.B.M.
RAB	eZ/	051922			-			Traces C.B.M.
RAB	ePZ	080303	0.3	5.0	u			Regional
RAB	ePZ/ eSN/	083940 4916			u	79°		C.B.M.
RAB	iPZ	095322.0	0.3	3.0	d			Regional
WAN	iPZ	21.5	0.2	3.3	d			
RAL	iPZ	21.8			d			
TAV	iPZ	21.6			d			
VUL	iPZ	23.3	0.2	2.0	d			
KRT	iPZ	25.2	0.3	14.0	d			
RAB	iPZ iSN	114627.5 49.0	0.4	2.8	u	1¾°	114558	
RAB	eZ/	161854			+			Traces
RAB	iPZ iSN	170305.4 28.0	0.4	6.0	u	2°	170235	
WAN	iPZ iSZ	05.0 26.5	0.2	1.4	u	1½°	170237	
SUL	iPZ iSZ	05.0 28.5	0.2	1.8	u	2°	170234	
RAL	iPZ	04.0			u			
TAV	iPZ	03.0	0.2	2.0	d			
VUL	iPZ	03.0	0.3	1.6	d			
KRT	iPZ iSE	03.8 29.3	0.3	6.0	d	2¼°	170229	
RAB	eZ/	202326			+			Traces

Very strong microseismic activity throughout the day, Wood- Anderson unreadable.

Rabaul Central Observatory,
6th September, 1968.

(G.W.D'ADDARIO)
Volcanologist-in-Charge.

19 SEP 1968

PEA SEP-68 No. 37.

TERRITORY OF PAPUA AND NEW GUINEA
GEOLOGICAL AND VOLCANOLOGICAL BRANCH
VOLCANOLOGICAL SECTION

PRELIMINARY EARTHQUAKE ANALYSIS
RABAUL CENTRAL OBSERVATORY
1968

Rabaul	RAB	From: SEP. 4. 1968 To : SEP. 10. 1968
Rabaul Harbour Network	WAN SUL RAL TAV VUL	From: SEP. 4. 1968 To : SEP. 10. 1968
Keravat	KRT	From: SEP. 4. 1968 To : SEP. 9. 1968
Esa'ala	ESA	From: AUG. 13. 1968 To : AUG. 26. 1968
Agenahambo	AGE	From: To :
Waris	WAA	Not operational
Ulamona	ULA	Not operational
Piva	PIV	Not operational
Cape Gloucester	LAG	Not operational

STATION PERSONNEL

RAB Central Observatory, Rabaul.

Volcanologist-in-Charge	G.W.D'Addario
Volcanologist	R.F.Heming
Seismologist	M.Mancini
Seismogram	D.J.Cook, R.A.Page
Senior Technical Officer	N.O.Myers
Technical Officer	R.J.Conway
Volcanological Assistants	L.Topue, M.Gaiam, E.Ravian.
Technical Assistant	P.Daimbari
Trainee Volcanological Assistants	B.Talai, M.Salaiau, C.Matupit
Secretary	H.James

KRT Keravat Outstation.

Observer (part-time)	G.E.Chorick

TBL Tabele Observatory.

Observer	V.Kaita

ESA Esa'ala Observatory.

Observer	F.Dira

AGE Agenahambo Outstation.

Observer (part-time)	B.Kirke

The Rabaul Preliminary Earthquake Analysis (PEA) is produced by the staff under the direction of the Volcanologist-in-Charge from whom additional information and photocopies of seismogram records from all stations may be obtained on request.

Please address all communications to:-

Volcanologist-in-Charge
Central Observatory,
P.O. Box 386,
RABAUL. T.N.G.

SEISMOGRAPH STATIONS

Station (NEW GUINEA)	Code	South Latitude	East Longitude	Elev. (m)	Foundation.
Rabaul	RAB	04°11'28.6"	152°10'11.4"	183.5	Basalt Flow
Wanliss Street	WAN*	04°11'39.6"	152°10'32.5"	25.0	Basalt Flow
Sulphur Creek	SUL*	04°13'09.8"	152°10'33.3"	8.5	Unconsolidated volcanic ash
Rabalanakaia	RAL*	04°13'13.0"	152°12'07.0"	91.0	unconsolidated volcanic ash
Tavurvur	TAV*	04°13'52.18"	152°13'12.99"	27.0	Andesite flow
Taviliu	VUL*	04°16'58.2"	152°08'44.6"	332.2	Unconsolidated volcanic ash
Keravat	KRT	04°21'10.5"	152°03'06"	20.0	Alluvium
Tabele	TBL	04°06'04.67"	145°00'41.37"	179.5	Basalt Flow
Waris	WAA	04°07'00"	145°06'00"	48.0	Lapilli Tuff
Piva	PIV	06°12'00"	155°03'30"	60.0	Alluvium
Cape Gloucester	LAG	04°27'20"	148°26'00"	24.0	Lapilli Tuff
Ulamona (PAPUA)	ULA	04°59'24.0"	151°16'30.0"	17.0	Lapilli Tuff
Agenahambo	AGE	08°48'49"	148°05'56"	303.0	Unconsolidated volcanic ash
Esa'ala	ESA	09°44'18.2"	150°48'50.7"	46.4	Granite Gneiss

* Rabaul Harbour Network.

Station Instrumentation

Station & Instruments	Comp.	To.	Tg.	Trace speed mm/min	Approximate relative Magnification	Approximate damping
(NEW GUINEA)						
Rabaul Central Observatory RAB						
World-wide Standard	Z	1.0	0.74	60	12,500	Critical
	N.E.	1.0	0.74	60	6,250	Critical
	Z/N/E/	15.0	100.0	15	750	Critical
Benioff VR 14.7Kg	Zh	1.0	0.02	180+	4,000	Critical
Omori 15Kg	No	3.6	-	24	12	10.1 Air
Omori 15Kg	Eo	3.8	-	24	10	10.1 Air
Wood-Anderson Torsion	Na,Ea	0.8	-	60	2,800	Critical

\+ Recording is triggered by the onset of any earthquake with pre-determined minimum amplitude. Recorder is stopped automatically by hour break pulse.

Rabaul Harbuor Network

Readings from the Harbour Network are entered in the PEA only for large earthquakes, with impulsive and sharply defined onset of phases.

WAN°	Benioff VR 14.7Kg Z	1.0	0.02	60	5,240	Critical
SUL°	Benioff VR 14.7Kg Z	1.0	0.02	60	2,850	Critical
RAL°	Benioff VR 14.7Kg Z	1.0	0.02	60	8,075	Critical
TAV°	Benioff VR 14.7Kg Z	1.0	0.02	60	20,900	Critical
VUL°	Benioff VR 14.7Kg Z	1.0	0.02	60	5,000	Critical

Station & Instruments	Comp	To	Tg	Trace Speed mm/min	Approximate relative Magnification	Approximate damping
Rabaul Harbour Network (cont'd)						
o Signals from these stations are telemetered by land line to Helicorders (Geotech Mod. 2484) at the Central Observatory.						
oo Signals from this station are telemetered via VHF to its Helicorder at the Central Observatory.						
KRT Keravat Out-station						
Benioff MC 50Kg	Z	1.2	0.2	15	20% sensitivity	critical
Benioff MC 50Kg	N,E	1.2	0.2	15	10% sensitivity	critical
ULA Ulamona Field Station						
Willmore portable	Z	0.6	0.25	60	3,000	underdamped
PIV Piva Field Station						
Willmore portable	Z	0.6	0.25	60	3,000	underdamped
WAA Waris Field Station						
Willmore portable	Z	0.6	0.25	60	3,000	underdamped
LAG Cape Gloucester						
Willmore portable	Z	0.6	0.25	60	3,000	underdamped

N.B. These field stations consist of a permanent building in which instruments are installed when necessary.

Details of emergency field stations, within the Territory will be listed when in operation.

TBL Tabele Observatory						
Benioff VR 107.5Kg (PAPUA)	Z	1.0	0.2	60	1,350	critical
ESA Esa'ala Observatory						
Benioff VR 107.5Kg	Z	1.0	0.2	15	36,000	critical
Benioff VR 107.5Kg	N,E	1.0	0.2	15	18,000	critical
Benioff VR 107.5Kg	Z/N/E/	1.0	60.0	30	50% sensitivity	critical
AGE Agenahambo Station						
Willmore portable	Z	0.6	0.25	60	3,000	underdamped

VR Variable Reluctance

MC Moving-coil

Relative magnification curves of seismograph systems installed in the stations controlled by the Rabaul Central Observatory are listed once a month on the P.E.A.

PRESENTATION OF DATA

(reviewed in November, 1967)

All times are reduced to Greenwich Mean Time (GMT), which is 10 hours behind Eastern Standard Time.

At RAB and Harbour Network, the time signal is marked every minute on each seismogram record from the Observatory crystal chronometer. Second marks from radio signal VNG (Australia) are recorded on World-Wide Standard System S.P.=N component only according to the W.W.S.S. programme, at six hour intervals. Primary time is provided by W.W.S.S. equipment and secondary time by a Labtronic crystal chronometer with the accuracy of ± 5ms per day compared with VNG (Australia) with the aid of a chronoscope.

At TBL and AGE, the time signal is derived from a spring driven chronometer (Mercer) and marked each minute on records. Time accuracy is determined by comparison with signals from WWVH daily. Linear correction is applied to the daily drift.

On all seismogram records time increases from left to right and time break is upward.

At RAB* and Harbour Network the recording drum of each seismograph is driven by a 110VAC 60Hz synchronous motor. The 110VAC is frequency regulated by a crystal chronometer.

* The Omori recording drum is driven by a nonregulated 50Hz frequency supply.

At ESA and KRT power for recorder motors is frequency regulated by a crystal chronometer at 50Hz. Power for AGE and TBL and field stations is supplied by a 50Hz free running oscillator.

Direction of Motion

Upward direction of ground motion corresponds to upward trace motion on vertical seismogram records. Direction of component of ground motion to North or East corresponds to upward trace motion on horizontal seismogram records.

Vertical trace motion from impulsive onset of longitudinal waves of compressional or dilational ground movement is indicated by "u" or "d" accompanied by N,S,E, or W as per trace motion amplitude on horizontal seismogram records, to represent vectorially the direction of ground motion. "+" or "-" indicates upward or downward motion of the ground respectively, from a wave not known to be of the longitudinal type.

Accuracy of Readings

When readings are given with a decimal figure, they are to 1/10 of a second, other readings have been made to the nearest half second.

Crustal Phases

Px, Sx, Crustal phases, other than Pn and Sn for local and near earthquakes.

Felt Intensity

Information on maximum intensities of shocks reported felt is included. Intensities are given in Roman numerals based on the Modified Mercalli scale, of 1931.

Determination of Epicentre

Where no souce is cited, the determination of epicentral distance and origin time for local and regional earthquakes is carried out at the Central Observatory Rabaul from the S-P travel times, assuming a normal depth of the focus.

Geographical Designation of Epicentre

The regional names which follow the co-ordinates of epicentres located at the Central Observatory are meant only to supplement the co-ordinates and normally follow well-known geographical rather than geological features. Use is made of the full degree blocks according to the mehtod defined by E.A. Flinn and E.R. Engadhl in "A PROPOSED BASIS FOR GEOGRAPHICAL AND SEISMIC REGIONALIZATION", Seismic Data Laboratory Report NO. 101, U.I.D. Inc., Alexandria, Virginia, 1964, adopted by the U.S.C.G.S. for computer requirements.

Magnitude Definition and Determination

M_L - Local Magnitude (Richter, 1935) is calculated from the recorded trace amplitude of the Wood-Anderson torsion seismographs of stated physical constants (installed at the Observatory in November, 1967).

Maximum trace amplitude (0 to peak) expressed in millimetres and tenths is measured directly on both components. Magnitude is determined independantly and the arithmetic mean taken. M_L values are given to the tenth of a unit.

The station correction factor is assumed to be zero until better known.

M_S - Surface Wave Magnitude (Gutemberg & Richter, 1956) is calculated from the amplitude of surface waves of period near 20 seconds for shallow distant earthquakes.

M_B - Body Wave Magnitude is calculated from the ratio of amplitude over period for body waves on S.P.-Z of World-Wide Seismograph System only when depth is known. The magnification factor for the standard seismograph is taken into account.

m - Unified magnitude (Gutemberg & Richter, 1956) has the following relation to M_L , M_S, and M_B.

$$m = 1.7 + 0.8\ M_L - 0.01\ M^2_L$$

$$m = M_B \text{ (without correction)}$$

$$m = 2.5 + 0.63\ M_S$$

Local Magnitude of earthquakes recorded at RAB with clear S-P interval is tabulated on a Day-Distance (in Central Angle Degrees) graph which is added to the PEA monthly.

Symbols

i - impulsive and sharply defined beginning of a phase.

e - emergent and poorly defined beginning of a phase.

T - Period in seconds.

A - Peak-to-Trough trace amplitude in millimetres.

GM - Ground Motion.

Dist - Epicentral distance in central angle degrees.

H - Origin time.

h - Focal depth in kilometres.

CBM - Confused by microseisms.

PRESENTATION OF DATA
(cont'd)

Remarks

Local - Typical signature of an earthquake with epicentre within 0.9°.

Near - Typical signature of an earthquake with epicentre between 0.9° and 9°.

Distant - Typical signature of an earthquake with epicentre between 9° and 45°.

Teleseism - Typical signature of an earthquake with epicentre more than 45°.

Traces - Any recorded disperse waves or very weak unknown earthquake phases.

Local and Near earthquakes will be classified Regional, and Distant earthquakes willbe grouped with Teleseisms if sheer waves and their reflections are unidentifiable.

G. W. D'ADDARIO
Vulcanologist-in-Charge

.	.	.	T sec	A mm	GM	Dist	H	Remarks
RABAUL								
4th September, 1968.								
RAB	eZ/	074728			+			Traces
RAB	eZ/	105846			+			Traces
RAB	ePZ	131906½	0.5	3.0	c	(20°)		
	e(S)N/	2246						
KRT	iPZ	1908.8	0.5	1.8	c			Distant
RAB	iPZ	153627.1		2.1	d	1°	153608	M_L3.7
	iSN	41.7						
VUL	iPZ	26.5	0.5	2.5	d	1°	153609	
	iSZ	39.9						
KRT	iPZ	25.7	0.4	2.8	c	1°	153608	
	iSE	38.5						
RAB	iPZ	153859.8	0.5	3.0	d	1¼°	153838	M_L4.5
VUL	iPZ	59.6	0.5	9.2	d	1¼°	153837	
	iSZ	3916.5						
KRT	iPZ	3858.0	0.3	4.5	d	1¼°	153838	
	iSE	3913.4						
RAB	iPZ	170207.0	0.5	3.1	c			Regional
KRT	iPZ	08.8	0.6	1.6	c			Regional
5th September, 1968.								
RAB	ePZ	021054½	1.0	1.0	d	16½°		
	eSE/	1358						
RAB	eiPZ	034603	0.5	1.0	d	2¼°	034524	M_L5.8
	iZ	06						
	iSN	33.0						Felt Rabaul Int. I-II 04°11'S 152°10'E
WAN	ePZ	03½			(c)			
	iZ	08.0						
SUL	ePZ	03½	0.2	4.0	d			
	iZ	07.1						
RAL	eiPZ	03½			d			
	iZ	07.5						
TAV	iPZ	03.1			d			
	iZ	05.5						
VUL	iPZ	03.4	0.2	3.0	c			
	iZ	07.0						
KRT	eiPZ	03½	0.3	3.4	d	2½°	034523	
	iZ	04.8						
	iSE	34.5						

.	.	.	T sec	A mm	GM	Dist	H	Remarks
5th September, 1968 continued.								
RAB	iPZ iSN/	043232.6 46.0	0.3	22.0	c	1°	043215	M_L5.0 Felt Rabaul Int. I-II 04°11"S 152°10"E
WAN	iPZ	32.4			d			
SUL	iPZ	32.2			c			
RAL	iPZ	30.0			c			
VUL	iPZ	33.7			d			
KRT	iPZ	34.9	0.4	12.0	d	1°	043216	
RAB	iPZ eSN	052701.4 28	0.4	3.0	c	2¼°	052625	M_L4.2
RAB	ePZ	063825	0.4	1.5	d			Distant
RAB	eZ/	1020 04			-			Traces
RAB	iPZ iSN	111623.4 32.2	0.3	4.0	d	½°	111611	M_L3.6
WAN	iPZ iSZ	23.4 31.0	0.2	9.5	d	¼°	111614	
SUL	iPZ iSZ	23.6 31.0			c	¼°	111613	
RAL	iPZ iSZ	23.3 31.0	0.1		d	¼°	111613	
VUL	iPZ iSZ	25.0 33.0	0.2	4.5	c	¼°	111617	
RAB	iPZ eSN	114746.5 4803	0.3	3.0	d	1¼°	114723	M_L3.5
KRT	iPZ iSE	4745.5 4802.0	0.4	3.2	c	1¼°	114723	
RAB	ePZ e(S)N	170509 0656	0.6	2.0	c	(9½°)	170251	Felt Tari Int. IV 05°52"S 142°57"E
KRT	ePZ	0505½	0.8	1.8	d			
6th September, 1968.								
RAB	ePZ	032607	0.6	3.0	c			Distant
RAB	ePZ eSN/	074048 4430	o.5	2.0	c	20°		
RAB	iPZ iZ iSE	093023.2 27.0 41.0	0.3	10.0	d	1½°	092959	M_L4.7
WAN	iPZ iSZ	23.2 40.8			d	1½°	092959	
SUL	iPZ	23.2			d			
RAL	iPZ iSZ	23.2 42.0	0.3	11.0	d	1½°	092958	
TAV	iPZ iSZ	23.0 42.1		22.4	d	1½°	092958	

			T sec	A mm	GM	Dist	H	Remarks
6th September, 1968 continued.								
VUL	iPZ	093022.6			d	1½°	092957	
	iSZ	43.2						
KRT	iPZ	30.8			d	1½°	092958	
	iSZ	50.0						
RAB	ePZ	140524½	0.4	1.0	d	(27°)		
	e(S)E/	0958						
RAB	iPZ	193021.5	0.8	3.0	c	(42°)		
	e(S)E/	3646						
WAN	iPZ	3021.5	0.8	1.8	c			
RAL	ePZ	22	0.8	3.4	c			
TAV	iPZ	21.8	1.0	7.2	c			
VUL	ePZ	22	0.6	3.0	d			
KRT	ePZ	21½	1.0	1.4	c			
7th September, 1968.								
Strong microseismic activity.								
RAB	eZ/	032706			-			Traces C.B.M
RAB	iPZ	064934.2	0.5	4.0	d	7½°	064740	M_L 6.2
	iZ	41.0						
	iSE/	5102						Felt Madang Int. III 05°13'S 145° 48'E
								Manam Int. III 04°05'S 145°05'E
WAN	iPZ	4935.0			c			
RAL	iPZ	35.0			d			
TAV	iPZ	35.0			d			
VUL	iPZ	35.2			d			
KRT	iPZ	32.8	0.5	6.0	d			
RAB	iPZ	170848.0	0.5	39.0	cSE	1½°	070822	M_L 4.6
	eSE/	0908						
WAN	iPZ	0848.0			c			
SUL	iPZ	48.0			d			
RAL	iPZ	47.8			c			
TAV	iPZ	47.8			c			
VUL	iPZ	47.0			d			
KRT	iPZ	45.3			d			
RAB	iPZ	211049.0	0.5	5.0	d	1°	211029	
	eSE/	1104						
WAN	ePZ	1048½	0.6	5.0	d	1¼°	211025	
	iSZ	1105.5						
RAL	iPZ	1048.8		6.2	d			
TAV	iPZ	48.0			d			
VUL	iPZ	48.0	0.3	17.0	d			
KRT	iPZ	48.2	0.3	5.8	d	1°	211027	
	iSE	1104.0						

.	.	.	T sec	A mm	GM	Dist	H	Remarks
8th September, 1968.								
RAB	ePZ e(S)N/	002118 2504	0.8	2.5	d	(15°)		
RAB	iPZ	013817.0	0.4	3.0	d			Regional C.B.M
KRT	iPZ iSE	15.7 36.2	0.3	8.8	d	1½°	013747	
RAB	ePZ eSN/	133444 3840	0.8	1.0	c	22°		
RAB	iPZ iZ iSN/	151437.5 39.0 1611.0	1.0	4.0	d	8¼°	151236	M_L6.4 M_B6.1
								Felt Maprik Int. VI 03°38'S 143° 03'E
								Yangoru Int. VI 03°40'S 143°18'E
								Wewak Int. VI 03°34'S 143°38'E
								Koboibus Int. VII
								Angoram Int.III-IV 04°05'S 144° 05'E
								Imonda Int. III

Felt widely over Sepik District and followed by a swarm of felt after-shocks of lesser intensity and accompanied by explosive sounds.

Epicentre:- 144°25'E 3°50'S

WAN	iPZ	1437.2			d			Near
SUL	iPZ	37.9			d			Near
RAL	iPZ	37.7			d			Near
TAV	iPZ	38.0			d			Near
VUL	iPZ	37.6			d			Near
KRT	eiPZ iZ	35 36.5	1.0	27.4	c			Near
RAB	iPZ	153422.4	0.8	2.0	d			Near
KRT	ePZ	20½	1.0	3.0	d			Near
RAB	iPZ	195008.2	0.5	3.5	d			Near
RAB	ePZ	203316	0.6	1.0	c			Near
9th September, 1968.								
Microseismic activity between 090045 to 090600 hours.								
RAB	ePZ	023915½	0.5	3.0	c			(Distant)
RAB	eZ/	040309			+			Traces
RAB	iPZ eSN	090257.6 0334½	0.4	3.2	d	3¼°	090209	M_L4.5
RAL	ePZ	55			d			
VUL	ePZ iSE	0254 0334.0	0.5	1.2	d	3½°	090202	

			T sec	A mm	GM	Dist	H	Remarks
9th September, 1968 continued.								
RAB	iPZ	150917.4	0.3	5.0	c			Local
	iSN	20.0						
WAN	iPZ	17.4	0.2	8.2	d			
RAL	iPZ	17.6	0.2	3.0	d			
VUL	iPZ	16.0	0.4	14.8	c			
KRT	iPZ	16.8			d			
	~~iSE~~	~~19.4~~						Local
RAB	ePZ	164507	0.5	1.0	c	10½°	164234	Felt at Maprik Int. III 3°38'S 143°03'E
	eSN/	4706						
TAV	ePZ	4507½			c			
VUL	ePZ	07½	1.0	2.0	c			
10th September, 1968.								
RAB	iPZ	022358.2			dSE	1½°	022334	M_L 5.1 Felt Rabaul Int. I-III 04°11'S 152°10'E
	iSNa	2416.0						
WAN	iPZ	2358.0			d			
RAL	iPZ	58.0			d			
TAV	iPZ	57.4			d			
VUL	iPZ	57.2			d			
RAB	ePZ	052714	0.5	1.8	c	10½°	052442	M_L 5.8 Felt Maprik Int. IV 3°38'S 143° 03'E
	eSN/	2912						
RAB	ePZ	054214	0.5	1.6	c	11½°	?	M_L 6.1 Felt Maprik Int. III 3°38'S 143° 03'E
	eSN/	4422						
RAB	eZ/	070256			+			Traces
RAB	eiPZ	212847	0.5	1.0	c			Regional
	iZ	47.3						
WAN	ePZ	47	0.6	1.0	c			
RAL	ePZ	47	0.5		c			
TAV	ePZ	47	0.4	0.8	c			

. . .		T sec	A mm	GM	Dist	H	Remarks
ESA'ALA							
13th August, 1968							
ESA	ePZ 025830 iSE/ 5915.5	0.5	1.0	u	3¾°	025731	
ESA	iPZ/ 124441.5 iSN/ 4526.0	0.8	15.0	d	3¾°	124344	
ESA	ePZ/ 193918½ iPPZ/ 28.2 isPN/ 59.0 iSN/ 4239.5		6.0	d	18°		
ESA	iPZ 234044.2			d			
14th August, 1968.							
ESA	ePZ/ 222039½			d			
15th August, 1968.							
ESA	iPZ/ 065702.0 iPPZ/ 46.0 iSN/ 070001.0 iSSE/ 0115.0	1.0	9.0	u	37°		
ESA	iPZ 162647.5 ePZ/ 2707½ iSE/ 26.5	0.2	0.3	u	3¼°	162558	
ESA	ePZ/ 174506½ iPPZ/ 55.5 eSN/ 4815½			u	40°		
ESA	iPZ/ 192128.5 iSE/ 2227.0	1.0	18.0	d	5°	192013	
16th August, 1968							
ESA	iPZ/ 035156 iSN/ 5221			u	2°	035123	
ESA	ePZ/ 104700	0.4	3.0	u			
ESA	iPZ 220815.5			d			Local
17th August, 1968.							
ESA	iPZ/ 040515.0 iSN/ 0605.0	1.0	9.0	u	4¼°	04 04.10	
ESA	iPZ/ 044815.0	0.9	4.0	u			Local
ESA	ePZ/ 185207½			d			
ESA	ePZ/ 185619½		1.0	d			After shock
ESA	ePZ 204901½			u			
ESA	ePZ 213025½			d			
ESA	iPZ/ 225807.4	0.9	1.0	d			Local

.	.	.	T sec	A mm	GM	Dist	H	Remarks
18th August, 1968.								
ESA	ePZ/	053128	0.8	2.0	d	3¼°	053035	
	iSE/	3208.0						
ESA	ePZ/	152113	1.0	2.0	d	1°	152055	
	iSN/	26.0						
ESA	ePZ	174017½	0.6	1.8	u			Local
ESA	iPZ/	181112.5	1.0	5.3	d	18½°		
	iPPZ/	1223.5						
	iSE/	1429.0						
	iPcPZ/	1539.5						
ESA	iPZ	183939.5			u			Overlapping traces
19th August, 1968.								
ESA	iPZ/	154808		7.0	u			Distant
20th August, 1968.								
ESA	ePZ/	111934½		12.0	u	17°		
	iSN/	2249.0						
21st August, 1968.								
ESA	ePZ/	180237½		13.0	u	(35°)		Superimposed shock
	iPPZ/	0413						
	i(S)N/	08(24)						
ESA	iPZ/	191413.0	0.6	5.0	u	4¼°	190309	
	iSN/	1502.0						
22nd August, 1968.								
ESA	ePZ	140943½		1.0	d			Distant
ESA	iPZ/	162300.5		5.0	d	1½°	162254	
	iSN/	20.5						
ESA	iPZ/	162630.5	0.8	6.0	d			After shock
ESA	ePZ	202634	0.3	0.6	d			Regional
23rd August, 1968.								
ESA	ePZ/	114747	1.4	5.0	d	3½°	114653	
	iSE/	4828.3						
ESA	iPZ	141708.5			d			Regional
24th August, 1968.								
ESA	iPZ	120710.5	0.4	7.0	d			Regional
25th August, 1968.								
ESA	iPZ	013656.8			d			Local
ESA	ePZ/	132747	1.0	1.0	d			Distant
ESA	iPZ	154707.6						Local

.	.	.	T sec	A mm	GM	Dist	H	Remarks
26th August, 1968.								
ESA	ePZ/	014048.2	1.0	1.0	d	4°	013935	
	iSN/	4136.0						

Rabaul Central Observatory
13th September, 1968.

G.W. D'ADDARIO
Volcanologist-in-Charge

30 SEP 1968

PEA SEP-68 No.38.

TERRITORY OF PAPUA AND NEW GUINEA
GEOLOGICAL AND VOLCANOLOGICAL BRANCH
VOLCANOLOGICAL SECTION

PRELIMINARY EARTHQUAKE ANALYSIS
RABAUL CENTRAL OBSERVATORY
1968

Rabaul	RAB	From: SEP. 11. 1968 To : SEP. 17. 1968
Rabaul Harbour Network	WAN SUL RAL TAV VUL	From: SEP. 11. 1968 To : SEP. 17. 1968
Keravat	KRT	From: SEP. 10. 1968 To : SEP. 17. 1968
Esa'ala	ESA	From: AUG. 27. 1968 To : SEP. 2. 1968
Agenahambo	AGE	From: To :
Waris	WA	Not operational
Ulamona	ULA	Not operational
Piva	PIV	Not operational
Cape Gloucester	LAG	Not operational

STATION PERSONNEL

RAB Central Observatory, Rabaul.

Volcanologist-in-Charge	G.W.D'Addario
Volcanologist	R.F.Heming
Seismologist	M.Mancini
Seismogram	D.J.Cook, R.A.Page
Senior Technical Officer	N.O.Myers
Technical Officer	R.J.Conway
Volcanological Assistants	L.Topue, M.Gaiam, E.Ravian.
Technical Assistant	P.Daimbari
Trainee Volcanological Assistants	B.Talai, M.Salaiau, C.Matupit
Secretary	H.James

KRT Keravat Outstation.

Observer (part-time)	G.E.Chorick

TBL Tabele Observatory.

Observer	V.Kaita

ESA Esa'ala Observatory.

Observer	F.Dira

AGE Agenahambo Outstation.

Observer (part-time)	B.Kirke

The Rabaul Preliminary Earthquake Analysis (PEA) is produced by the staff under the direction of the Volcanologist-in-Charge from whom additional information and photocopies of seismogram records from all stations may be obtained on request.

Please address all communications to:-

Volcanologist-in-Charge
Central Observatory,
P.O. Box 386,
RABAUL. T.N.G.

SEISMOGRAPH STATIONS

Station (NEW GUINEA)	Code	South Latitude	East Longitude	Elev. (m)	Foundation.
Rabaul	RAB	04°11'28.6"	152°10'11.4"	183.5	Basalt Flow
Wanliss Street	WAN*	04°11'39.6"	152°10'32.5"	25.0	Basalt Flow
Sulphur Creek	SUL*	04°13'09.8"	152°10'33.3"	8.5	Unconsolidated volcanic ash
Rabalanakaia	RAL*	04°13'13.0"	152°12'07.0"	91.0	unconsolidated volcanic ash
Tavurvur	TAV*	04°13'52.18"	152°13'12.99"	27.0	Andesite flow
Taviliu	VUL*	04°16'58.2"	152°08'44.6"	332.2	Unconsolidated volcanic ash
Keravat	KRT	04°21'10.5"	152°03'06"	20.0	Alluvium
Tabele	TBL	04°06'04.67"	145°00'41.37"	179.5	Basalt Flow
Waris	WAA	04°07'00"	145°06'00"	48.0	Lapilli Tuff
Piva	PIV	06°12'00"	155°03'30"	60.0	Alluvium
Cape Gloucester	LAG	04°27'20"	148°26'00"	24.0	Lapilli Tuff
Ulamona (PAPUA)	ULA	04°59'24.0"	151°16'30.0"	17.0	Lapilli Tuff
Agenahambo	AGE	08°48'49"	148°05'56"	303.0	Unconsolidated volcanic ash
Esa'ala	ESA	09°44'18.2"	150°48'50.7"	46.4	Granite Gneiss

* Rabaul Harbour Network.

Station Instrumentation

Station & Instruments	Comp.	To.	Tg.	Trace speed mm/min	Approximate relative Magnification	Approximate damping
(NEW GUINEA)						
Rabaul Central Observatory RAB						
World-wide Standard	Z	1.0	0.74	60	12,500	Critical
	N.E.	1.0	0.74	60	6,250	Critical
	Z/N/E/	15.0	100.0	15	750	Critical
Benioff VR 14.7Kg	Zh	1.0	0.02	180+	4,000	Critical
+ Recording is triggered by the onset of any earthquake with pre-determined minimum amplitude. Recorder is stopped automatically by hour break pulse.						
Omori 15Kg	No	3.6	-	24	12	10.1 Air
Omori 15Kg	Eo	3.8	-	24	10	10.1 Air
Wood-Anderson Torsion	Na,Ea	0.8	-	60	2,800	Critical
Rabaul Harbuor Network						
Readings from the Harbour Network are entered in the PEA only for large earthquakes, with impulsive and sharply defined onset of phases.						
WAN° Benioff VR 14.7Kg	Z	1.0	0.02	60	5,240	Critical
SUL° Benioff VR 14.7Kg	Z	1.0	0.02	60	2,850	Critical
RAL° Benioff VR 14.7Kg	Z	1.0	0.02	60	8,075	Critical
TAV° Benioff VR 14.7Kg	Z	1.0	0.02	60	20,900	Critical
VUL° Benioff VR 14.7Kg	Z	1.0	0.02	60	5,000	Critical

Station & Instruments	Comp	To	Tg	Trace Speed mm/min	Approximate relative Magnification	Approximate damping
Rabaul Harbour Network (cont'd)						
o Signals from these stations are telemetered by land line to Helicorders (Geotech Mod. 2484) at the Central Observatory.						
oo Signals from this station are telemetered via VHF to its Helicorder at the Central Observatory.						
KRT Keravat Out-station						
Benioff MC 50Kg	Z	1.2	0.2	15	20% sensitivity	critical
Benioff MC 50Kg	N,E	1.2	0.2	15	10% sensitivity	critical
ULA Ulamona Field Station						
Willmore portable	Z	0.6	0.25	60	3,000	underdamped
PIV Piva Field Station						
Willmore portable	Z	0.6	0.25	60	3,000	underdamped
WAA Waris Field Station						
Willmore portable	Z	0.6	0.25	60	3,000	underdamped
LAG Cape Gloucester						
Willmore portable	Z	0.6	0.25	60	3,000	underdamped

N.B. These field stations consist of a permanent building in which instruments are installed when necessary.

Details of emergency field stations, within the Territory will be listed when in operation.

TBL Tabele Observatory						
Benioff VR 107.5Kg (PAPUA)	Z	1.0	0.2	60	1,350	critical
ESA Esa'ala Observatory						
Benioff VR 107.5Kg	Z	1.0	0.2	15	36,000	critical
Benioff VR 107.5Kg	N,E	1.0	0.2	15	18,000	critical
Benioff VR 107.5Kg	Z/N/E/	1.0	60.0	30	50% sensitivity	critical
AGE Agenahambo Station						
Willmore portable	Z	0.6	0.25	60	3,000	underdamped

VR Variable Reluctance

MC Moving-coil

Relative magnification curves of seismograph systems installed in the stations controlled by the Rabaul Central Observatory are listed once a month on the P.E.A.

PRESENTATION OF DATA

(reviewed in November, 1967)

All times are reduced to Greenwich Mean Time (GMT), which is 10 hours behind Eastern Standard Time.

At RAB and Harbour Network, the time signal is marked every minute on each seismogram record from the Observatory crystal chronometer. Second marks from radio signal VNG (Australia) are recorded on World-Wide Standard System S.P.=N component only according to the W.W.S.S. programme, at six hour intervals. Primary time is provided by W.W.S.S. equipment and secondary time by a Labtronic crystal chronometer with the accuracy of ± 5ms per day compared with VNG (Australia) with the aid of a chronoscope.

At TBL and AGE, the time signal is derived from a spring driven chronometer (Mercer) and marked each minute on records. Time accuracy is determined by comparison with signals from WWVH daily. Linear correction is applied to the daily drift.

On all seismogram records time increases from left to right and time break is upward.

At RAB* and Harbour Network the recording drum of each seismograph is driven by a 110VAC 60Hz synchronous motor. The 110VAC is frequency regulated by a crystal chronometer.

* The Omori recording drum is driven by a nonregulated 50Hz frequency supply.

At ESA and KRT power for recorder motors is frequency regulated by a crystal chronometer at 50Hz. Power for AGE and TBL and field stations is supplied by a 50Hz free running oscillator.

Direction of Motion

Upward direction of ground motion corresponds to upward trace motion on vertical seismogram records. Direction of component of ground motion to North or East corresponds to upward trace motion on horizontal seismogram records.

Vertical trace motion from impulsive onset of longitudinal waves of compressional or dilational ground movement is indicated by "u" or "d" accompanied by N,S,E, or W as per trace motion amplitude on horizontal seismogram records, to represent vectorially the direction of ground motion. "+" or "-" indicates upward or downward motion of the ground respectively, from a wave not known to be of the longitudinal type.

Accuracy of Readings

When readings are given with a decimal figure, they are to 1/10 of a second, other readings have been made to the nearest half second.

Crustal Phases

Px, Sx Crustal phases, other than Pn and Sn for local and near earthquakes.

Felt Intensity

Information on maximum intensities of shocks reported felt is included. Intensities are given in Roman numerals based on the Modified Mercalli scale, of 1931.

Determination of Epicentre

Where no souce is cited, the determination of epicentral distance and origin time for local and regional earthquakes is carried out at the Central Observatory Rabaul from the S-P travel times, assuming a normal depth of the focus.

Geographical Designation of Epicentre

The regional names which follow the co-ordinates of epicentres located at the Central Observatory are meant only to supplement the co-ordinates and normally follow well-known geographical rather than geological features. Use is made of the full degree blocks according to the mehtod defined by E.A. Flinn and E.R. Engadhl in "A PROPOSED BASIS FOR GEOGRAPHICAL AND SEISMIC REGIONALIZATION", Seismic Data Laboratory Report NO. 101, U.I.D. Inc., Alexandria, Virginia, 1964, adopted by the U.S.C.G.S. for computer requirements.

Magnitude Definition and Determination

M_L - Local Magnitude (Richter, 1935) is calculated from the recorded trace amplitude of the [illegible]-Anderson torsion seismographs of stated physical constants (installed at the Observatory in November, 1967).

Maximum trace amplitude (0 to peak) expressed in millimetres and tenths is measured directly on both components. Magnitude is determined independantly and the arithmetic mean taken. M_L values are given to the tenth of a unit.

The station correction factor is assumed to be zero until better known.

M_S - Surface Wave Magnitude (Gutemberg & Richter, 1956) is calculated from the amplitude of surface waves of period near 20 seconds for shallow distant earthquakes.

M_B - Body Wave Magnitude is calculated from the ratio of amplitude over period for body waves on S.P.-Z of World-Wide Seismograph System only when depth is known. The magnification factor for the standard seismograph is taken into account.

m - Unified magnitude (Gutemberg & Richter, 1956) has the following relation to M_L, M_S, and M_B.

$$m = 1.7 + 0.8\ M_L - 0.01\ M^2_L$$

$$m = M_B \text{ (without correction)}$$

$$m = 2.5 + 0.63\ M_S$$

Local Magnitude of earthquakes recorded at RAB with clear S-P interval is tabulated on a Day-Distance (in Central Angle Degrees) graph which is added to the PEA monthly.

Symbols

i - impulsive and sharply defined beginning of a phase.

e - emergent and poorly defined beginning of a phase.

T - Period in seconds.

A - Peak-to-Trough trace amplitude in millimetres.

GM - Ground Motion.

Dist - Epicentral distance in central angle degrees.

H - Origin time.

h - Focal depth in kilometres.

CBM - Confused by microseisms.

PRESENTATION OF DATA
(cont'd)

Remarks

Local - Typical signature of an earthquake with epicentre within 0.9°.

Near - Typical signature of an earthquake with epicentre between 0.9° and 9°.

Distant - Typical signature of an earthquake with epicentre between 9° and 45°.

Teleseism - Typical signature of an earthquake with epicentre more than 45°.

Traces - Any recorded disperse waves or very weak unknown earthquake phases.

Local and Near earthquakes will be classified Regional, and Distant earthquakes willbe grouped with Teleseisms if sheer waves and their reflections are unidentifiable.

G. W. D'ADDARIO
Vulcanologist-in-Charge

			T sec	A mm	GM	Dist	H	Remarks
KEREVAT.								
10th September, 1968.								
KRT	iP!Z	022311.3			d			Local
KRT	iPZ iSN	042714.0 24.4			d	¾°	042700	Regional
KRT	iPZ	044241.4	0.3	2.8	d			Distant
RABAUL.								
11th September, 1968.								
KRT	Microseismic activity.							
RAB	ePZ eSN	070650 0700	0.6	2.3	d	¾°	070635	M_L3.4
WAN	iPZ iSZ	0648.5 0701.0		5.4	d	1°	070631	
RAL	ePZ	0649			d			Regional
TAV	iPZ	49.3	0.5	2.8	c			Regional
RAB	iPZ iSNa	071551.9 58.0			c	¼°	071544	M_L3.2
WAN	ePZ	51½			c			Local
SUL	iPZ	51.0			c			Local
RAL	iPZ	51.0			c			Local
TAV	iPZ	51.0			c			Local
RAB	eiPZ eSE	140914½ 40			d	2¼°	140840	M_L4.3
WAN	ePZ iSZ	15 41.0			c	2¼°	140841	
RAL	ePZ iSZ	15½ 41.5			d	2¼°	140841	
TAV	e(P)Z iSZ	16 41.7			d	2¼°	140842	
KRT	ePZ i(S)E	11½ 33.0			c	(1¾)°	1408(42)	
RAB	ePZ	184619.7			c			Teleseism
RAB	ePZ eSE	192900½ 37½	0.7	4.6	c	3¼°	192812	
WAN	iPZ	00.5	0.7	3.0	d			Regional
RAL	ePZ	01	0.6	1.2	c			Regional
TAV	iPZ	00.5	0.5	2.0	d			Regional
RAB	eZ/	220631			+			Traces

			T sec	A mm	GM	Dist	H	Remarks
12th September, 1968.								
KRT	Confused by microseismic activity.							
RAB	iPZ	070756.0	0.4	2.1	c			Regional
WAN	ePZ	54			c			Regional
TAV	e(P)Z	55			c			Regional
VUL	iPZ	54.7		2.4	d			Regional
RAB	iPZ iSN/	080512.8 48.0	0.5	6.5	d	3°	080427	M_L 4.8
WAN	iPZ	12.8	0.4	2.4	c			Regional
RAL	ePZ	13	0.5	2.8	c			Regional
TAV	iPZ	13.0	0.5	2.4	c			Regional
VUL	iPZ	12.3	0.5	5.4	c			Regional
KRT	ePZ iSE	10 46.8	0.4	3.0	c	3¼°	080421	
RAB	iPZ iSN/	110558.0 0604.0	0.4	32.8	d	¼°	110550	M_L 3.4
WAN	iPZ	0558.0			d			Local
SUL	iPZ	58.4			d			Local
RAL	iPZ	58.5		4.4	d			Local
TAV	iPZ	58.8			d			Local
VUL	iPZ	57.8			d			Local
KRT	iPZ iSE	56.0 0604.0			c	½°	110545	
RAB	iPZ	155513.8			c			Distant
RAB	iPZ iSN	221143.0 59.6	0.5	2.0	c	1¼°	221120	
TAV	iPZ	42.4		2.4	d			Regional
VUL	iPZ iSZ	41.8 58.0	0.4	12.0	c	1¼°	221120	
RAB	iPZ	224949.5	1.0	7.0	d			Regional
KRT		51			d			Regional
13th September, 1968.								
RAB	ePZ e(S)E/	050903 1504	0.4	2.5	d	(40)°		M_S 5.5
RAB	ePZ iSN	125328 5644	0.4	2.0	d	19°		

			T sec	A mm	GM	Dist	H	Remarks
14th September, 1968.								
RAB	eZ/	012649			+			Traces
RAB	eZ/	015947			+			Traces
RAB	iPZ	024346.3	0.4	1.3	c			Regional
WAN	iPZ	46.2			d			Regional
RAL	iPZ	46.6			d			Regional
TAV	ePZ	46½			d			Regional
VUL	iPZ	46.4		24.0	d			Regional
KRT	iPZ iSE	47.0 4403.4	0.2	2.5	d	1¼°	024324	
RAB	ePZ eSE	125922 31½	0.4	3.8	d	½°	125908	M_L3.4
WAN	iPZ	21.7			c			Local
RAL	ePZ	21½			d			Local
TAV	iPZ	21.4			d			Local
VUL	iPZ iSZ	22.5 33.5	0.5	1.5	c	¾°	125907	
RAB	ePZ/	141526			c			Distant
RAB	ePZ	172738½	0.4	0.5	d			Regional
WAN	e(P)Z	38			d			Regional
RAL	ePZ	38½			c			Regional
TAV	iPZ	38.5		3.0	c			Regional
VUL	ePZ	38	0.4	2.0	c			Regional
RAB	ePZ	180650½	0.5	9.0	c			Regional
WAN	iPZ	50.8	0.6	(3.7)	d			Regional
TAV	iPZ	51.0	0.7	2.6	c			Regional
VUL	iPZ	50.7	0.5	6.0	d			Regional
RAB	eZ/	233454			-			Traces
15th September, 1968.								
RAB	iPZ iSN/	031056.8 1205.0	0.4	18.0	c	6°	030929	M_L5.7
WAN	iPZ	1057.3	0.8	15.6	d			
VUL	iPZ	56.8	0.5	13.4	d			
KRT	iPZ	54.4	0.8	4.8	d			
RAB	iPZ iSE	065922.2 070012.0	0.5	4.6	c	4¼°	065817	M_L5.9
RAL	iPZ	065918.2			c			
VUL	iPZ	15.8			c			
KRT	ePZ	17			c			

			T sec	A mm	GM	Dist	H	Remarks
15th September, 1968 continued.								
RAB	iPZ eSN/	105833.6 110514	0.8	4.2	c	46°		
VUL	ePZ	105834	1.0	3.0	c			
RAB	iPZ iSN	152803.4 21.0	0.4	11.8	d	1½°	152740	M_L 4.6
WAN	iPZ iSZ	03.4 21.2	0.3	6.3	d	1½°	152740	
RAL	iPZ iSZ	03.0 20.0	0.3	11.0	d	1¼°	152740	
TAV	iPZ	02.5			d			
VUL	iPZ iSZ	03.4 20.3	0.4	24.8	d	1¼°	152740	
KRT	iPZ iSN	04.4 22.5	0.2	14.0	c			
RAB	eZ/	173650			+			Traces
16th September, 1968.								
KRT	Very strong microseismic activity.							
RAB	eZ/	030318			-			Traces
RAB	iPZ ~~iSE/~~	135633.7 ~~5700.0~~	0.5	3.0	d	4½°	135526	Epicentre 148° 17' E 6° 11' S.

Felt			
Kandrian	Int. VI	06°15'S	149°35'E
Gloucester	Int. V-VI	05°25'S	148°25'E
Iboki	Int. V-VI		
Hoskins	Int. V	05°27'S	150°32'E
Lablab	Int. V	05°39'S	148°05'E
Talasea	Int. V	05°20'S	150°05'E
Popondetta	Int. V	08°45'S	148°15'E
Bali	Int. IV-V	04°30'S	149°30'E
Mempa	Int. IV-V		
Lae	Int. IV	06°43'S	147°00'E
Finschhafen	Int. IV	06°34'S	147°51'E
Bialla	Int. III-IV	05°19'S	151°02'E
Pomio	Int. III	05°30'S	151°30'E
Kilengi	Int. III	05°30'S	148°20'E
Tapini	Int. II	08°20'S	147°00'E
Silavuti	Int. VI	05°32'S	149°45'E

WAN	iPZ	34.0			c			
SUL	ePZ	33½			d			
RAL	iPZ	34.2			c			
TAV	iPZ	35.1			d			
KRT	iPZ	30.6	1.2	8.0	d			
RAB	iPZ	154603.0			d			Superimposed
WAN	iPZ	03.3	0.5	4.6	c			Regional
SUL	iPZ	04.0	0.5	3.0	d			Regional
RAL	ePZ	04			c			Regional
VUL	ePZ	04			c			Regional
KRT	iPZ iZ i(S)E	4559.3 4601.1 42.6	0.6	3.4	c	3¾°	154503	

			T sec	A mm	GM	Dist	H	Remarks
16th September, 1968 continued.								
RAB	ePZ	160150½			d			C.B.M. ~~Major after-shock - hard to read.~~
Felt- Popondetta V.; Lablab V.; Bali II-III; Finschhafen IV.								
WAN	iPZ	50.8			d			Regional
SUL	iPZ	51.0			d			Regional
RAL	iPZ	51.0			d			Regional
KRT	ePZ	46			c			Regional
RAB	ePZ	163246½	0.5	2.0	c			Regional
Felt- Talasea II-III								
RAB	iPZ	175127.3	0.4	4.0	d			Regional
KRT	iPZ	24.5	1.0	9.0	d			Regional
RAB	iPZ	183529.4 3629	0.5	2.5	d	5¼°	183412	M_L5.2
RAB	iPZ	190130.0	0.5	6.0	d	(5¾)°	1900(12)	M_L5.4
WAN	iPZ	29.5	0.5	6.0	d			Regional
RAL	iPZ	29.8	0.5	4.0	d			Regional
17th September, 1968.								
RAB	iPZ	003543.0	0.5	2.0	d			Regional
RAB	ePZ iSN	053430 54.0	0.4	2.0	d	2°	053358	M_L4.3
WAN	iPZ	30.4	0.5	2.5	d			
RAB	iPZ	055419.5	0.5	2.0	c			Regional
RAB	iPZ	071439.2	0.5	6.0	d			Regional
WAN	iPZ	39.2	0.4	3.0	d			Regional
VUL	iPZ	38.3	0.4	2.8	d			Regional
RAB	eiPZ iZ eSN	073155 56.0 3255	0.4	1.5	d	5¼°	073037	M_L5.8
WAN	ePZ	56	0.5	1.5	d			Regional
VUL	ePZ	56	0.3	2.0	c			Regional
KRT	ePZ	54½			d			Regional
*See below RAB	iPZ eSN/	165420.0 5520	0.5	2.0	d	5¼°	165302	M_L5.6
WAN	iPZ	20.0	0.5	5.5	d			Regional
SUL	iPZ	20.3	0.5	6.0	c			Regional
RAL	iPZ	20.5	0.5	6.0	c			Regional
TAV	iPZ	20.5	0.4	6.0	c			Regional
KRT	iPZ e(S)E	5417.0 27	0.5	1.7	c	¾°	165405	
*RAB	e(P)Z/ eSE/	175624 0204			d	(36)°		
KRT Confused by microseismic activity.								
*RAB	eZ/	142758				-		Traces
RAB	eZ/	153308				+		Traces

			T sec	A mm	GM	Dist	H	Remarks
ESA'ALA								
From 27th August, 1968 to 2nd September, 1968.								
27th August, 1968.								
ESA	ePZ eSN/	135050 5509	0.5	1.0	d	26½°		
ESA	ePZ iSN/	214616 4703½	0.3	1.0	c	4°	124515	
28th August, 1968.								
ESA	iPZ	100657	0.4	0.8	d			
ESA	ePZ iSN/ eLqN/ eLrZ/	115608 120051½ 0249 0351	1.0	1.2	d	29°		
ESA	iPZ iSN/	152942 3105½	0.3	0.8	c	2°	153912	
ESA	ePZ/ eSN/ eLqN/ eLrZ/	204934 5527 5923 210103				39°		
29th August, 1968.								
ESA	ePZ/	014338½						Regional
ESA	ePZ	142957½			d			Regional
ESA	ePZ/	215126½						Regional
30th August, 1968.								
ESA	iPZ	012846	0.4	5.4	c			Local
ESA	iPZ iSN/	024830 4917	0.5	2.0	d	4°	024729	
ESA	iPZ iSN/	133244 3343	0.5	4.0	d	5°	133127	
31st August, 1968.								
ESA	iPZ iSN/	102627 2713	0.4	4.4	c	4°	102527	
ESA	ePZ/	110115						Distant
1st September, 1968.								
ESA	iPZ	052955	0.3	1.8	d			Local
ESA	iPZ	143147			d			Regional
ESA	iPZ iSN/	222916½ 22			c	¼°	222908	
ESA	iPZ iSN/	230710 12			c			
2nd September, 1968.								
ESA	iPZ	003613½			c			

Rabaul Central Observatory,
20th September, 1968.
G.W. D'ADDARIO
Volcanologist-in-Charge

8 OCT 1968

PEA SEP-68 No. 39.

TERRITORY OF PAPUA AND NEW GUINEA
GEOLOGICAL AND VOLCANOLOGICAL BRANCH
VOLCANOLOGICAL SECTION

PRELIMINARY EARTHQUAKE ANALYSIS
RABAUL CENTRAL OBSERVATORY
1968

Rabaul	RAB	From: SEP. 18. 1968 To : SEP. 24. 1968
Rabaul Harbour Network	WAN SUL RAL TAV VUL	From: SEP. 18. 1968 To : SEP. 24. 1968
Keravat	KRT	From: SEP. 18. 1968 To : SEP. 24. 1968
Esa'ala	ESA	From: SEP. 3. 1968 To : SEP. 16. 1968
Agenahambo	AGE	From: To :
Waris	WAA	Not operational
Ulamona	ULA	Not operational
Piva	PIV	Not operational
Cape Gloucester	LAG	Not operational

STATION PERSONNEL

RAB Central Observatory, Rabaul.

Volcanologist-in-Charge	G.W.D'Addario
Volcanologist	R.F.Heming
Seismologist	M.Mancini
Seismogram	D.J.Cook, R.A.Page
Senior Technical Officer	N.O.Myers
Technical Officer	R.J.Conway
Volcanological Assistants	L.Topue, M.Gaiam, E.Ravian.
Technical Assistant	P.Daimbari
Trainee Volcanological Assistants	B.Talai, M.Salaiau, C.Matupit
Secretary	H.James

KRT Keravat Outstation.

Observer (part-time)	G.E.Chorick

TBL Tabele Observatory.

Observer	V.Kaita

ESA Esa'ala Observatory.

Observer	F.Dira

AGE Agenahambo Outstation.

Observer (part-time)	B.Kirke

The Rabaul Preliminary Earthquake Analysis (PEA) is produced by the staff under the direction of the Volcanologist-in-Charge from whom additional information and photocopies of seismogram records from all stations may be obtained on request.

Please address all communications to:-

Volcanologist-in-Charge
Central Observatory,
P.O. Box 386,
RABAUL. T.N.G.

SEISMOGRAPH STATIONS

Station (NEW GUINEA)	Code	South Latitude	East Longitude	Elev. (m)	Foundation.
Rabaul	RAB	04°11'28.6"	152°10'11.4"	183.5	Basalt Flow
Wanliss Street	WAN*	04°11'39.6"	152°10'32.5"	25.0	Basalt Flow
Sulphur Creek	SUL*	04°13'09.8"	152°10'33.3"	8.5	Unconsolidated volcanic ash
Rabalanakaia	RAL*	04°13'13.0"	152°12'07.0"	91.0	unconsolidated volcanic ash
Tavurvur	TAV*	04°13'52.18"	152°13'12.99"	27.0	Andesite flow
Taviliu	VUL*	04°16'58.2"	152°08'44.6"	332.2	Unconsolidated volcanic ash
Keravat	KRT	04°21'10.5"	152°03'06"	20.0	Alluvium
Tabele	TBL	04°06'04.67"	145°00'41.37"	179.5	Basalt Flow
Waris	WAA	04°07'00"	145°06'00"	48.0	Lapilli Tuff
Piva	PIV	06°12'00"	155°03'30"	60.0	Alluvium
Cape Gloucester	LAG	04°27'20"	148°26'00"	24.0	Lapilli Tuff
Ulamona (PAPUA)	ULA	04°59'24.0"	151°16'30.0"	17.0	Lapilli Tuff
Agenahambo	AGE	08°48'49"	148°05'56"	303.0	Unconsolidated volcanic ash
Esa'ala	ESA	09°44'18.2"	150°48'50.7"	46.4	Granite Gneiss

* Rabaul Harbour Network.

Station Instrumentation

Station & Instruments	Comp.	To.	Tg.	Trace speed mm/min	Approximate Relative Magnification	Approximate damping
(NEW GUINEA)						
Rabaul Central Observatory RAB						
World-wide Standard	Z	1.0	0.74	60	12,500	Critical
	N.E.	1.0	0.74	60	6,250	Critical
	Z/N/E/	15.0	100.0	15	750	Critical
Benioff VR 14.7Kg	Zh	1.0	0.02	180+	4,000	Critical
Omori 15Kg	No	3.6	-	24	12	10.1 Air
Omori 15Kg	Eo	3.8	-	24	10	10.1 Air
Wood-Anderson Torsion	Na,Ea	0.8	-	60	2,800	Critical

\+ Recording is triggered by the onset of any earthquake with pre-determined minimum amplitude. Recorder is stopped automatically by hour break pulse.

Rabaul Harbuor Network

Readings from the Harbour Network are entered in the PEA only for large earthquakes, with impulsive and sharply defined onset of phases.

WAN°	Benioff VR 14.7Kg	Z	1.0	0.02	60	5,240	Critical
SUL°	Benioff VR 14.7Kg	Z	1.0	0.02	60	2,850	Critical
RAL°	Benioff VR 14.7Kg	Z	1.0	0.02	60	8,075	Critical
TAV°	Benioff VR 14.7Kg	Z	1.0	0.02	60	20,900	Critical
VUL°	Benioff VR 14.7Kg	Z	1.0	0.02	60	5,000	Critical

Station & Instruments	Comp	Tc	Tg	Trace Speed mm/min	Approximate relative Magnification	Approximate damping
Rabaul Harbour Network (cont'd)						
KRT Keravat Out-station						
Benioff MC 50Kg	Z	1.2	0.2	15	20% sensitivity	critical
Benioff MC 50Kg	N,E	1.2	0.2	15	10% sensitivity	critical
ULA Ulamona Field Station						
Willmore portable	Z	0.6	0.25	60	3,000	underdamped
PIV Piva Field Station						
Willmore portable	Z	0.6	0.25	60	3,000	underdamped
WAA Waris Field Station						
Willmore portable	Z	0.6	0.25	60	3,000	underdamped
LAG Cape Gloucester						
Willmore portable	Z	0.6	0.25	60	3,000	underdamped
TBL Tabele Observatory						
Benioff VR 107.5Kg (PAPUA)	Z	1.0	0.2	60	1,350	critical
ESA Esa'ala Observatory						
Benioff VR 107.5Kg	Z	1.0	0.2	15	36,000	critical
Benioff VR 107.5Kg	N,E	1.0	0.2	15	18,000	critical
Benioff VR 107.5Kg	Z/N/E/	1.0	60.0	30	50% sensitivity	critical
AGE Agenahambo Station						
Willmore portable	Z	0.6	0.25	60	3,000	underdamped

o Signals from these stations are telemetered by land line to Helicorders (Geotech Mod. 2484) at the Central Observatory.

oo Signals from this station are telemetered via VHF to its Helicorder at the Central Observatory.

N.B. These field stations consist of a permanent building in which instruments are installed when necessary.

Details of emergency field stations, within the Territory will be listed when in operation.

VR Variable Reluctance

MC Moving-coil

Relative magnification curves of seismograph systems installed in the stations controlled by the Rabaul Central Observatory are listed once a month on the P.E.A.

PRESENTATION OF DATA

(reviewed in November, 1967)

All times are reduced to Greenwich Mean Time (GMT), which is 10 hours behind Eastern Standard Time.

At RAB and Harbour Network, the time signal is marked every minute on each seismogram record from the Observatory crystal chronometer. Second marks from radio signal VNG (Australia) are recorded on World-Wide Standard System S.P.=N component only according to the W.W.S.S. programme, at six hour intervals. Primary time is provided by W.W.S.S. equipment and secondary time by a Labtronic crystal chronometer with the accuracy of $\pm$ 5ms per day compared with VNG (Australia) with the aid of a chronoscope.

At TBL and AGE, the time signal is derived from a spring driven chronometer (Mercer) and marked each minute on records. Time accuracy is determined by comparison with signals from WWVH daily. Linear correction is applied to the daily drift.

On all seismogram records time increases from left to right and time break is upward.

At RAB* and Harbour Network the recording drum of each seismograph is driven by a 110VAC 60Hz synchronous motor. The 110VAC is frequency regulated by a crystal chronometer.

* The Omori recording drum is driven by a nonregulated 50Hz frequency supply.

At ESA and KRT power for recorder motors is frequency regulated by a crystal chronometer at 50Hz. Power for AGE and TBL and field stations is supplied by a 50Hz free running oscillator.

Direction of Motion

Upward direction of ground motion corresponds to upward trace motion on vertical seismogram records. Direction of component of ground motion to North or East corresponds to upward trace motion on horizontal seismogram records.

Vertical trace motion from impulsive onset of longitudinal waves of compressional or dilational ground movement is indicated by "u" or "d" accompanied by N,S,E, or W as per trace motion amplitude on horizontal seismogram records, to represent vectorially the direction of ground motion. "+" or "-" indicates upward or downward motion of the ground respectively, from a wave not known to be of the longitudinal type.

Accuracy of Readings

When readings are given with a decimal figure, they are to 1/10 of a second, other readings have been made to the nearest half second.

Crustal Phases

Px, Sx, Crustal phases, other than Pn and Sn for local and near earthquakes.

Felt Intensity

Information on maximum intensities of shocks reported felt is included. Intensities are given in Roman numerals based on the Modified Mercalli scale, of 1931.

Determination of Epicentre

Where no souce is cited, the determination of epicentral distance and origin time for local and regional earthquakes is carried out at the Central Observatory Rabaul from the S-P travel times, assuming a normal depth of the focus.

Geographical Designation of Epicentre

The regional names which follow the co-ordinates of epicentres located at the Central Observatory are meant only to supplement the co-ordinates and normally follow well-known geographical rather than geological features. Use is made of the full degree blocks according to the mehtod defined by E.A. Flinn and E.R. Engadhl in "A PROPOSED BASIS FOR GEOGRAPHICAL AND SEISMIC REGIONALIZATION", Seismic Data Laboratory Report NO. 101, U.I.D. Inc., Alexandria, Virginia, 1964, adopted by the U.S.C.G.S. for computer requirements.

Magnitude Definition and Determination

M_L - Local Magnitude (Richter, 1935) is calculated from the recorded trace amplitude of the Wood-Anderson torsion seismographs of stated physical constants (installed at the Observatory in November, 1967).

Maximum trace amplitude (0 to peak) expressed in millimetres and tenths is measured directly on both components. Magnitude is determined independantly and the arithmetic mean taken. M_L values are given to the tenth of a unit.

The station correction factor is assumed to be zero until better known.

M_S - Surface Wave Magnitude (Gutemberg & Richter, 1956) is calculated from the amplitude of surface waves of period near 20 seconds for shallow distant earthquakes.

M_B - Body Wave Magnitude is calculated from the ratio of amplitude over period for body waves on S.P.-Z of World-Wide Seismograph System only when depth is known. The magnification factor for the standard seismograph is taken into account.

m - Unified magnitude (Gutemberg & Richter, 1956) has the following relation to M_L , M_S, and M_B.

$$m = 1.7 + 0.8\ M_L - 0.01\ M^2_L$$

$$m = M_B \text{ (without correction)}$$

$$m = 2.5 + 0.63\ M_S$$

Local Magnitude of earthquakes recorded at RAB with clear S-P interval is tabulated on a Day-Distance (in Central Angle Degrees) graph which is added to the PEA monthly.

Symbols

i - impulsive and sharply defined beginning of a phase.

e - emergent and poorly defined beginning of a phase.

T - Period in seconds.

A - Peak-to-Trough trace amplitude in millimetres.

GM - Ground Motion.

Dist - Epicentral distance in central angle degrees.

H - Origin time.

h - Focal depth in kilometres.

CBM - Confused by microseisms.

PRESENTATION OF DATA
(cont'd)

Remarks

Local - Typical signature of an earthquake with epicentre within 0.9°.

Near - Typical signature of an earthquake with epicentre between 0.9° and 9°.

Distant - Typical signature of an earthquake with epicentre between 9° and 45°.

Teleseism - Typical signature of an earthquake with epicentre more than 45°.

Traces - Any recorded disperse waves or very weak unknown earthquake phases.

Local and Near earthquakes will be classified Regional, and Distant earthquakes willbe grouped with Teleseisms if sheer waves and their reflections are unidentifiable.

G. W. D'ADDARIO
Vulcanologist-in-Charge

			T sec	A mm	GM	Dist	H	Remarks
RABAUL.								
17th September, 1968.								
RAL	iPZ	224752.2			d	¾°	224738	
	iSZ	4802.3						
TAV	iPZ	4752.0			d	¾°	224738	
	iSZ	4802.0						
VUL	ePZ	4753½		2.8	c			
RAB	e(P)Z	225242½	0.4	3.8	d	(2¼°)	2252(06)	M_L5.3
	iSE	5310.7						
WAN	iPZ	5242.6			d			
RAL	ePZ	42			d			
TAV	iPZ	41.3			d			
VUL	iPZ	40.6		3.0	d			
18th September, 1968.								
VUL	ePZ	051334½	0.4	2.1	c	¾°	051321	
	eSZ	44½						
RAB	iPZ	091253.4	0.5	7.2				Regional
WAN	ePZ	53	0.5	7.0	c			
RAL	ePZ	53	0.7	3.2	d			
TAV	iPZ	53.2			d			
VUL	ePZ	52½	0.5	3.8	c			
KRT	ePZ	51			d			
RAB	ePZ	103737½	0.5	2.4	d	1½°	103712	M_L4.3
	iSN	56.2						
WAN	iPZ	103736.8			d	1¾°	103708	
	eSZ	58½						
SUL	iPZ	36.8			c	1½°	103710	
	iSZ	56.7						
TAV	iPZ	35.7			c			
VUL	ePZ	36½	0.3	1.8	d			
KRT	ePZ	38			d	1½°	103712	
	eSN	58						
RAB	iPZ	110129.2	0.5	2.0	c			Local
WAN	ePZ	29½	0.4	4.1	c			
TAV	ePZ	29½	0.5	3.0	d			
VUL	ePZ	28	0.5	1.8	c			
RAB	iPZ	114819.4	0.7	3.2	d	9¼°	114604	M_L6.1
	eSN/	5004						
	eLqN/	5203						
WAN	ePZ	4819			d			
SUL	ePZ	22½			d			
RAL	ePZ	19½	0.7	1.5	c			
TAV	ePZ	20½			c			
VUL	ePZ	19	0.5	4.8	d			
KRT	ePZ	19	0.2	1.2	e	1°	114801	
	iSN	32.2						

			T sec	A mm	GM	Dist	H	Remarks.
18th September, 1968 continued.								
RAB	iPZ	122826.4	0.7	2.4	d			Local
WAN	ePZ eSZ	26 34	0.6	1.2	d	½°	122815	
RAL	iPZ	26.7	0.5	1.2	d			
TAV	ePZ eSZ	26 34½	0.6	2.7	c	½°	122814	
VUL	ePZ	26½	0.5	3.8	d			
KRT	ePZ iSE	24 33.4	0.6	1.4	c			
RAB	ePZ	141102	0.5	2.4	c			Local
WAN	ePZ	02			d			
SUL	ePZ	02½			d			
RAL	ePZ	02			c			
TAV	iPZ	02.2	0.5	2.0	c			
VUL	iPZ	02.2						
KRT	ePZ iSN iSE	00½ 57.8 57.6	0.6	1.8	c	5°	140946	
RAB	ePZ eSN/	141156½ 1222			d	2¼°	141122	M_L 4.8 In coda of
WAN	ePZ iSZ	1156½ 1222.3	0.5	18.4	d	2¼°	141122	preceding shock
SUL	ePZ iSZ	1157½ 1221.3	0.8		c	2°	141126	
RAL	ePZ iSZ	1156½ 1221.2	0.5	10.0	c	2°	141123	
TAV	iPZ	1157.0		15.2	c			
VUL	ePZ	56½	0.4	10.4	d			
RAB	iPZ	151934.8	0.8	3.5	c			Regional
WAN	ePZ	34½			c			
RAL	iPZ	34.3			c			
TAV	ePZ	34		2.4	c			
VUL	iPZ	34.0	0.5	3.0	c			
KRT	iPZ	32.6	0.2	2.0	c			
TAV	ePZ eSZ	170955 1014			d	1½°	170930	
VUL	ePZ iSZ	0956 1016.3	0.7	7.8	d	1½°	170930	
VUL	ePZ	180745	0.5	3.1	c			Local

			T sec	A mm	GM	Dist	H	Remarks
18th September, 1968 continued.								
VUL	eiPZ	231528	0.7	3.0	d			
RAB	ePZ	234625	0.4	3.0	c	1½°	244601	M_L 4.9
	iSNa	42.6						
WAN	iPZ	24.7			c			
SUL	iPZ	25.0			c			
RAL	iPZ	24.7			c			
TAV	iPZ	24.0			d			
VUL	iPZ	24.8		5.2	d			
RAB	ePZ	235947	0.4	2.0	d	3°	235901	M_L 4.7
	eSN	000021½						
VUL	iPZ	235945.7	3.0	2.6	c	¾°	235931	
	iSZ	56.6						
19th September, 1968.								
RAB	ePZ	004322	0.5	4.0	c			Local C.B.M.
WAN	iPZ	22.5	0.4	2.8	c			
TAV	e(P)Z	22	0.4	2.2	d			
VUL	iPZ	23.3	0.6	4.0	d			
VUL	iPZ	055719.0		2.3	c			
VUL	ePZ	105534			c	1°	105518	
	eSZ	46						
RAB	eZ/	122422			+			Traces
RAB	iPZ	150916.7		1.4	c	1¾°	150849	M_L 3.5
	eSE	37½						
RAL	ePZ	12			d			
TAV	ePZ	12			c	2°	150840	
	e(S)Z	36						
VUL	ePZ	12½	0.5	1.2	d			
WAN	ePZ	154317	0.5	0.7	c			Local
VUL	iPZ	17.7	0.3	2.2	d			Local
RAB	ePZ	171920½	0.5	29.0	d	1°	171902	M_L 4.1
	eSN	34						
WAN	iPZ	20.4			d	1°	171904	
	iSZ	32.8						
SUL	iPZ	20.0		4.2	d			
RAL	iPZ	20.0		24.5	d	¾°	171904	
	eSZ	32						
TAV	iPZ	20.0			d			
VUL	iPZ	20.8			d			
KRT	iPZ	21.9	0.4	1.3	d	1°	171903	
	iSE	36.2						
RAB	ePZ	193650½	0.4	1.2	d	1°	193634	M_L 3.5
	eSE	3702½						
VUL	ePZ	3649½			d			Local

			T sec	A mm	GM	Dist	H	Remarks
20th September, 1968.								
RABAUL - Strong microseismic activity between 0300-0645 hours.								
RAB	iPZ	020234.0	0.2	5.0	c	2°	020202	M_L 4.3
	iSE	58.2						
WAN	iPZ	34.0	0.2	3.0	c	2°	020202	
	iSZ	58.0						
RAL	iPZ	34.0	0.2	1.0	c			
TAV	iPZ	34.0	0.2	1.2	c			
VUL	iPZ	32.9		11.9	c			
RAB	iPZ	061928.2	0.5	13.3	d	25°		
	iPPZ/	2006.0						
	iPcPZ/	2300.0						
	iSN/	36.0						
	eLrZ/	3052						
WAN	iPZ	1928.2	0.6	9.1	d			
SUL	iPZ	28.2	0.6	2.0	c			
RAL	iPZ	28.2	0.5	5.0	d			
TAV	iPZ	27.9	0.5	2.8	d			
VUL	iPZ	29.0	(0.2)		c			
KRT	iPZ	28.2			c			
RAB	iPZ	063625.2	0.3	2.8	d			
WAN	iPZ	26.2	0.2	6.7	c			
SUL	iPZ	26.8	0.3	2.1	c			
RAL	iPZ	26.2	0.4	4.0	c			
TAV	iPZ	26.0	0.4	1.4	d			
VUL	iPZ	25.8			c			
KRT	iPZ	25.7		2.4	c			
RAB	iPZ	092751.0	0.5	4.0	c	2¾°	092709	M_L 5.0
	iSE	2822.5						
WAN	iPZ	2751.0	0.3	2.0	d			
SUL	iPZ	51.2		1.0	d			
RAL	iPZ	51.0	0.3	2.0	d			
TAV	iPZ	51.0	0.5	2.0	d			
VUL	iPZ	50.2	0.2	5.5	c			
KRT	iPZ	48.8	0.2	3.0	c			
KRT	iPZ	113652.7	0.2	8.0	c	1°	113634	
	iSE	3706.6						
RAB	ePZ	114608	0.5	1.3	c	1½°	114542	M_L 5.1
	iSE	28.4						
WAN	ePZ	10			c			
SUL	ePZ	(10½)			d			
RAL	ePZ	10			d			
TAV	iPZ	09.2			d			
VUL	iPZ	10.0	0.2	1.9	c			
KRT	iPZ	11.0			c	1½°	114546	C.B.M.
	iSE	30.2						

			T sec	A mm	GM	Dist	H	Remarks
20th September, 1968 continued.								
RAB	iPZ	124537.0		1.0	c	2°	124504	M_L5.5
	iZ	38.7						
	iSE	4602.4						
WAN	iPZ	4537.0			(c)	2¼°	124501	
	iSZ	4603.5						
SUL	ePZ	4538		1.0	d	2°	124505	
	iSZ	4602.8						
RAL	iPZ	4537.5	0.4	4.6	c			
TAV	iPZ	4536.7			c			
VUL	iPZ	37.0	0.3	5.0	d			
KRT	iPZ	37.6	0.2	2.4	c	2°	124506	
	iSE	4602.0						
RAB	eZ/	137606½			+			Traces
RAB	ePZ	183620½	0.8	1.0	c			Teleseism
WAN	ePZ	21			d			
RAL	ePZ	20			c			
TAV	ePZ	21			c			
VUL	ePZ	20½			c			
RAB	eZ/	224650			+			Traces
RAB	eZ/	234312			+			Traces
RAB	e(P)Z	235045	0.4	2.0	c	(2°)	2350(13)	
	iSN	5109.2						
VUL	iPZ	5043.5	0.3	3.6	c	(2¼°)	2350(08)	
	e(S)Z	5110						
21st September, 1968. NO KERAVAT RECORDS (KRT) FROM 0400 to 2300.								
RAB	e(P)Z	012010½	0.4	2.2	d	(2¼°)	0119(36)	
	iSN	36.5						
VUL	iPZ	08.5	0.4	2.4	c	2¼°	011933	
	iSZ	35.0						
RAB	e(P)Z	012152			c	(2°)	0121(19)	
	iSN	2217.0						
VUL	iPZ	2151.0	0.4	4.0	c	(2¼°)	0121(17)	
	e(S)Z	2217						
VUL	ei(P)	012414	0.4	2.6	c			Local
TAV	ePZ	023122½			c			LOCAL
VUL	ePZ	23½	0.5	2.4	d			Local
RAB	iPZ	031030.7	0.4	3.4	c			Regional
VUL	iPZ	30.5	0.3	3.0	d			Regional

			T sec	A mm	GM	Dist	H	Remarks
21st September, 1968 continued.								
WAN	iPZ	045808.5			c			
TAV	iPZ	09.5		3.6	d			
VUL	iPZ	10.0	0.4	4.0	c	½°	045758	
	iSZ	18.5						
VUL	iPZ	054955.6			c			Local
TAV	iPZ	060402.0			c			
VUL	iPZ	01.5	0.5	3.4	c			
RAB	iPZ	072541.6	0.4	6.3	d			Regional
WAN	iPZ	41.0	0.4	3.8	c			
SUL	ePZ	41½	0.2	2.0	c			
RAL	iPZ	41.5	0.4	2.4	d			
TAV	iPZ	41.5	0.5	4.0	d			
VUL	iPZ	40.7	0.4	3.8	d			
RAB	iPZ	075031.5	0.4	6.3	d	2¼°	074957	M_L 4.3
	iSN	57.2						
VUL	iPZ	29.5		2.4	c			
RAB	iPZ	075245.0	0.4	2.0	c	2°	075212	M_L 5.2
	eSN	5310						
VUL	iPZ	5243.5	0.3	3.5	c	2¼°	075208	
	iSZ	5310.0						
RAB	iPZ	075427.5	0.5	2.5	d	1½°	075404	M_L 4.5
	iSE	45.5						
RAL	iPZ	27.5		2.8	c			
TAV	ePZ	26½			d			
VUL	iPZ	27.0		6.0	c	1¼°	075404	
	e(S)Z	44						
RAB	iPZ	104855.3			d			Local
WAN	ePZ	55.0	0.2	0.5	d			
RAL	ePZ	56.0	0.4	0.5	c			
TAV	iPZ	56.1	0.5	2.0	c			
VUL	iPZ	55.0	0.5	2.4	d			
RAB	iPZ	131427.9	0.6	3.3	c	46°		
	iPPZ/	1614.0						
	iPPPZ/	1702.0						
	iSN/	2112.0						
	eLqN/	3402						
	eLrZ/	3558						
WAN	ePZ	1427½			c			
RAL	iPZ	28.0	0.8	2.4	c			
TAV	ePZ	28	0.5	2.6	c			
VUL	iPZ	28.5	0.5	2.4	c			
RAB	e(P)Z	183831	0.5	2.0	c			Local

			T sec	A mm	GM	Dist	H	Remarks
22nd September, 1968.								
RAB	iPZ	072853.2	0.3	2.0	c	1¾°	072824	M_L 4.5
	iSN	2915.0						
WAN	ePZ	2853½	0.2	1.0	c	1¾°	072826	
	iSZ	2914.5						
SUL	ePZ	2853	0.4	1.0	c	1¾°	072824	
	iSZ	2915.0						
RAL	iPZ	2853.0	0.3	3.0	c			Regional
TAV	iPZ	2852.0		10.0	d	1¾°	072824	
	iSZ	2913.2						
VUL	iPZ	2852.2	0.2	1.5	d			Regional
RAB	ePZ	080609	0.5	2.0	d	26°		
	eSN/	1038						
TAV	ePZ	0608	1.0	1.5	c			
VUL	ePZ	09	1.0	1.0	c			
RAB	ePZ	092729	0.5	2.0	d	37°		
	eSN/	3308						
WAN	ePZ	2729		0.8	d			
SUL	ePZ	(28)	0.5	0.5	d			
RAL	ePZ	(31)		(0.9)	d			
TAV	ePZ	30½	1.0	1.6	c			
VUL	ePZ	29	0.2	1.0	d			
RAB	eiPZ	111113	0.4	1.5	d	5¼°	110956	M_L 5.0
	iZ	14.5						
	iZ	18.2						
	eSN/	1212						
WAN	iPZ	1114.2	0.4	2.0	d			
SUL	iPZ	12.9	(0.6)	1.0	d			
RAL	iPZ	14.0	0.3	1.0	d			
TAV	iPZ	15.0	0.2	1.0	c			
RAB	eZ/	120608			+			Traces
RAB	iPZ	152709.0	0.5	2.0	c	1½°	152644	M_L 4.1
	iSN	28.0						
WAN	iPZ	08.0		1.0	c	1¾°	152640	
	iSZ	29.0						
SUL	iPZ	10.0	0.2	2.0	c	1½°	152646	
	iSZ	27.7						
RAL	iPZ	08.0		2.0	c	1½°	152643	
	iSZ	27.5						
TAV	iPZ	05.8	0.2	6.0	c	1¾°	152638	
	iSZ	27.2						
VUL	iPZ	06.2	0.2	6.0	c	1½°	152640	
	iSZ	26.5						

			T sec	A mm	GM	Dist	H	Remarks
22nd September, 1968 continued.								
RAB	eZ/	170540			-			Traces
RAB	ePZ eSEZ/ eLqEZ/ eLrZ/	202850½ 3424 3744 3946			d	34°		
RAB	ePZ	221153	0.4	1.0	d			Distant
RAB	iPZ iSE	231806.5 32.5	0.5	2.0	d	2¼°	231732	M_L 4.4
RAL	ePZ i(S)Z	05 30.0			c	2°	231732	
TAV	ePZ i(S)Z	05 30.0	0.2	1.0	c	2°	231732	
VUL	iPZ i(S)Z	05.1 32.7			c	2¼°	231728	
23rd September, 1968.								
RAB	iPZ	020653.0	0.8	3.0	c			Distant
RAB	ePZ iSE	022530 53.1	0.4	1.4	d	2°	022500	M_L 4.1
RAL	iPZ iSZ	29.2 51.1			d	1¾°	022500	
TAV	ePZ iSZ	29½ 51.3	0.2	1.2	d	1¾°	022500	
VUL	ePZ iSZ	29½ 52.9	0.4	0.9	d	2°	022459	
KRT	ePZ iSE	32.0 55.8	0.4	4.2	c	2°	022500	
RAB	ePZ	051205	0.3	2.2	d			Distant
TAV	iPZ	073311.4		0.9	c			
VUL	iPZ	11.9	0.3	0.8	c			
RAB	ePZ	092308	0.4	1.4	c			Regional
RAL	iPZ iSZ	07.6 37			d	2½°	092229	
TAV	iPZ	06.5	0.3	1.8	c			
VUL	iPZ eSZ	06.9 37	0.1	1.1	c	2½°	092227	
RAB	iPZ iSN	114746.5 4803.8	0.4	7.0	d	1¼°	114724	M_L 4.3
WAN	ePZ	4746½	0.2	6.9	d			
SUL	iPZ	46.8	0.3	1.8	c			
RAL	eiPZ	47	0.2	2.8	c			
TAV	ePZ	47	0.3	3.1	c			
VUL	iPZ	45.3		9.0	d			
KRT	iPZ iSN	43.8 59.5	0.4	7.9	d	1¼°	114722	

			T sec	A mm	GM	Dist	H	Remarks
23rd September, 1968 continued.								
RAB	iPZ	153054.5	0.4	2.4	c	1½°	153028	
	iSN	3114.7						
WAN	iPZ	3054.1	0.3	1.1	d	1½°	153029	
	iSZ	3114.1						
SUL	ePZ	3054	0.2	0.4	d	1¾°	153026	
	eSZ	3115						
RAL	iPZ	3054.2	0.5	1.3	c	1½°	153028	
	iSZ	3114.6						
TAV	iPZ	3054	0.5	1.3	d	1¾°	153025	
	eSZ	3116						
VUL	iPZ	3053.0	0.3	8.3	c	1½°	153028	
	iSZ	3111.9						
KRT	iPZ	3050.6	0.3	0.8	d	1½°	153026	
	iSE	3108.8						

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			T sec	A mm	GM	Dist	H	Remarks.
23rd September, 1968 continued.								
RAB	iPZ eSE/	232206.5 18	0.4	14.0		1°	232150	M_L 3.7 Local
WAN	iPZ	06.0	0.2	5.1	d			
SUL	iPZ	06.2		4.0	c			
RAL	ePZ	05½			d			
TAV	iPZ	05.6		5.0	d			
VUL	iPZ	06.0			d			
RAB	iP!Z iSN$_o$	233819.0 35.0			dSE	1¼°	233758	M_L 5.0 AZ=150° Near Epicentre 5°22'S 152°52'E
WAN	iP!Z	18.4			d			
SUL	iPZ	18.5			d			
RAL	iP!Z	18.4			d			
TAV	iP!Z	18.0			d			
VUL	iP!Z	18.0			d			
KRT	iP!Z	16.8			d			
24th September, 1968.								
RAB	eZ/	034304			+			Traces
RAB	iPZ e(S)N/ eRZ/	084919.5 5020 5300	0.5	3.5	c	4°	084800	Near
WAN	ePZ	4918	0.7	1.0	c			
SUL	ePZ	20			d			
RAL	iPZ	20.0	0.8	3.0	d			
TAV	ePZ	18½	0.7	2.2	d			
VUL	ePZ	16½	0.7	1.5	d			
RAB	iPZ iSE	092028.0 38.5	0.3	4.0	c	¾°	092013	M_L 3.6
WAN	iPZ iSZ	27.7 38.0	0.2	3.0	d	¾°	092014	
SUL	ePZ iSZ	28 39.0		1.0	c	¾°	092014	
RAL	ePZ iSZ	27½ 38.0	0.2	1.9	d	¾°	092012	
TAV	iPZ	27.3			d			
VUL	iPZ iSZ	29.0 40.0	0.2	1.0	c	¾°	092014	
KRT	ePZ iSE	30 44.7		1.1	c	1°	092010	

			T sec	A mm	GM	Dist	H	Remarks
24th September, 1968 continued.								
RAB	iPZ	100342.0	0.2	26.4	c			
WAN	iPZ	42.0	0.2	17.1	c			
SUL	iPZ	42.0			c			
RAL	iPZ	41.9			c			
TAV	iPZ	41.5			c			
VUL	iPZ	42.2	(0.3)	6.2	d			
KRT	iPZ	43.7			d	4¼°	100241	
	eiSN	0432						
RAB	ePZ	101136½	0.6	1.0	c	¾°	101123	M_L 3.3
	eSN	46						
WAN	iPZ	36.6	0.2	1.2	c	¾°	101122	
	eSZ	47						
SUL	ePZ	39			c			Local
RAL	ePZ	37			d	¾°	101122	
	iSZ	48.3						
TAV	iPZ	41.7			c	½°		
	iSZ	47.4					101132	
VUL	iPZ	37.3	0.2	2.0	c	½°		Local
KRT	ePZ	36		1.8	c	¾°	101121	
	iSE	46.8						
RAB	eZ/	135412			-			Traces
RAB	iPZ	141247.6	0.5	3.0	d	1½°	141222	M_L 3.5
	iSN	1306.4						
WAN	iPZ	1247.6		1.7	c	1½°	141224	
	iSZ	1305.8						
SUL	iPZ	1247.6	0.2	1.0	d	1½°	141224	
	iSZ	1305.5						
RAL	iPZ	1247.0		2.0	c	1½°	141222	
	iSZ	1306.2						
TAV	iPZ	1246.5	(0.2)	7.8	d	1½°	141223	
	iSZ	1304.0						
VUL	iPZ	1246.5	0.2	8.4	d	1½°	141223	
	iSZ	1304.0						
KRT	iPZ	1246.3	0.3	1.3	d			
RAB	eiPZ	120840	0.4	2.0	c	1¾°	170811	M_L 4.7
	iZ	42.2						
	iSN	0902.0						
WAN	ePZ	0840			c	2°	170810	
	iSZ	0903.0						
SUL	ePZ	0840			d	1¾°	170811	
	iSZ	0902.2						
RAL	iPZ	0840.0			d	1¾°	170811	
	i(S)Z	0902.0						
TAV	iPZ	0838.9	0.2	2.0	d	2°	170810	
	iSZ	0903.1						
VUL	iPZ	0840.0	0.2	3.0	c			Regional
KRT	iPZ	40.8	0.2	2.6	c			

	T sec	A mm	GM	Dist	H	Remarks.

EMERGENCY FIELD STATION - YANGORU.

03°39'30S 143°17'30"E

Elev. 219m

Foundation: Details not available to date

	COMP.	To	Tg	TRACE SPEED mm/min	APPROX RELATIVE MAGNIFICATION	APPROXIMATE DAMPING
Willmore portable	Z	0.6	0.25	60	1000	underdamped

11th September, 1968.

iPZ	165405			Int. II-III
iSZ	08½			
iPZ	194232		24Km	Int. II
iSZ	35			
iPZ	235638			
iSZ	39½			

12th September, 1968.

iPZ	035431½	27.6Km	Felt Int. IV
iSZ	34		
iPZ	055234½		29 shocks recorded on 12.9.68
iSZ	48		
iPZ	075046½		
iSZ	49½		
iPZ	085720		
iPZ	111100		
iPZ	190443		
iPZ	193613		
iPZ	210349		
iPZ	214603		
iSZ	04½		

13th September, 1968.

iPZ	011526	24Km	Felt
iSZ	29		
iPZ	131715		Felt
iPZ	174412½		
iPZ	204231	3Km	Felt
iSZ	31½		
iPZ	221644½	31.2Km	27 shocks recorded 13.9.68
iSZ	49½		

EMERGENCY FIELD STATION - YANGORU CONTINUED.

	T sec	A mm	GM	Dist	H	Remarks
14th September, 1968.						
iPZ	012228½					Felt
iPZ	034239					Felt
iPZ	114259					Felt
iPZ	121228½			24Km		Felt
iSZ	31½					
iPZ	124247½					Felt
iSZ	49½					
iPZ	180402½					Felt 33 shocks recorded 14.9.68
15th September, 1968.						
iPZ	052718½					Felt
iPZ	184459½					Felt 14 shocks recorded 15.9.68
16th September, 1968.						
iPZ	082622					Felt
ePZ	135717					
iPZ	145951			24Km		11 shocks recorded 16.9.68
iSZ	54					
ePZ	160225					
iSZ	0349					
iPZ	182619					
17th September, 1968.						
iPZ	013741			24Km		
iSZ	44					
iPZ	051305					Felt
iPZ	125839			15.6Km		
iSZ	41					17 shocks recorded 17.9.68

EMERGENCY FIELD STATION - YANGORU CONTINUED.

	T sec	A mm	GM	Dist	H	Remarks
18th September, 1968.						
iPZ	043831½			24Km		31 shocks recorded 18.9.68
iSZ	34½					
iPZ	082836½					
iPZ	165541½					
19th September, 1968.						
iPZ	014002½					
iPZ	042701½					
iPZ	130036			24Km		Epicentre about 3°38'S 143°7'E
iSZ	39			13 00 (31)		
iPZ	144009					
iPZ	215958					

ALL EPICENTRES HAVE BEEN PROVISIONALLY LOCATED NEAR THE ANUMB-MISUAM RIVERS.

			T sec	A mm	GM	Dist	H	Remarks
ESA'ALA from 3rd September, 1968 to 9th September, 1968.								
3rd September, 1968.								
ESA	ePZ/	003321						
ESA	ePZ	080302						
ESA	iPZ/	083951	2.3	2.2	d			
4th September, 1968.								
ESA	ePZ/ i(S)N	170201 32				2½°	170120	
ESA	iPZ	040446	0.5	1.5	d			
ESA	iPZ/	233431½	2.5	2.1	d			
5th September, 1968.								
ESA	iPZ	034644			c			
ESA	iPZ iSZ	140251½ 0343½			c	4½°	140144	
ESA	iPZ/ eSN/	170452½ 0702½	2.0	2.0	d	11½°		
6th September, 1968								
ESA	iPZ	052245½			c			
ESA	iPZ/ eSN/	074027 4401	6.9	6.0	d	8¼°		
ESA	iPZ	095323	0.6					Distant
7th September, 1968.								
ESA	iPZ/ iSN/	064948½ 5057½		18.0	c	6°	064819	
8th September, 1968.								
ESA	iPZ/	132213		8.0	c			Distant
ESA	iPZ/ iSN/	151440½ 46	1.0	2.5	c	¼°	151432	
9th September, 1968.								
ESA	ePZ/	023848			d			
ESA	iPZ/ iSN/	154535 41	0.2	6.0	c	¼°	154527	
ESA	ePZ/	164510½			c			Distant

			T sec	A mm	GM	Dist	H	Remarks
ESA'ALA from 10th September, 1968 to 16th September, 1968.								
10th September, 1968.								
ESA	ePZ iSN/	022443 2534	1.0	2.0	d	4½°	022337	
ESA	ePZ eSN/	052720 2920	1.0	1.0	c	10¾°	052446	
ESA	ePZ iSN/	054220 4419	1.0	1.0	d	10¾°	053947	Distant
ESA	iPZ	205432			d			Local
ESA	iPZ	205643			d			
11th September, 1968.								
ESA	iPZ	014654.0			d			Local
ESA	iPZ	022628½	0.2	5.0	d			
12th September, 1968.								
ESA	iPZ iSN/	080533 0610	1.0		c	3¼°	080444	
ESA	ePZ	155438	0.8	1.0	c			Distant
ESA	iPZ	201334			c			Local
ESA	eiPZ iSN/	224936 5400	1.0	1.0	c	26°		Distant
13th September, 1968.								
ESA	ePZ	051416			d			Teleseism
ESA	ePZ	125307	0.6	0.7				Distant
ESA	ePZ iSN/	185906 55½	0.1	0.5	d	4¼°	185801	
14th September, 1968.								
ESA	iPZ iSN/	010001½ 56	0.6	1.0	d	4¾°	005850	
15th September, 1968.								
ESA	ePZ iSN/	031046 1141	0.7	5.0	d	4¾°	030934	
ESA	iPZ	0314(58)			c			In coda of preceding shock
ESA	iPZ	043201	0.2	3.0	c			
16th September, 1968.								
ESA	iPZ	135631½			d			Epigentre 148 17'E 6°11'S (Kandrian Area)
ESA	iPZ	154558			d			

			T sec	A mm	GM	Dist	H	Remarks
ESA'ALA.								
16th September, 1968 continued.								
ESA	iPZ	160132½	0.2	1.0	c			
ESA	iPZ	163242½	0.2	2.5	c			
ESA	ePZ	190031½	0.2	1.8	d			
ESA	iPZ	211306.0			d			Regional

15 OCT 1968

PEA SEP-68 No. 40.

TERRITORY OF PAPUA AND NEW GUINEA
GEOLOGICAL AND VOLCANOLOGICAL BRANCH
VOLCANOLOGICAL SECTION

PRELIMINARY EARTHQUAKE ANALYSIS
RABAUL CENTRAL OBSERVATORY
1968

Rabaul	RAB	From: SEP. 25. 1968 To: OCT. 1 - 1968
Rabaul Harbour Network	WAN SUL RAL TAV VUL	From: SEP. 25. 1968 To: OCT. 1 - 1968
Keravat	KRT	From: SEP. 25. 1968 To. OCT. 1 - 1968
Esa'ala	ESA	From: To:
Agenahambo	AGE	From: To:
Yangoru (Emergency Field Station)		From: To:
Waris	WAA	Not operational
Ulamona	ULA	Not operational
Piva	PIV	Not operational
Cape Gloucester	LAG	Not operational
Tabele	TBL	From: AUG. 7. 1968 To: AUG. 27. 1968

STATION PERSONNEL

RAB Central Observatory, Rabaul.

Volcanologist-in-Charge	G.W. D'Addario
Volcanologist	R.F. Heming
Seismologist	M. Mancini
Seismogram Readers	R.A. Page, L.M. Cartwright
Senior Technical Officer	N.O. Myers
Technical Officer	R.J. Conway
Volcanological Assistants	L. Topue, M. Gaiam, E. Ravian
Technical Assistant	P. Daimbari
Trainee Volcanological Assistants	B. Talai, M. Salaiau, C. Matupit
Clerk	J.A. Alcock

KRT Keravat Outstation.

Observer (part-time)	G.E. Chorick

TBL Tabele Observatory.

Observer	V. Kaita

ESA Esa'Ala Observatory.

Observer	F. Dira

AGE Agenahambo Outstation.

Observer (part-time)	B. Kirke

The Rabaul Preliminary Earthquake Analysis (PEA) is produced by the staff under the direction of the Volcanologist-in-Charge from whom additional information and photocopies of seismogram records from all stations may be obtained on request.

Please address all communications to:-

Volcanologist-in-Charge,
Central Observatory,
P.O. Box 386,
RABAUL. T.N.G.

SEISMOGRAPH STATIONS

Station (NEW GUINEA)	Code	South Latitude	East Longitude	Elev. (m)	Foundation.
Rabaul	RAB	04°11'28.6"	152°10'11.4"	183.5	Basalt Flow
Wanliss Street	WAN*	04°11'39.6"	152°10'32.5"	25.0	Basalt Flow
Sulphur Creek	SUL*	04°13'09.8"	152°10'33.3"	8.5	Unconsolidated volcanic ash
Rabalanakaia	RAL*	04°13'13.0"	152°12'07.0"	91.0	unconsolidated volcanic ash
Tavurvur	TAV*	04°13'52.18"	152°13'12.99"	27.0	Andesite flow
Taviliu	VUL*	04°16'58.2"	152°08'44.6"	332.2	Unconsolidated volcanic ash
Keravat	KRT	04°21'10.5"	152°03'06"	20.0	Alluvium
Tabele	TBL	04°06'04.67"	145°00'41.37"	179.5	Basalt Flow
Waris	WAA	04°07'00"	145°06'00"	48.0	Lapilli Tuff
Piva	PIV	06°12'00"	155°03'30"	60.0	Alluvium
Cape Gloucester	LAG	04°27'20"	148°26'00"	24.0	Lapilli Tuff
Ulamona (PAPUA)	ULA	04°59'24.0"	151°16'30.0"	17.0	Lapilli Tuff
Agenahambo	AGE	08°48'49"	148°05'56"	303.0	Unconsolidated volcanic ash
Esa'ala	ESA	09°44'18.2"	150°48'50.7"	46.4	Granite Gneiss

* Rabaul Harbour Network.

Station Instrumentation

Station & Instruments	Comp.	To.	Tg.	Trace speed mm/min	Approximate relative Magnification	Approximate damping
(NEW GUINEA) Rabaul Central Observatory RAB						
World-wide Standard	Z	1.0	0.74	60	12,500	Critical
	N.E.	1.0	0.74	60	6,250	Critical
	Z/N/E/	15.0	100.0	15	750	Critical
Benioff VR 14.7Kg	Zh	1.0	0.02	180+	4,000	Critical
Omori 15Kg	No	3.6	-	24	12	10.1 Air
Omori 15Kg	Eo	3.8	-	24	10	10.1 Air
Wood-Anderson Torsion	Na,Ea	0.8	-	60	2,800	Critical

\+ Recording is triggered by the onset of any earthquake with pre-determined minimum amplitude. Recorder is stopped automatically by hour break pulse.

Rabaul Harbuor Network

Readings from the Harbour Network are entered in the PEA only for large earthquakes, with impulsive and sharply defined onset of phases.

WAN°	Benioff VR 14.7Kg Z	1.0	0.02	60	5,240	Critical
SUL°	Benioff VR 14.7Kg Z	1.0	0.02	60	2,850	Critical
RAL°	Benioff VR 14.7Kg Z	1.0	0.02	60	8,075	Critical
TAV°	Benioff VR 14.7Kg Z	1.0	0.02	60	20,900	Critical
VUL°	Benioff VR 14.7Kg Z	1.0	0.02	60	5,000	Critical

Station & Instruments	Comp	To	Tg	Trace Speed mm/min	Approximate relative Magnification	Approximate damping
Rabaul Harbour Network (cont'd)						
° Signals from these stations are telemetered by land line to Helicorders (Geotech Mod. 2484) at the Central Observatory.						
°° Signals from this station are telemetered via VHF to its Helicorder at the Central Observatory.						
KRT Keravat Out-station						
Benioff MC 50Kg	Z	1.2	0.2	15	20% sensitivity	critical
Benioff MC 50Kg	N,E	1.2	0.2	15	10% sensitivity	critical
ULA Ulamona Field Station						
Willmore portable	Z	0.6	0.25	60	3,000	underdamped
PIV Piva Field Station						
Willmore portable	Z	0.6	0.25	60	3,000	underdamped
WAA Waris Field Station						
Willmore portable	Z	0.6	0.25	60	3,000	underdamped
LAG Cape Gloucester						
Willmore portable	Z	0.6	0.25	60	3,000	underdamped

N.B. These field stations consist of a permanent building in which instruments are installed when necessary.

Details of emergency field stations, within the Territory will be listed when in operation.

TBL Tabele Observatory						
Benioff VR 107.5Kg (PAPUA)	Z	1.0	0.2	60	1,350	critical
ESA Esa'ala Observatory						
Benioff VR 107.5Kg	Z	1.0	0.2	15	36,000	critical
Benioff VR 107.5Kg	N,E	1.0	0.2	15	18,000	critical
Benioff VR 107.5Kg	Z/N/E/	1.0	60.0	30	50% sensitivity	critical
AGE Agenahambo Station						
Willmore portable	Z	0.6	0.25	60	3,000	underdamped

VR Variable Reluctance

MC Moving-coil

Relative magnification curves of seismograph systems installed in the stations controlled by the Rabaul Central Observatory are listed once a month on the P.E.A.

PRESENTATION OF DATA

(reviewed in November, 1967)

All times are reduced to Greenwich Mean Time (GMT), which is 10 hours behind Eastern Standard Time.

At RAB and Harbour Network, the time signal is marked every minute on each seismogram record from the Observatory crystal chronometer. Second marks from radio signal VNG (Australia) are recorded on World-Wide Standard System S.P.=N component only according to the W.W.S.S. programme, at six hour intervals. Primary time is provided by W.W.S.S. equipment and secondary time by a Labtronic crystal chronometer with the accuracy of $\pm$ 5ms per day compared with VNG (Australia) with the aid of a chronoscope.

At TBL and AGE, the time signal is derived from a spring driven chronometer (Mercer) and marked each minute on records. Time accuracy is determined by comparison with signals from WWVH daily. Linear correction is applied to the daily drift.

On all seismogram records time increases from left to right and time break is upward.

At RAB* and Harbour Network the recording drum of each seismograph is driven by a 110VAC 60Hz synchronous motor. The 110VAC is frequency regulated by a crystal chronometer.

* The Omori recording drum is driven by a nonregulated 50Hz frequency supply.

At ESA and KRT power for recorder motors is frequency regulated by a crystal chronometer at 50Hz. Power for AGE and TBL and field stations is supplied by a 50Hz free running oscillator.

Direction of Motion

Upward direction of ground motion corresponds to upward trace motion on vertical seismogram records. Direction of component of ground motion to North or East corresponds to upward trace motion on horizontal seismogram records.

Vertical trace motion from impulsive onset of longitudinal waves of compressional or dilational ground movement is indicated by "u" or "d" accompanied by N,S,E, or W as per trace motion amplitude on horizontal seismogram records, to represent vectorially the direction of ground motion. "+" or "-" indicates upward or downward motion of the ground respectively, from a wave not known to be of the longitudinal type.

Accuracy of Readings

When readings are given with a decimal figure, they are to 1/10 of a second, other readings have been made to the nearest half second.

Crustal Phases

Px, Sx, Crustal phases, other than Pn and Sn for local and near earthquakes.

Felt Intensity

Information on maximum intensities of shocks reported felt is included. Intensities are given in Roman numerals based on the Modified Mercalli scale, of 1931.

Determination of Epicentre

Where no souce is cited, the determination of epicentral distance and origin time for local and regional earthquakes is carried out at the Central Observatory Rabaul from the S-P travel times, assuming a normal depth of the focus.

Geographical Designation of Epicentre

The regional names which follow the co-ordinates of epicentres located at the Central Observatory are meant only to supplement the co-ordinates and normally follow well-known geographical rather than geological features. Use is made of the full degree blocks according to the mehtod defined by E.A. Flinn and E.R. Engadhl in "A PROPOSED BASIS FOR GEOGRAPHICAL AND SEISMIC REGIONALIZATION", Seismic Data Laboratory Report NO. 101, U.I.D. Inc., Alexandria, Virginia, 1964, adopted by the U.S.C.G.S. for computer requirements.

Magnitude Definition and Determination

M_L - Local Magnitude (Richter, 1935) is calculated from the recorded trace amplitude of the Wood-Anderson torsion seismographs of stated physical constants (installed at the Observatory in November, 1967).

Maximum trace amplitude (0 to peak) expressed in millimetres and tenths is measured directly on both components. Magnitude is determined independantly and the arithmetic mean taken. M_L values are given to the tenth of a unit.

The station correction factor is assumed to be zero until better known.

M_S - Surface Wave Magnitude (Gutemberg & Richter, 1956) is calculated from the amplitude of surface waves of period near 20 seconds for shallow distant earthquakes.

M_B - Body Wave Magnitude is calculated from the ratio of amplitude over period for body waves on S.P.-Z of World-Wide Seismograph System only when depth is known. The magnification factor for the standard seismograph is taken into account.

m - Unified magnitude (Gutemberg & Richter, 1956) has the following relation to M_L , M_S, and M_B.

$$m = 1.7 + 0.8\ M_L - 0.01\ M^2_L$$

$$m = M_B \text{ (without correction)}$$

$$m = 2.5 + 0.63\ M_S$$

Local Magnitude of earthquakes recorded at RAB with clear S-P interval is tabulated on a Day-Distance (in Central Angle Degrees) graph which is added to the PEA monthly.

Symbols

i - impulsive and sharply defined beginning of a phase.

e - emergent and poorly defined beginning of a phase.

T - Period in seconds.

A - Peak-to-Trough trace amplitude in millimetres.

GM - Ground Motion.

Dist - Epicentral distance in central angle degrees.

H - Origin time.

h - Focal depth in kilometres.

CBM - Confused by microseisms.

PRESENTATION OF DATA
(cont'd)

Remarks

Local - Typical signature of an earthquake with epicentre within 0.9°.

Near - Typical signature of an earthquake with epicentre between 0.9° and 9°.

Distant - Typical signature of an earthquake with epicentre between 9° and 45°.

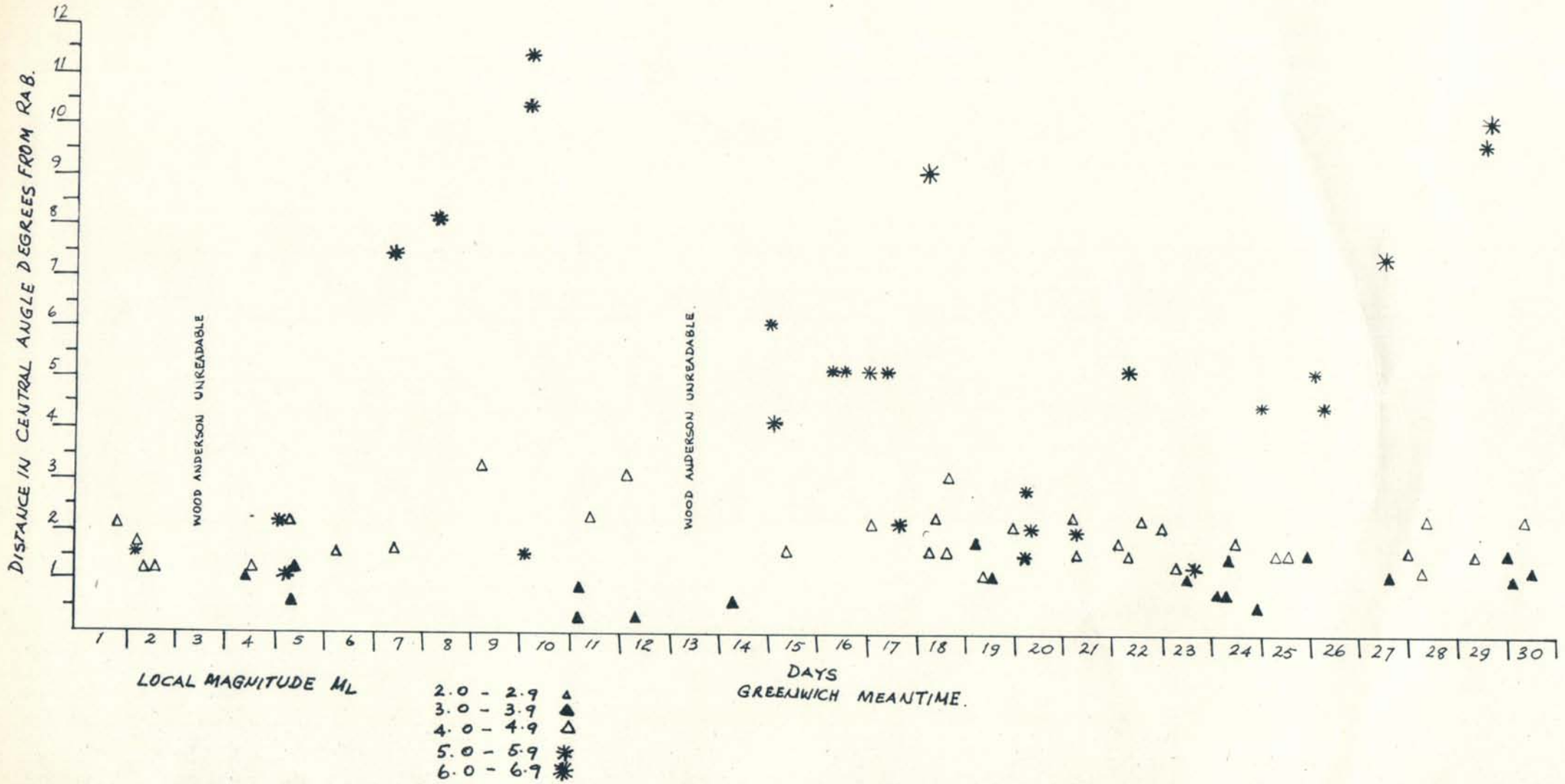
Teleseism - Typical signature of an earthquake with epicentre more than 45°.

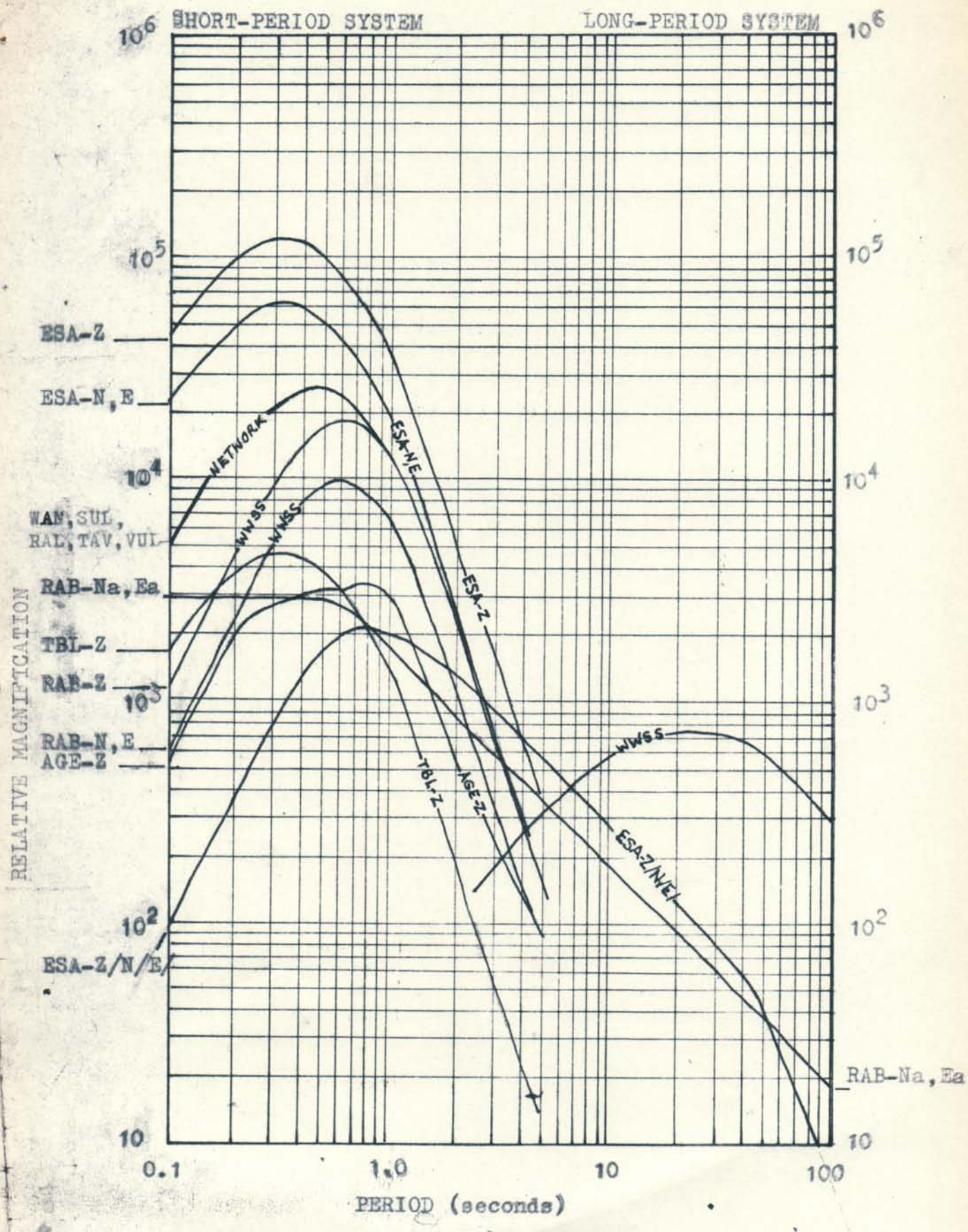
Traces - Any recorded disperse waves or very weak unknown earthquake phases.

Local and Near earthquakes will be classified Regional, and Distant earthquakes willbe grouped with Teleseisms if sheer waves and their reflections are unidentifiable.

G. W. D'ADDARIO
Vulcanologist-in-Charge

MAGNITUDE OF REGIONAL EARTHQUAKES WITH A CLEAR S-P INTERVAL.
SEPTEMBER 1968.





FREQUENCY RESPONSE CURVES OF THE INSTRUMENTS

GWDA Nov.67

TOTAL NUMBER OF EARTHQUAKES AS RECORDED AND CLASSIFIED AT EACH STATION FOR THE MONTH OF SEPTEMBER 1968

LOCAL -0 -.9°					NEAR 0.9°-9°					REGIONAL					DISTANT 9° - 45°					TELESEISM 45°- -					TRACES				
13	12	6	8	11	88	44	30	41	42	22	9	1	8	9	50	11	7	14	16	9					36				
11	7			4	60				46	7	3			5	20	9			6									

RAB	WAN	SUL	RAL	TAV
VUL	ESA	TBL	AGE	KRT

Rabbul Inner Network

Wanliss Street - WAN.
Sulphur Creek - SUL.
Rabalanakaia - RAL
Tavurvur - TAV.
Taviliu - VUL.

Rabaul Outer Network

Keravat - KRT.

Observatories

Rabaul Central (W.W.S.S.)- RAB.
Esa'ala - ESA.
Tabele - TBL.

Station

Agenahambo - AGE.

RABAUL.

25th September, 1968.

			T sec	A mm	GM	Dist	H	Remarks
RAB	iPZ	023343.6	0.5	5.1	d	½°	023331	M_L=3.5
	iSN	53.0						
WAN	iPZ	43.0		2.0	c	¾°	023329	
	iSZ	53.4						
VUL	iPZ	44.2	0.4	5.9	d	¾°	023329	
	iSZ	55.0						
KRT	ePZ	44½	0.1	2.0	d	½°	023332	
	iSE	53.0						
RAB	iPZ	024127.3	0.5	22.1	c	4½°	024018	M_L=5.7
	iZ	29.6						
	iSN/	4220.0						
WAN	eiPZ	4128½	0.5	11.0	c			
	iZ	29.5						
RAL	iPZ	30.0	1.0	7.4	d			
TAV	eiPZ	29	0.8	18.2	c			
	iZ	30.0						
VUL	iPZ	28.1	0.4	16.4	c			
	iZ	28.8						
RAB	iPZ	071057.2	0.5	4.0	d	45°		
	ePcSN/	1632						
	eSN/	1729						
	eScSE/	2050						
		LZ	22.0	50.0				
		LN	24.0	83.0				
		LE	18.0	68.0				
WAN	ePZ	57			d			
RAL	iPZ	57.6	0.8	3.8	d			
TAV	ePZ	57			d			
VUL	ePZ	58			d			
RAB	eZ/	094322			+			Traces
RAB	eZ/	105322			+			Traces
RAB	ePZ	105710	0.6	1.5	c	48°		
	eSN/	0356						
		LZ	28.0	68.0				
		LN	26.0	22.0				
		LE	30.0	54.0				
RAB	iPZ	144051.2	1.0	2.0	c			Distant
KRT	ePZ	53			c			
RAB	eiPZ	153105½	0.5	10.0	c	1½°	153040	M_L=4.3
	iZ	06.2						
	iSN	24.8						
WAN	eiPZ	05½	0.4	7.3	c			
	iZ	05.9						
RAL	iPZ	05.2	0.5	10.2	c			
TAV	iPZ	05.2			c	1½°	153041	
	iSZ	23.0						
VUL	iPZ	05.2			c			
KRT	iPZ	05.4	0.4		c	1½°	153042	
	iSE	23.2						

			T sec	A mm	GM	Dist	H	Remarks
25th September, 1968 continued.								
RAB	iPZ	193938.0	0.5	26.6	d	1½°	193914	M_L=4.5
	iSN/	56.0						
WAN	iPZ	37.8	0.5	16.0	c	1½°	193913	
	iSZ	56.6						
SUL	iPZ	36.2			d			
RAL	iPZ	37.2	0.5	21.3	d	1½°	193912	
	iSZ	56.6						
TAV	iPZ	37.8			d	1½°	193913	
	iSZ	55.0						
VUL	iPZ	36.2			d			
KRT	iPZ	36.4	0.2	3.0	d	1¾°	193909	
	iSE	57.8						
26th September, 1968.								
RAB	iPZ	002020.0	0.4	1.2	d	1½°	001955	M_L=3.7
	iSN	38.5						
RAL	iPZ	20.0	0.2	1.8	d			
VUL	iPZ	19.6	0.3	2.0	c			
RAB	ePZ	024546½	0.6	1.5	c	28°		M_B=6.1
	iZ	48.5						
	eSE/	5029						
WAN	ePZ	4548	0.5	1.0	c			
TAV	ePZ	48	0.4	1.0	c			
VUL	ePZ	48	0.3	1.5	c			
RAB	ePZ	061413	0.4	2.0	c	5°	061259	M_L=5.1 M_B=5.6
	eSE/	1510						
RAB	ePZ	084702			c			
TAV	ePZ	4659½	0.2	1.6	c	¼°	084653	
	iSZ	4704.0						
VUL	ePZ	00						
RAB	ePZ	084834	0.5	1.0	c	15°		M_B=5.5
	iZ	34.5						
	iSE/	5129.0						
RAB	iPZ	125633.3	0.6	11.0	c	4½°	125525	M_L=5.0
	iSE	5725.6						
WAN	iPZ	33.3	0.5	6.0	c			
SUL	iPZ	33.5	0.4	3.0	d			
RAL	iPZ	33.3	0.6	3.0	c			
TAV	iPZ	33.4	0.5	6.0	c			
VUL	iPZ	32.5	0.6	8.0	c			
KRT	iPZ	30.6	0.3	2.8	d	4½°	125520	
	iSE	5724.6						

			T sec	A mm	GM	Dist	H	Remarks
26th September, 1968 continued.								
RAB	ePZ	144410	0.5	1.0	d	31°		
	iZ	16.3						M_B=6.2
	eSN/	4918						
WAN	ePZ	4410	0.3	1.0	d			
SUL	ePZ	10			d			
RAL	ePZ	10½	0.5	1.0	c			
TAV	ePZ	09			c			
VUL	ePZ	10½	0.5	1.0	d			
KRT	iPZ	11.8	0.8	2.5	c			
	eSE	4920½						
RAB	ePZ	162853½	0.7	1.8	d	27°		M_B=5.4
	eSE/	3330						
VUL	ePZ	2850	0.8	1.0	d			
RAB	ePZ	181009	0.5	1.0	c	39°		
	ePPZ/	1142						
	iPcPZ/	1218.0						
	eScPZ/	1603						
	eSE/	06						
		LZ	19.0	99.0				
		LN	17.0	72.0				
		LE	18.0	148.0				
WAN	ePZ	1008			c			
SUL	ePZ	08			c			
RAL	ePZ	08½			c			
TAV	ePZ	08½			c			
VUL	ePZ	10	0.5	1.0	c			
KRT	iPZ	11.1	0.5	1.5	d			
	eSE	1608½						
RAB	ePZ	184905½	0.5	1.0	c			Distant
RAL	ePZ	225512.5			d			
TAV	iPZ	11.5	0.3	5.2	d			
VUL	iPZ	12.5	0.4	4.4	c	2°	225442	
	iSZ	35.0						
27th September, 1968.								
RAB	eiPZ	040348.8	0.4	1.5	d	27°		
	iZ	51.5						M_B=6.7
	ePcPZ/	0704						
	eSE/	0822						
WAN	iPZ	0351.0			c			
SUL	iPZ	51.3		2.1	c			
RAL	iPZ	51.5	1.0	11.0	c			
TAV	iPZ	51.7	1.0	11.0	c			
VUL	iPZ	51.5	0.5	14.0	c			
KRT	ePZ	51						C.B.M.

			T sec	A mm	GM	Dist	H	Remarks
27th September, 1968 continued.								
RAL	ePZ	152857			c			
TAV	iPZ	56.5	0.4	4.4	c	3½°	152802	
	e(S)Z	2938						
VUL	ePZ	2857½		5.2	c	3½°	152803	
	iSZ	2939.1						
RAB	ePZ	164832	0.8	1.0				Distant
RAL	ePZ	31						
TAV	ePZ	31						
VUL	e(P)Z	31		1.8	d			
KRT	e(P)Z	31						
RAB	ePZ	165816	1.0	1.0	d	9½°	165600	
	iZ	19.0						
	eSN/	170002						
WAN	ePZ	165816		1.0	d			-
SUL	ePZ	16			d			
RAL	ePZ	16		1.0	c			
TAV	ePZ	16		2.4	c			
VUL	ePZ	15½	0.8	3.0	c			
KRT	ePZ	15			d			
VUL	iZ	172007.6	0.3	3.5	d	1¼°	171946	
	iSZ	25.0						
KRT	ePZ	07			c			
RAB	iPZ	190854.0	1.0	3.8	c	7½°	190705	M_L=6.3 M_B=6.3 Felt Wewak Int. VI-VII Yangoru Int IV-V Epicentre 145°E 4°S Near North Coast of New Guinea.
	iZ	55.0						
	eSN	1018						
WAN	ePZ	0854	1.0	3.0	c			
SUL	ePZ	54	1.0	1.2	c			
RAL	ePZ	54½	1.0	3.0	c			
TAV	ePZ	54	1.0	3.3	c			
VUL	iPZ	53.3	1.0	4.0	c			
KRT	iPZ	54.2			c			
RAB	iPZ	210109.7	1.0	4.0	c	10°		M_B=6.9
	iSE	0302.0						
	eLqE/	14						
	eLrZ/	36						
WAN	ePZ	0110		2.0	c			
SUL	ePZ	10						
RAL	ePZ	10		3.3	c			
TAV	ePZ	10	1.0	13.0	d			
VUL	iPZ	10.0	1.0	13.0	c			
KRT	ePZ	09			c			

			T sec	A mm	GM	Dist	H	Remarks
27th September, 1968 continued.								
RAB	iPZ	212009.3	1.0	2.4	c			Distant
WAN	ePZ	09			c			
RAL	ePZ	09	1.0	1.0	c			
TAV	ePZ	09	1.0	1.8	c			
VUL	iPZ	09.0	0.5	6.6	c			
KRT	ePZ	09	0.6	4.8	c			
RAB	iPZ	212803.0			d	3½°	212709	
	iSN	44.0						
WAN	iPZ	03.0			d			
SUL	iPZ	03.2			d			
RAL	iPZ	03.5			d			
TAV	iPZ	04.0			d			
VUL	iPZ	03.4			d			
KRT	iPZ	03.4			c			
RAB	iPZ	213624.7	0.5	3.0	c	1½°	213600	
	iSN	43.5						
WAN	ePZ	24			c			
RAL	ePZ	24			c	1½°	213600	
	iSZ	41.5						
TAV	iPZ	24.0			c			
VUL	iPZ	24.7	0.5	7.0	d			
RAB	eZ/	230022½			+			Traces
RAB	iPZ	235856.2	0.3	3.7	c	1°	235837	M_L=3.8
	iSE	5910.0						
WAN	iPZ	5856.2	0.4	3.4	c	1°	235837	
	iSZ	5910.0						
RAL	iPZ	5856.0		0.8	d	1°	235838	
	iSZ	5909.0						
TAV	iPZ	5856.0	0.4	2.4	d	1°	233837	
	iSZ	5910.4						
VUL	iPZ	5855.0			c			
28th September, 1968.								
RAB	iPZ	054455.2	0.5	5.0	c	1½°	054431	M_L=4.3
	iSN/	4513.0						
WAN	iPZ	4455.5	0.2	2.6	d			
SUL	iPZ	55.8	0.3	1.4	d			
RAL	iPZ	54.7		4.0	d			
TAV	iPZ	54.0			c			
VUL	iPZ	54.0			c			
KRT	ePZ	54	0.2	2.0	c	1°	054436	
	iSE	4509.0						

			T sec	A mm	GM	Dist	H	Remarks
28th September, 1968 continued.								
RAB	iPZ	070020.4	0.5	2.5	d			Regional
WAN	iPZ	20.4	0.8	3.0	d			
SUL	iPZ	20.6	0.6	2.0	c			
TAV	iPZ	20.8	0.8	3.9	d			
VUL	iPZ	20.4			d			
RAB	ePZ eSN/	074037 4232	0.6	1.2	c	10¼°	073809	M_B=6.6
WAN	ePZ	4035	0.5	1.0	c			
TAV	ePZ	34			d			
VUL	iPZ	36.4		1.8	d			
RAB	ePZ eSN/	100147½ 0703	1.0	2.0	c	34°		M_B=6.1
WAN	ePZ	0147½			c			
RAL	ePZ	47			c			
TAV	ePZ	48	1.0	1.5	c			
VUL	ePZ	48	0.8	1.3	c			
RAB	iPZ e(S)N/	141237.5 1558	0.6	2.8	d	(18°)		M_B=5.1
WAN	iPZ	1237.5	0.6	1.4	c			
SUL	ePZ	38			c			
RAL	ePZ	37½	0.8	1.8	c			
TAV	ePZ	37½	1.0	1.5	d			
VUL	ePZ	37½	0.7	1.8	c			
KRT	ePZ	37						
RAB	iPZ iSN	172658.8 2716.0	0.3	2.0	d	1¼°	172636	M_L=4.4
WAN	iPZ iSZ	2658.5 2715.6	0.2	3.0	d	1¼°	172636	
SUL	iPZ	2658.3	0.3	0.8	d			
RAL	ePZ iSZ	2658½ 2716.3			(C)	1½°	172635	
TAV	iPZ iSZ	2658.5 2716.3	0.3	2.3	d	1¼°	172635	
VUL	iPZ	2657.8			c			
KRT	iPZ iSE	2656.0 2711.3	0.2	6.2	d	1¼°	172636	
RAB	iPZ iSE	185408.0 35	0.4	4.0	d	2¼°	185332	M_L=4.1
WAN	iPZ	07.6	0.2	3.0	d			
SUL	iPZ	07.8	0.4	1.0	c			
RAL	iPZ	07.8	0.8	1.0	d			
TAV	iPZ	07.6	0.3	2.0	d			
VUL	iPZ	07.0			d			
KRT	iPZ iSE	05.4 29.3		11.4	d	2°	185334	

			T sec	A mm	GM	Dist	H	Remarks
29th September, 1968.								
RAB	ePZ	064505		6.2	c			
WAN	ePZ	05	0.4	3.0	c			
RAL	ePZ	04½	0.4	1.0	c			
TAV	ePZ	05	0.4	5.0	c			
RAB	eZ/	072351			-			Traces
RAB	iPZ e(S)N/	082604.0 3010	0.6	1.1	d	(25°)		
WAN	ePZ	2607			c			
RAL	iPZ	07.8	0.6	1.4	c			
TAV	ePZ	08			c			
RAB	ePZ	084322			c			Distant
RAB	iPZ e(S)E/	133223.0 3652	1.0	2.6	c	(28°)		M_B=6.0
		LZ	26.0	20.0				
		LN	20.0	8.0				
		LE	24.0	19.0				
RAB	iPZ iSN	145948.9 150008.6	0.5	9.5	c	1½°	145922	M_L=4.1
WAN	iPZ iSZ	145948.6 150008.5	0.3	4.0	c	1½°	145922	
RAL	iPZ iSZ	145948.9 150007.5	0.4	2.0	c	1½°	145923	
TAV	iPZ	145949.0			c			
VUL	iPZ iSZ	48.1 150007.0	0.4	39.4	c	1½°	145923	
KRT	iPZ iSE	145945.8 150003.3	0.2	3.0	c	1½°	145922	
RAB	iPZ eSN/	172032.2 2220	0.6	3.2	d	9½°	171813	M_B=5.7
WAN	ePZ	2032			d			
TAV	ePZ	33			d			
VUL	iPZ	31.8	1.0	4.1	d			
KRT	ePZ	28½	1.0	1.2	d			
RAB	iPZ iSN/	173955.5 4145	0.9	2.5	d	9¾°	173734	M_L=5.7 M_B=5.7
WAN	ePZ	3955			d			
TAV	i(P)Z	52.2	0.8	7.2	d			
VUL	ePZ	54½	0.8	7.2	d			
KRT	iPZ	51.9	0.6	2.0	c			
RAB	ePZ eSE/	181531 1738	1.0	2.0	c	11¼°		M_B=5.6
WAN	ePZ	1531	0.8	1.2	c			
RAL	ePZ	31½	0.8	1.0	c			
TAV	ePZ	31½		2.4	c			
VUL	iPZ	30.2	0.8	5.8	c			
KRT	iPZ	29.0	0.9	2.5	c			

			T sec	A mm	GM	Dist	H	Remarks
29th September, 1968 continued.								
RAB	iPZ eSN/	194650.9 5140	0.5	1.5	c	(31°)		
RAB	iPZ iSN/	215642.0 5834.0	1.0	3.5	d	10°		M_L=6.1
RAL	ePZ	215642	1.0	4.0	c			
TAV	iPZ	42.0	1.0	6.9	c			
VUL	iPZ	40.6		1.0	c			
RAB	iPZ eSN/	224415.0 4556	0.5	2.0	d	9°	224205	M_L=5.6
RAL	ePZ	4415	0.5	1.8	d			
TAV	ePZ	14½	0.5	2.4	c			
VUL	iPZ	14.0	0.5	5.0	c			
30th September, 1968.								
TAV	iPZ	002031.0	0.8	1.0	c			
VUL	iPZ	30.0		0.6	c			
KRT	e(P)Z iSE	36 54.8		2.2	d	1½°	002011	
VUL	iPZ iSZ	005023.9 52.5	0.4	4.2	d	2½°	004946	
RAB	eZ/	040928			+			Traces
RAB	iPZ	053808.0	0.4	3.0	d			Regional
RAL	iPZ	07.5			c			
TAV	iPZ	07.4			c			
VUL	iPZ	07.2			c			
KRT	ePZ	07	0.4		c			
RAB	iPZ	064350.6	0.5	3.8	d			Regional
RAL	e(P)Z	50	0.5	2.4	c			
TAV	iPZ	50.5			c			
VUL	iPZ	50.0		2.4	c			
RAB	iPZ iSN	065110.5 28.2	0.5	4.2	d	1½°	065045	M_L=3.6
VUL	iPZ	09.2			c			
RAB	iPZ eSN/	081543.5 1736	0.5	1.6	c	10°	081318	
VUL	ePZ	1543½		2.4	c			
RAB	iPZ iSN	104919.5 33.2	0.3	2.0	c	1°	104901	M_L=3.4
WAN	iPZ	19.3			c			
RAL	iPZ	19.5			c			
TAV	iPZ	19.0	0.4	6.9	c			
VUL	iPZ	18.7			c			
KRT	ePZ iSE	18½ 31.0			d	1°	104902	

			T sec	A mm	GM	Dist	H	Remarks
30th September, 1968 continued.								
RAB	iPZ	114444.3		1.6	c	(30°)		
	e(S)N/	4920						
		LZ	20.0	12.0				
		LN	20.0	10.0				
		LE	19.0	17.0				
VUL	ePZ	43	0.5	1.0	c			
RAB	eZ/	141546			+			Traces
RAB	eiPZ	142108	1.0	3.0	c	(22°)		
	iZ	18.4						
	e(S)E/	2526						
WAN	ePZ	2108	0.4	0.4	d			
RAL	ePZ	8½	0.6	0.6	d			
TAV	ePZ	8½	0.8	1.2	d			
VUL	iPZ	8.8	0.4	1.6	d			
KRT	iPZ	07.5	0.8	0.2	d	1¼°	142046	
	eSE	24						
RAB	iPZ	150610.2	0.5	2.9	d	2¼°	150533	M_L=4.2
	iSN	37.9						
VUL	iPZ	19.0		1.0	d			
KRT	ePZ	07½			c	2°	150534	
	iSE	32.5						
RAB	iPZ	213009.3	0.5	3.0	c	1¼°	212949	M_L=3.5
	iSE	24.5						
RAL	ePZ	09		1.8				
TAV	iPZ	09.0		4.0	c	1°	212950	
	iSZ	23.3						
VUL	ePZ	09		3.0	d			
RAB	iPZ	222859.3	0.5	2.2	c			Local
1st October, 1968.								
RAB	ePZ/	005517			-	10¼°	005250	
	eSE/	5711						
RAB	ePZ	055941½			c			
WAN	ePZ	42			-			
RAL	ePZ	42			d			
TAV	ePZ	41½						
VUL	ePZ	38			d			
RAB	iPZ	081224.2	0.5	2.0	c			
WAN	ePZ	24						
RAL	ePZ	24						
TAV	ePZ	24						
VUL	ePZ	25	0.6	0.8	c			

			T sec	A mm	GM	Dist	H	Remarks
1st October, 1968 continued.								
RAB	ePZ	091313½	0.3	1.5	c	1¾°	091244	M_L=4.0
	eSN	35						
WAN	ePZ	13			d	1¾°	091244	
	iSZ	34.5						
SUL	ePZ	14			c	1¾°	091248	
	eSZ	34						
RAL	ePZ	13	0.9	1.0	c	1¾°	091243	
	eSZ	35½						
TAV	ePZ	12½	0.2	1.0	c	1¾°	091245	
	iSZ	33.5						
VUL	ePZ	12½		1.0	d			
KRT	iPZ	14.8	0.5	3.1	c	1½°	091248	
	iSE	34.8						
RAB	ePZ	103012	0.3		d	1¼°	102952	M_L=3.6
	iSN	27						
WAN	ePZ	12			d	1¼°	102951	
	eSZ	27½						
SUL	ePZ	14			c	1°	102955	
	iSZ	28.2						
RAL	ePZ	11½		1.5	d	1¼°	102950	
	iSZ	27.0						
TAV	ePZ	10½	0.1	5.0	c	1¼°	102949	
	iSZ	26.0						
VUL	iPZ	11.8	0.2	4.0	c	1¼°	102952	
	iSZ	27.0						
RAB	ePZ	122928	1.0	1.0	d			Teleseism
WAN	ePZ	30			d			
RAL	ePZ	30½			d			
TAV	ePZ	29			-			
VUL	ePZ	28			d			
RAB	iPZ	150353.0	0.3	17.0	d	1°	150334	M_L=4.1
	iSN/	0407.0						
WAN	iPZ	0353.0	(0.2)	8.8	d	1°	150335	
	iSZ	0406.3						
SUL	ePZ	0353	0.4	4.0	d	1°	150334	
	eSZ	0407						
RAL	iPZ	0352.8	(0.3)	5.9	d	1°	150333	
	iSZ	0407.5						
TAV	iPZ	0352.0			d			
VUL	iP!Z	52.0			d			
KRT	iPZ	51.9		11.5	d	1¼°	150330	
	eSE	0408						

			T sec	A mm	GM	Dist	H	Remarks
1st October, 1968 continued.								
RAB	ePZ	151320½	0.2	1.8	d	¾°	151305	M_L=3.2
	iSN	31.5						
WAN	ePZ	20½	0.2	0.5	c	¾°	151305	
	iSZ	31.2						
SUL	ePZ	20½			c	¾°	151307	
	iSZ	30.5						
RAL	ePZ	20	0.2	3.0	d	¾°	151306	
	iSZ	30.0						
TAV	iPZ	20.0	0.2	20.0	d	¾°	151306	
	iSZ	29.8						
VUL	ePZ	21½	0.3	4.0	d	¾°	151307	
	iSZ	32.0						
KRT	ePZ	23	0.2	1.2	c			
RAB	iPZ	160139.6	0.3	4.7	d	1¼°	160120	
	iSZ	55.0						
WAN	ePZ	39		1.5	d			
SUL	iPZ	39.0	0.4	1.0	c			
RAL	eiPZ	39			c			
TAV	ePZ	39	0.2	7.0	d			
VUL	ePZ	38½			d			
KRT	iPZ	38.4		2.8	d	1°	160120	
	iSE	52.5						
RAB	ePZ	190302½	0.3	1.0	d			Regional
WAN	ePZ	02½			d			
SUL	ePZ	03			-			
RAL	ePZ	02			d			
TAV	ePZ	01½			d			
VUL	ePZ	02			d			
RAB	iPZ	213128.0	0.4	1.5	d	3¾°	213032	M_L=4.8
	iSE	3210.8						
RAL	ePZ	3125				3½°	213030	
	eSZ	3207						
TAV	ePZ	3125				3¾°	213029	
	iSZ	3208						
VUL	ePZ	3125				3¾°	213028	
	i(S)Z	32(09)						
RAB	iPZ	221144	0.5	2.5	c	2¾°	221102	M_L=5.0
	iSE/	1216						
KRT	ePZ	1144½	0.5	4.2	c			

			T sec	A mm	GM	Dist	H	Remarks
TABELE.								
7th to 27th August, 1968.								
7th August, 1968.								
Nil recorded.								
8th August, 1968.								
Nil recorded.								
9th August, 1968.								
TBL	iPZ i(S)Z	015854 5913	0.5	16.0	c	1½°	015829	
TBL	iPZ	155910	0.2	1.2	d			Distant
10th August, 1968.								
TBL	ePZ	021130	0.2	1.0	d			Near
TBL	ePZ	041014			c			Distant
TBL	eiPZ	055615						Distant
TBL	iPZ iSZ	100337 53	0.3	8.5	d	1¼°	100317	
TBL	iPZ iSZ	125535 42	0.2	6.8	d	½°	125526	
TBL	iPZ iSZ	125845 57	0.3	2.0	c	1°	125831	
TBL	iPZ i(S)Z	130055 0101	0.2	18.0	d	¼°	130048	
TBL	iPZ i(S)Z	130740 47	0.3	3.8	d	½°		
TBL	iPZ iSZ	135202.0 09.0	0.3	4.0	d	½°	135153	
TBL	iPZ iSZ	143906.0 13.0	0.2	2.7	d	½°	143857	
TBL	ePZ	200509	0.5	1.0	d			Distant
11th August, 1968.								
Nil recorded.								
12th August, 1968.								
TBL	iPZ iSZ	185912 47	0.3	1.0	d	3°	185828	
13th August, 1968.								
TBL	iPZ	124447	0.5	2.8	c			Near
14th August, 1968.								
TBL	iPZ iSZ	100119 33	0.5	5.8	d	1°	100103	

			T sec	A mm	GM	Dist	H	Remarks.
TABELE.								
14th August, 1968 continued.								
TBL	iPZ iSZ	141704 11	0.4	6.0	d	½°	141657	
TBL	ePZ	221938	0.2	1.0	c			Distant
15th August, 1968.								
TBL	ePZ	174622			d			Distant
16th August, 1968.								
Nil recorded.								
17th August, 1968.								
TBL	iPZ	040505	0.3	1.0	d			Near
18th August, 1968.								
TBL	ePZ	053126	0.3	1.2	d			Near
TBL	ePZ	152314			(d)			Teleseism
TBL	ePZ	181248			c			Distant
TBL	iPZ	184052	0.4	2.4	d			
19th August, 1968.								
TBL	ePZ	000307	0.2	1.0	d			
20th August, 1968.								
TBL	ePZ	111903	0.3	1.0	d			Near
TBL	ePZ i(S)Z	221851 1905	0.2	1.0	d	1°	221832	
21st August, 1968.								
TBL	ePZ iSZ	191414 1513	0.2	1.0	d	5¼°	191259	
22nd - 24th August, 1968.								
Nil recorded								
25th August, 1968.								
Microseismic activity between 1728-1731 hours (L.T)								
26th August, 1968.								
TBL	iP!Z	063245			d			Local
TBL	iPZ i(S)Z	063846 58	0.2	1.0	d	1°	0638(32)	
27th August, 1968.								
Nil recorded.								

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PEA OCT-68 No.41.

20 OCT 1968

TERRITORY OF PAPUA AND NEW GUINEA
GEOLOGICAL AND VOLCANOLOGICAL BRANCH
VOLCANOLOGICAL SECTION

PRELIMINARY EARTHQUAKE ANALYSIS
RABAUL CENTRAL OBSERVATORY
1968

Rabaul	RAB	From: OCT. 2. 1968 To: OCT. 8. 1968
Rabaul Harbour Network	WAN SUL RAL TAV VUL	From: OCT. 2. 1968 To: OCT. 8. 1968
Keravat	KRT	From: OCT. 2. 1968 To: OCT. 8. 1968
Esa'Ala	ESA	From: SEP. 16. 1968 To: SEP. 23. 1968
Agenahambo	AGE	From: AUG. 25. 1968 To: SEP. 28. 1968
Waris	WAA	Not operational
Ulamona	ULA	Not operational
Piva	PIV	Not operational
Cape Gloucester	LAG	Not operational
Tabele	TBL	From: AUG. 28. 1968 To: SEP. 4. 1968
Yangoru (Emergency Field Station)		From: To:

STATION PERSONNEL

RAB Central Observatory, Rabaul.

Volcanologist-in-Charge	G.W. D'Addario
Volcanologist	R.F. Heming
Seismologist	M. Mancini
Seismogram Readers	R.A. Page, L.M. Cartwright
Senior Technical Officer	N.O. Myers
Technical Officer	R.J. Conway
Volcanological Assistants	L. Topue, M. Gaiam, E. Ravian
Technical Assistant	P. Daimbari
Trainee Volcanological Assistants	B. Talai, M. Salaiau, C. Matupit
Clerk	J.A. Alcock

KRT Keravat Outstation.

Observer (part-time)	G.E. Chorick

TBL Tabele Observatory.

Observer	V. Kaita

ESA Esa'Ala Observatory.

Observer	F. Dira

AGE Agenahambo Outstation.

Observer (part-time)	B. Kirke

The Rabaul Preliminary Earthquake Analysis (PEA) is produced by the staff under the direction of the Volcanologist-in-Charge from whom additional information and photocopies of seismogram records from all stations may be obtained on request.

Please address all communications to:-

Volcanologist-in-Charge,
Central Observatory,
P.O. Box 386,
RABAUL. T.N.G.

Station & Instruments	Comp	To	Tg	Trace Speed mm/min	Approximate relative Magnification	Approximate damping
Rabaul Harbour Network (cont'd)						
o Signals from these stations are telemetered by land line to Helicorders (Geotech Mod. 2484) at the Central Observatory.						
oo Signals from this station are telemetered via VHF to its Helicorder at the Central Observatory.						
KRT Keravat Out-station						
Benioff MC 50Kg	Z	1.2	0.2	15	20% sensitivity	critical
Benioff MC 50Kg	N,E	1.2	0.2	15	10% sensitivity	critical
ULA Ulamona Field Station						
Willmore portable	Z	0.6	0.25	60	3,000	underdamped
PIV Piva Field Station						
Willmore portable	Z	0.6	0.25	60	3,000	underdamped
WAA Waris Field Station						
Willmore portable	Z	0.6	0.25	60	3,000	underdamped
LAG Cape Gloucester						
Willmore portable	Z	0.6	0.25	60	3,000	underdamped

N.B. These field stations consist of a permanent building in which instruments are installed when necessary.

Details of emergency field stations, within the Territory will be listed when in operation.

TBL Tabele Observatory						
Benioff VR 107.5Kg (PAPUA)	Z	1.0	0.2	60	1,350	critical
ESA Esa'ala Observatory						
Benioff VR 107.5Kg	Z	1.0	0.2	15	36,000	critical
Benioff VR 107.5Kg	N,E	1.0	0.2	15	18,000	critical
Benioff VR 107.5Kg	Z/N/E/	1.0	60.0	30	50% sensitivity	critical
AGE Agenahambo Station						
Willmore portable	Z	0.6	0.25	60	3,000	underdamped

VR Variable Reluctance

MC Moving-coil

Relative magnification curves of seismograph systems installed in the stations controlled by the Rabaul Central Observatory are listed once a month on the P.E.A.

PRESENTATION OF DATA

(reviewed in November, 1967)

All times are reduced to Greenwich Mean Time (GMT), which is 10 hours behind Eastern Standard Time.

At RAB and Harbour Network, the time signal is marked every minute on each seismogram record from the Observatory crystal chronometer. Second marks from radio signal VNG (Australia) are recorded on World-Wide Standard System S.P.=N component only according to the W.W.S.S. programme, at six hour intervals. Primary time is provided by W.W.S.S. equipment and secondary time by a Labtronic crystal chronometer with the accuracy of $\pm$ 5ms per day compared with VNG (Australia) with the aid of a chronoscope.

At TBL and AGE, the time signal is derived from a spring driven chronometer (Mercer) and marked each minute on records. Time accuracy is determined by comparison with signals from WWVH daily. Linear correction is applied to the daily drift.

On all seismogram records time increases from left to right and time break is upward.

At RAB* and Harbour Network the recording drum of each seismograph is driven by a 110VAC 60Hz synchronous motor. The 110VAC is frequency regulated by a crystal chronometer.

* The Omori recording drum is driven by a nonregulated 50Hz frequency supply.

At ESA and KRT power for recorder motors is frequency regulated by a crystal chronometer at 50Hz. Power for AGE and TBL and field stations is supplied by a 50Hz free running oscillator.

Direction of Motion

Upward direction of ground motion corresponds to upward trace motion on vertical seismogram records. Direction of component of ground motion to North or East corresponds to upward trace motion on horizontal seismogram records.

Vertical trace motion from impulsive onset of longitudinal waves of compressional or dilational ground movement is indicated by "u" or "d" accompanied by N,S,E, or W as per trace motion amplitude on horizontal seismogram records, to represent vectorially the direction of ground motion. "+" or "-" indicates upward or downward motion of the ground respectively, from a wave not known to be of the longitudinal type.

Accuracy of Readings

When readings are given with a decimal figure, they are to 1/10 of a second, other readings have been made to the nearest half second.

Crustal Phases

Px, Sx, Crustal phases, other than Pn and Sn for local and near earthquakes.

Felt Intensity

Information on maximum intensities of shocks reported felt is included. Intensities are given in Roman numerals based on the Modified Mercalli scale, of 1931.

Determination of Epicentre

Where no souce is cited, the determination of epicentral distance and origin time for local and regional earthquakes is carried out at the Central Observatory Rabaul from the S-P travel times, assuming a normal depth of the focus.

Geographical Designation of Epicentre

The regional names which follow the co-ordinates of epicentres located at the Central Observatory are meant only to supplement the co-ordinates and normally follow well-known geographical rather than geological features. Use is made of the full degree blocks according to the mehtod defined by E.A. Flinn and E.R. Engadhl in "A PROPOSED BASIS FOR GEOGRAPHICAL AND SEISMIC REGIONALIZATION", Seismic Data Laboratory Report NO. 101, U.I.D. Inc., Alexandria, Virginia, 1964, adopted by the U.S.C.G.S. for computer requirements.

Magnitude Definition and Determination

M_L - Local Magnitude (Richter, 1935) is calculated from the recorded trace amplitude of the Wood-Anderson torsion seismographs of stated physical constants (installed at the Observatory in November, 1967).

Maximum trace amplitude (0 to peak) expressed in millimetres and tenths is measured directly on both components. Magnitude is determined independantly and the arithmetic mean taken. M_L values are given to the tenth of a unit.

The station correction factor is assumed to be zero until better known.

M_S - Surface Wave Magnitude (Gutemberg & Richter, 1956) is calculated from the amplitude of surface waves of period near 20 seconds for shallow distant earthquakes.

M_B - Body Wave Magnitude is calculated from the ratio of amplitude over period for body waves on S.P.-Z of World-Wide Seismograph System only when depth is known. The magnification factor for the standard seismograph is taken into account.

m - Unified magnitude (Gutemberg & Richter, 1956) has the following relation to M_L , M_S, and M_B.

$$m = 1.7 + 0.8\ M_L - 0.01\ M^2_L$$

$$m = M_B \text{ (without correction)}$$

$$m = 2.5 + 0.63\ M_S$$

Local Magnitude of earthquakes recorded at RAB with clear S-P interval is tabulated on a Day-Distance (in Central Angle Degrees) graph which is added to the PEA monthly.

Symbols

i - impulsive and sharply defined beginning of a phase.

e - emergent and poorly defined beginning of a phase.

T - Period in seconds.

A - Peak-to-Trough trace amplitude in millimetres.

GM - Ground Motion.

Dist - Epicentral distance in central angle degrees.

H - Origin time.

h - Focal depth in kilometres.

CBM - Confused by microseisms.

PRESENTATION OF DATA
(cont'd)

Remarks

Local - Typical signature of an earthquake with epicentre within 0.9°.

Near - Typical signature of an earthquake with epicentre between 0.9° and 9°.

Distant - Typical signature of an earthquake with epicentre between 9° and 45°.

Teleseism - Typical signature of an earthquake with epicentre more than 45°.

Traces - Any recorded disperse waves or very weak unknown earthquake phases.

Local and Near earthquakes will be classified Regional, and Distant earthquakes willbe grouped with Teleseisms if sheer waves and their reflections are unidentifiable.

G. W. D'ADDARIO
Vulcanologist-in-Charge

		T			GM	Dist	H	Remarks
		sec		m				
RABAUL.								
2nd October, 1968.								
RAB	iZ	031339.5			d			Ship movement in Rabaul (Simpson) Harbour.
	eF	1535½						
RAB	iPZ	053446.2	0.4	4.0	c	2°	053412	M_L=4.6
	iSZ	3511.8						
WAN	iPZ	3445.8	0.3	3.0	c	2¼°	053411	
	iZ	46.6						
	iSZ	3512.0						
SUL	iPZ	46.6	0.4	3.4	c	2¼°	053412	
	iSZ	3512.5						
RAL	ePZ	3446		9.6	d	2¼°	053412	
	iSZ	3511.4						
TAV	iPZ	3446.6		10.0	d			
VUL	iPZ	45.3		3.6	d			
KRT	iPZ	44.0			d	2°	053412	
	iSE	3508.2						
RAB	eZ/	065210			+			Traces
RAB	ePZ	071527½			d			Regional
	eE	38						
WAN	ePZ	27½	0.3		c			
RAL	ePZ	27½			c			
TAV	ePZ	27½						
RAB	iPZ	094253.6	0.4	22.0	c	1¼°	094234	M_L=4.7
	iSE	4309.0						
WAN	iPZ	4253.3		13.0	c	1¼°	094232	
	iZ	58.2						
	eSZ	4309						
SUL	ePZ	4253	0.4	3.6	c			
RAL	iPZ	52.8		12.4	c			
TAV	iPZ	52.5			c			
VUL	iPZ	53.6			c			
KRT	iPZ	54.6	0.6	6.4	c	1¼°	094233	
	iSE	4310.6						
RAB	ePZ	130316			d			Regional
WAN	ePZ	17			c			
RAL	ePZ	16½			c			
VUL	ePZ	18½			c			
RAB	iPZ	182259.7	0.4	2.7	c	1¼°	182240	M_L=3.9
	iSE	2315.0						
WAN	iPZ	2259.6			c			
SUL	iPZ	59.7	0.2	1.0	c			
RAL	iPZ	59.5	0.5	4.0	c			
TAV	iPZ	59.0	0.4	2.2	c			
VUL	iPZ	58.5	0.5	2.5	c	1°	182240	
	iSZ	2312.3						
KRT	iPZ	2257.8	7.2	0.3	d	1°	182240	
	iSE	2311.0						

			T sec	A mm	GM	Dist	H	Remarks
2nd October, 1968 continued.								
RAB	iPZ	182542.5	0.8	5.8	c	4¾°	182432	M_L=5.4
	iZ	46.7						
	iNE/	2622.0						
	iSNE/	36.0						
	eLqZ/	2740						
	eLrZ/	48						
WAN	iPZ	42.2		2.2	c			
	iZ	46.5						
SUL	e(P)Z	42		1.2	c			
RAL	ePZ	42½	0.7	2.0	c			
TAV	eiPZ	43	0.7	4.0	c			
	iZ	48.0						
VUL	iPZ	41.8	0.5	7.0	c			
	iZ	46.4						
KRT	eiPZ	39			c	4¾°	182429	
	iZ	43.0						
	iSE	2633.0						
RAB	ePZ	195521	0.7	1.0	d			
RAL	ePZ	22			+			
TAV	iPZ	22.0			c			
VUL	ePZ	22½			c			
3rd October, 1968.								
RAB	iPZ	033533.2	0.5	2.0	d			C.B.M. Regional
RAB	iPZ	080959.5	0.4	4.0	d	24°		M_B=6.1
	eSN/	1411						
WAN	ePZ	59½	0.5	2.0	d			
VUL	ePZ	59½	0.5	1.0	d			
RAB	iPZ	110023.5	0.3	2.8	d	1¾°	105954	M_L=3.8
	iSE	45.0						
RAL	iPZ	22.4	0.3	1.0	d	1¾°	105955	
	eSZ	43						
TAV	iPZ	21.0	0.2	2.0	d	1¾°	105952	
	iSZ	42.5						
VUL	iPZ	21.2			c	2°	105948	
	eSZ	46						
KRT	ePZ	24			c	1¾°	105955	
	iSE	46.2						
RAB	iPZ	120059.2	0.3	3.0	c	1½°	120034	M_L=3.3
	eSE	0118						
WAN	iPZ	0058.6	0.2	1.2	c			
RAL	ePZ	59			c			
TAV	ePZ	59			c			
VUL	iPZ	58.0	0.3	2.5	d	1½°	120032	
	iSZ	0118.0						
KRT	iPZ	0056.5		6.8	d	1½°	120031	
	iSE	0115.8						

			T sec	A mm	GM	Dist	H	Remarks
3rd October, 1968, continued.								
RAB	ePZ	122534½	0.3	1.0	d			Regional
WAN	ePZ	34			d			
RAL	ePZ	34	0.6	1.2	c			
TAV	ePZ	34			c			
VUL	ePZ	34	0.5	2.0	c			
KRT	iPZ	33.4	0.5	6.6	d			
RAB	ePZ	123252	0.4	1.2	d			Distant
RAB	ePZ	133915½	0.5	1.5	d			Regional
RAB	ePZ	144724	0.5	1.0	d	4°	144623	M_L=5.7
	iZ	31.1						
	iSE	4810.5						
WAN	e(P)Z	4725			d			
SUL	e(P)Z	29			d			
RAL	ePZ	25	0.5	1.0	d			
TAV	ePZ	24	0.3	1.0	d			
VUL	iPZ	24.0	0.3	2.0	d	4°	144623	
	iSZ	4811.0						
KRT	ePZ	4724		3.0	d	4°	144623	
	eSE	4811						
RAB	iP!Z	145212.8	0.4	19.0	dSW	(2°)	1451(40)	M_L=4.6
	i(S)E	38.0						
WAN	iP!Z	12.6	0.5	8.0	d			
SUL	iP!Z	12.6	0.5	1.8	d			
RAL	iP!Z	12.8	0.5	5.0	d			
TAV	iP!Z	12.5	0.3	10.0	d			
VUL	iP!Z	12.5	0.5	16.0	d			
KRT	iP!Z	11.7	0.3	6.0	d	2°	145139	
	iSE	36.8						
RAB	ePZ	181754½	1.0	1.0	d			Distant
4th October, 1968.								
RAB	eZ/	010120			-			Traces
RAB	iZ	030814.0	0.6	2.6	d			Ship moving in Simpson Harbour, Rab.
	eF	0925½						
TAV	ePZ	044554½			c	1¼	044533	
	iSZ	4610.0						
VUL	ePZ	4555		1.2	c	1¼°	044535	
	eSZ	4610						
RAB	eZ/	060411			-			Traces
RAB	ePZ/	062422			d			Teleseism C.B.M.
	LZ		21.0	16.0				
RAB	ePZ	065537	0.8	2.0	c			Distant C.B.M.
	LZ		21.0	16.0				
	LN		20.0	20.0				
	LE		20.0	10.0				

			T sec	A mm	GM	Dist	H	Remarks
4th October, 1968 continued.								
RAB	iPZ	095120.7	0.4	5.0	c	1½°	095054	M_L=4.8
	iSNa	40.4						
WAN	iPZ	20.2		2.4	c	1½°	095054	
	iSZ	39.7						
SUL	ePZ	20½	0.4	3.2	c	1½°	095054	
	iSZ	40.0						
RAL	iPZ	20.2		3.0	c	1½°	095054	
	eSZ	40						
TAV	e(P)Z	20	0.5	2.0	c	(1¾°)	0950(52)	
	iSZ	40.5						
VUL	iPZ	19.7	0.2	3.6	c	1½°	095053	
	iSZ	39.5						
KRT	iPZ	17.4		2.0	d	1½°	095054	
	iSE	35.2						
RAB	ePZ	133942	0.6	1.2	c			Regional
RAB	iPZ	173819.4	0.4	1.0	d	2°	173746	M_L=4.0
	iSN	44.5						
WAN	ePZ	19			d			
RAL	ePZ	19½			d			
VUL	iPZ	18.8	0.2	2.2	d	2°	173746	
	ePZ	44						
KRT	ePZ	17½		1.5	c	2°	173744	
	iSE	42.4						
RAB	ePZ	191619½	0.5	0.6	d			Distant
RAB	eZ	213029			d			Ship moving in Simpson Harbour, Rab.
	iF	3306.2						
5th October, 1968.								
RAB	iPZ	011551.3	0.5	3.2	d	3½°	011456	
	iSNa	1633.3						
TAV	iPZ	1551.0	0.5	4.0	c			
VUL	iPZ	51.0	0.5	5.4	c			
RAB	iPZ	062508.6	0.4	3.2	c	3¾°	062410	M_L=5.6
	iSE	53.4						
WAN	iPZ	08.4		1.2	c	3¾°	062410	
	iSZ	53.8						
RAL	iPZ	09.3	0.4	2.7	c	3¾°	062411	
	iSZ	54.5						
TAV	iPZ	07.6			c	3¾°	062409	
	iSZ	52.6						
VUL	iPZ	08.2	0.4	4.4	c	3¾°	062411	
	iSZ	52.0						
KRT	iPZ	08.0	0.4	3.5	c	3¾°	062411	
	iSE	52.0						

			T sec	A mm	GM	Dist	H	Remarks
5th October, 1968 continued.								
RAB	iPZ	092735.0	0.5	6.8	d	1¼°	192714	
	iSN	51.4						
SUL	ePZ	35			c			
RAL	eiPZ	34½		5.0	d	1¼°	092713	
	iSZ	50.2						
TAV	iPZ	34.0		29.9	d	1¼°	092714	
	iSZ	49.2						
VUL	iPZ	34.6	0.3	12.8	d	1°	092716	
	iSZ	49.0						
KRT	iPZ	33.8			d	1¼°	092714	
	iSE	49.2						
RAB	i(P)Z	135322.6	0.5	2.0	c	(3½°)	1352(30)	
	iSE	5403.0						
RAL	iPZ	5322.3	0.8	2.1	c			
TAV	iPZ	21.4		3.5	c	3½°	135229	
	iSZ	5401.3						
VUL	ePZ	5322	0.6	4.5	d			
KRT	ePZ	23	0.6	1.0	c	3¼°	135232	
	iSE	5401.6						
RAB	iPZ	180231.6	0.4	9.2	c	1½°	180206	M_L=4.1
	iSN	50.6						
WAN	iPZ	31.4	0.3	2.0	c			
SUL	iPZ	31.6	0.3	3.8	c	1½°	180206	
	iSZ	50.9						
RAL	eiPZ	31	0.3	9.5	d			
	iZ	31.4						
TAV	iPZ	31.0		15.4	d	1½°	180205	
	i(S)Z	50.8						
VUL	iPZ	30.3	0.3	6.8	d	1½°	180204	
	i(S)Z	50.7						
KRT	iPZ	29.6	0.3	4.2	d	1½°	180206	
	iSE	47.2						
RAB	iPZ	190335.8	0.4	8.2	c	1¼°	190314	M_L=4.0
	iSN	52.2						
WAN	iPZ	35.6	0.3	5.4	c	1¼°	190314	
	iSZ	51.1						
SUL	iPZ	35.7	0.3	2.0	c	1¼°	190313	
	iSZ	52.8						
RAL	iPZ	35.6	0.3	2.4	c			
TAV	iPZ	35.5	0.3	14.4	c			
VUL	iPZ	35.1	0.4	16.8	c	1¼°	190315	
	iSZ	50.3						
KRT	iPZ	34.0	0.2		c	1¼°	190314	
	iSE	48.9						

			T sec	A mm	GM	Dist	H	Remarks
5th October, 1968 continued.								
RAB	iPZ	202845.6	0.3	3.1	d	¾°	202831	M_L=3.5
	iSN	56.5						
WAN	iPZ	45.6	0.3	1.0	c	¾°	202831	
	iSZ	56.4						
RAL	iPZ	45.0		2.4	d	¾°	202831	
	iSZ	55.3						
TAV	iPZ	45.0	0.3	10.2	d	¾°	202831	
	iSZ	55.0						
VUL	iPZ	46.2	0.3	3.6	d	¾°	202831	
	iSZ	57.6						
KRT	ePZ	47½			c	1°	202831	
	iSE	59.8						
RAB	iPZ	203212.9	0.4	11.6	d	¾°	203158	M_L=4.0
	iSN	23.7						
WAN	iPZ	12.5	0.3	4.1	d	¾°	203157	
	iSZ	23.4						
SUL	iPZ	12.8		1.5	c	¾°	203159	
	iSZ	22.8						
RAL	iPZ	12.3		11.2	d	¾°	203159	
	iSZ	22.5						
TAV	iPZ	12.0			d	¾°	203158	
	i(S)Z	22.0						
VUL	iPZ	13.2	0.3	10.0	d	¾°	203159	
	iSZ	23.0						
KRT	iPZ	14.2		6.0	d	1°	203157	
	iSE	27.0						
6th October, 1968.								
RAB	eZ/	030518			-			Traces
RAB	eZ/	045956			+			Traces
RAB	ePZ	052150	0.6	1.5	d	35°	051500	M_B=5.9
	eSE/	2720						
		LZ	18.0	22.0				
		LN	19.0	83.0				
		LE	20.0	82.0				
RAB	iPZ	065311.0	0.4	4.0	d	1¼°	065250	M_L=3.8
	iSN	27.0						
WAN	iPZ	10.6	0.2	1.0	d	1¼°	065248	
	iSZ	27.3						
RAL	ePZ	10	0.5	1.0	d	1¼°	065249	
	eSZ	26						
TAV	iPZ	10.0	0.2	2.2	d	1¼°	065250	
	iSZ	25.0						
VUL	ePZ	10	0.3	1.0	c	(1½°)	0652(44)	
	e(S)Z	30						
KRT	e(P)Z	10	0.3	1.2	c	(1½°)	0652(46)	
	iSE	28.2						

			T sec	A mm	GM	Dist	H	Remarks
6th October, 1968 continued.								
RAB	e(P)Z	085351	0.7	2.0	c	(34°)	085400	
	eSE/	5913						
	iSSN/	090134.0						
		LZ	17.0	45.0				
		LN	19.0	124.0				
		LE	20.0	88.0				
RAB	iPZ	115748.2	0.3	1.8	d	1¾°	115719	M_L=4.6
	iZ	49.0						
	iZ	50.5						
	iS E	5810.2						
WAN	ePZ	5748	0.2	1.0	d	1¾°	115719	
	iSZ	5810.0						
SUL	ePZ	5749	0.2	2.0	c	2°	115717	
	eSZ	5812½						
RAL	ePZ	5748	0.4	0.8	d	2°	115716	
	iSZ	5812.0						
TAV	ePZ	5748	0.3	1.0	d	(2°)	1157(15)	
	i(S)Z	5812.8						
VUL	ePZ	5747	0.2	1.0	d	1¾°	115718	
	iSZ	5809.0						
KRT	iPZ	5745.4	0.2	7.0	d	1½°	115719	
	iSE	5805.0						
RAB	iPZ	120747.4	0.4	5.0	c	¾°	120732	M_L=3.8
	iZ	49.0						
	iSE	58.0						
WAN	ePZ	47	0.2	1.5	c	¾°	120732	
	iSZ	57.5						
SUL	iPZ	50.0	0.2	1.5	c	¾°	120736	
	iSZ	59.8						
RAL	ePZ	48	0.5	1.2	c			
TAV	ePZ	48½	0.2	1.0	d	½°	120740	
	iSZ	55.5						
VUL	iPZ	48.0	0.3	3.0	c			
KRT	iPZ	47.9	0.4	4.2	c	¾°	120734	
	iSE	58.1						
RAB	iPZ	122903.0	0.5	1.5	d	4¼°	122759	M_L=4.6
	eSN	51½						
WAN	ePZ	03	0.5	2.0	d			
RAL	ePZ	03	0.4	1.0	d			
TAV	ePZ	03½	0.4	1.0	d			
VUL	iPZ	02.2	0.2	1.0	c			
RAB	e(P)Z	154035	0.5	1.0	c	(15°)	153650	
	eSE/	4322						
RAB	iPZ	161649.3	0.3	1.8	c	1¼°	161627	M_L=3.6
	eSE	1706½						
WAN	ePZ	1649			c			
RAL	ePZ	49			d			
TAV	iPZ	48.5	0.2	2.0	c	1½°	161625	
	iSZ	1706.0						
VUL	iPZ	1648.0	0.2	1.2	d			

			T sec	A mm	GM	Dist	H	Remarks
6th October, 1968 continued.								
KRT	ePZ	161648½			d	1¼°	161626	
	eSE	1705						
RAB	ePZ	194752	0.8	1.8	d			Near
7th October, 1968.								
RAB	ePZ	002545½	0.6	2.0	d	6¼°	002414	M_L=5.9
	iSE/	2656.0						
WAN	iPZ	2541.6	0.5	2.0	d			
TAV	e(P)Z	43			c			
VUL	e(P)Z	43		1.0	c			
KRT	ePZ	41			c			
TAV	iPZ	064454.9	0.3	4.0	c	1¼°	064435	
	iSZ	4510.0						
VUL	iPZ	4455.0	0.3	4.5	d	1½°	064431	
	iSZ	4512.5						
TAV	ePZ	105215½			d			
VUL	ePZ	15		1.0	d	2°	105142	
	iSZ	39.5						
KRT	ePZ	14	0.2	2.1	c	1¾°	105145	
	iSE	36.2						
VUL	ePZ	142359½			d	1½°	142333	
	iSZ	2419.0						
VUL	ePZ	143224			c	½°	143214	
	iSZ	30.5						
RAB	iPZ	192607.0	1.7	15.0	c	8°	192411	M_L=6.2
	iSZ	2737.4						
		LZ	20.0	56.0				
		LN	20.0	6.0				
		LE	22.0	74.0				
WAN	ePZ	2607	1.0	3.3	c			
SUL	ePZ	08		2.0	d			
RAL	ePZ	07½	1.0	8.0	c			
TAV	iPZ	07.8	1.0	8.0	c			
VUL	ePZ	08	1.0	4.6	c			
KRT	ePZ	08			c			
RAB	iPZ	205725.0	0.5	1.6		1¾°	2056(57)	
	iZ	30.5						
	e(S)Z/	46						
WAN	ePZ	31	0.5	1.8	c			
RAL	ePZ	31	0.6	2.2	c			
TAV	iPZ	31.4	0.6	2.5	c			
VUL	ePZ	32	0.8	3.4	c			
KRT	ePZ	35½			c			

			T sec	A mm	GM	Dist	H	Remarks
7th October, 1968 continued.								
RAB	iPZ	235211.4	0.8	3.4	c	22°		
	eSE/	5608						
8th October, 1968.								
RAB	eZ/	043258			c			Traces
RAB	iPZ	044210.3	0.6	4.8	c	6¼°	044037	M_L=6.1
	iSN/	4322.0						
RAL	iPZ	4210.7			d			
VUL	iPZ	09.3	0.2	10.6	d			
KRT	ePZ	09	0.4	4.4	d			
RAB	iPZ	052724.0	1.0	12.0	d	1¾°	052656	M_L=5.0
	iSN/	45.0						
WAN	iPZ	24.0		5.4	d			
SUL	iPZ	23.7	0.3	9.2	d			
RAL	iPZ	23.1		35.2	d			
TAV	iPZ	23.0		105.5	d			
VUL	iPZ	25.0			d			
KRT	iPZ	24.8	0.3	3.2	d	1¾°	052657	
	eSE	46						
VUL	iPZ	061628.0	0.2	7.8	c	2°	061558	
	iSZ	50.5						
VUL	iPZ	065648.4	0.3	3.2	d	2°	065617	
	iSZ	5712.8						
RAB	iPZ	075418.8	0.5	5.2	c	70°		
	iSE/	080318						
	eLrZ/	1559						
		LZ	28.0	34.0				
		LN	22.0	34.0				
		LE	20.0	28.0				
VUL	iPZ	110713.2	0.2	3.2	d	1½°	110648	
	iSZ	32.0						
KRT	iPZ	12.5			d	1¼°	110651	
	iSE	28.5						
VUL	iPZ	120735.5	0.3	3.4	c			Near
VUL	iPZ	135835.1	0.2	1.5	c			Near
VUL	iPZ	142254.6	0.5	4.1	d	2¼°	142218	
	iSZ	2322.1						
TAV	iPZ	2254.4	0.8	1.0	d			Near
VUL	iPZ	143246.0	0.2	4.0	c	1¾°	143217	
	iSZ	3308.0						
VUL	iPZ	144355.7	0.4	2.0	c			Local
TAV	iPZ	55.9	0.4	1.6	c			
VUL	iPZ	150505.3	0.4	5.0	c			Local
TAV	iPZ	05.0	0.2	1.4	c			
RAB	iPZ	151539.8	0.6	2.5	d	2¼°	151503	
	eSN/	1608						

			T sec	A mm	GM	Dist	H	Remarks
8th October, 1968, continued.								
VUL	iPZ	152110.6	0.3	16.8	c			Local
TAV	iPZ	11.2		2.0	c			
KRT	iPZ	12.9	0.4	2.0	c			
RAB	iPZ	152858.1	0.5	7.2	d	4¾°	152745	M_L=5.4
	eSE/	2954						
WAN	iPZ	2858.6	0.6	10.0	d			Near
RAL	iPZ	58.4	0.6	5.8	d			
TAV	iPZ	58.5	0.6	5.9	d			
VUL	iPZ	57.3	0.5	9.9	c			
RAB	ePZ	164818			c	9¾°	164558	
	e(S)N/	5007						
VUL	iPZ	214507.5	0.2	1.5	c			

EMERGENCY FIELD STATION-YANGORU.

The Yangoru Field Station was closed on 30th September, 1968. The results from the analysis of the records from the 20th September until the 30th September will be included in PEA OCT-68 No. 42.

			T sec	A mm	GM	Dist	H	Remarks
ESA'ALA.								
16th September, 1968 - 23rd September, 1968.								
16th September, 1968.								
ESA	iPZ	225652	0.2	2.9	c	4°	225552	
	iSN/	5738						
17th September, 1968.								
ESA	iPZ	003536	0.2	1.0	d			Regional
								Epicentre 149°00'E 6°30'S
								New Britain Region
ESA	iPZ	071434½	0.2	2.0	c			Regional
ESA	iPZ	073145	0.3	4.0	d	3¾°	073048	
	iSN/	3229						
ESA	ePZ	165412½	0.3	1.0	c	3¾°	165314	
	i(S)N/	57						
ESA	ePZ/	175625			c	(59°)		
	eSN/	180328½						
18th September, 1968.								
ESA	iPZ	091245	0.1	2.0	c	4°	091144	
	iSN/	1332						
ESA	ePZ	110121	0.1	1.0	d	4¼°	110017	
	iSN/	0210						Epicentre 149°00'E 6°20'S
								New Britain Region
ESA	ePZ	114755½	1.0	1.8	d	19°		
	iPPZ/	4808						
	iSPPPZ/	4904						
	iSN/	5126						
ESA	iPZ	122817	0.1	2.5	c			Regional
ESA	iPZ	141054½		0.5	d	5°	140940	
	iSN/	1151						
ESA	ePZ	151927	0.3	1.4	c	3¾°	151830	
	iSN/	2011						
ESA	iPZ	180740	0.2	1.0	c			Local
ESA	ePZ	231520½	0.4	1.0	d	2°	2314(49)	
	iSN/	44½						
19th September, 1968.								
ESA	ePZ	004311	0.4	1.0	c	3¾°	004214	
	iSN/	55						Epicentre 148°40'E 6°20'S
ESA	iPZ	232318	0.2	1.0	c	2¼°	232241	
	iSN/	46						
20th September, 1968.								
ESA	iPZ	020245½	(0.1)	5.0	c			
ESA	iPZ	031343		11.0	d			Local
ESA	ePZ	061934	0.8	1.0	c			Distant
ESA	ePZ	063618	0.2	1.0	d	3½°	063523	
	iSN/	3700						
ESA	i(P)Z	092814			d			Regional
ESA	ePZ/	145124½			d	1¾°	145057	
	iSN/	45½						

			T sec	A mm	GM	Dist	H	Remarks
ESA'ALA.								
20th September, 1968 continued.								
ESA	ePZ	183601			d	7¾°	183406	
	eSN/	3730						
ESA	iPZ	233332			d	1¾°	233303	
	iSN/	53½						
21st September, 1968.								
ESA	e(P)Z	0603(52)						Regional
ESA	ePZ/	131506½	0.5	2.0	d	51°		
	ePcSZ/	2018½						
	iSN/	2227½						
	iPSZ/	2302½						
	eLrZ/	3013½						
22nd September, 1968.								
ESA	iPZ	013948½			d	2½°	013910	
	iSN/	4017						
ESA	ePZ	080601			d			Distant
ESA	ePZ	092715½			d	2°	092642	
	eSN/	40						
ESA	e(P)Z/	111107				3¼°	111018	
	iSN/	44						
23rd September, 1968.								
ESA	i(P)Z	020633	0.3	0.9	c			Distant
ESA	iPZ	042312			c			Local
ESA	e(P)Z	050849						Teleseism

			T sec	A mm	GM	Dist	H	Remarks.
TABELE.								
28th August, 1968 - 4th September, 1968.								
28th August, 1968.								
TBL	iPZ	131514	0.2	1.8	d	1½°	131449	
	iSZ	33						
TBL	iPZ	152831	0.3	2.0	c		15 28(00)	Local - Felt Madang Int. IV Epicentre 145°48'E 5°13'S East New Guinea Region
TBL	ePZ	204920			c			
29th August, 1968.								
TBL	ePZ	142746	0.2	7.0	c	1¼°	142723	
	iSZ	2803						
30th August, 1968 - Nil recorded.								
31st August, 1968.								
TBL	ePZ	110146			c			Distant
1st September, 1968 - Nil recorded.								
2nd September, 1968.								
TBL	iPZ	123719	0.2	3.4	c	¼°	123711	
	iSZ	25						
TBL	iPZ	231046	0.2	2.0	c	1¼°	231026	
	iSZ	1101						
3rd September, 1968 - Nil recorded.								
4th September, 1968 - Nil recorded.								

			T sec	A mm	GM	Dist	H	Remarks
AGENAHAMBO								
25th August, 1968 - 28th September, 1968.								
25th August, 1968.								
AGE	ePZ	000402½						Distant
26th August, 1968.								
AGE	ePZ	013359½			d			Regional
AGE	ePZ	162443½						
27th August, 1968 - Nil recorded.								
28th August, 1968.								
AGE	ePZ	101331				2°	101301	
	iSZ	53½						
AGE	ePZ	153609	0.3	0.5	d	4½°	153501	
	iSZ	3700½						
AGE	ePZ	155948½				3°	155904	
	iSZ	160023½						
AGE	ePZ	205611½			d			Distant
29th August, 1968.								
AGE	ePZ	143522½				4¼°	143419	
	iSZ	3611½						
30th August, 1968 - 6th September, 1968 - Nil recorded.								
7th September, 1968.								
AGE	ePZ	170232	0.3	1.0	c	4½°	170122	
	iSZ	0325½						
8th September, 1968.								
AGE	ePZ	151403			d	8½°	151200	Felt widely over Sepik District
	i(S)Z	1538						Epicentre 144°25'E 3°50'S
AGE	ePZ	153350			c			Near North Coast of N.G. Near
AGE	ePZ	200529			-	¾°	200515	
	iSZ	39						
9th September, 1968. - Record exposed.								
10th September, 1968.								
AGE	iP!Z	080521			c	3¾°	080422	
	i(S)Z	06(06)						
11th September, 1968 - Nil recorded.								
12th September, 1968.								
AGE	ePZ	230758	0.8	1.0	d			Distant
13th September, 1968.								
AGE	ePZ	185847	0.2	1.0	c			

			T sec	A mm	GM	Dist	H	Remarks
AGENAHAMBO.								
14th September, 1968.								
AGE	ePZ	005922½	0.2	0.5	c	2¾°	005840	
	iSZ	54½						
AGE	iP!Z	180628			c	3½°	180532	
	iSZ	0710½						
15th September, 1968.								
AGE	i(P)Z	031013½			c	2¾°	030930	
	iSZ	46½						
16th September, 1968.								
AGE	iP!Z	135516½			d		?	Felt over Kandrian area Epicentre 148°17'E 6°11'S East New Guinea Region
17th September, 1968.								
AGE	ePZ	073122			d			
AGE	ePZ	165954½			d	2¼°	165918	
	i(S)Z	170022½						
18th September, 1968.								
AGE	ePZ	091222½			d	2½°	091143	
	iSZ	52½						
AGE	i(P)Z	110101½			c	2¼°	110026	
	iSZ	28½						
AGE	ePZ	122755½				2¼°	122718	
	iSZ	2822½						
AGE	ePZ	141033						
AGE	ePZ	151905			d			
19th September, 1968 - Nil recorded.								
20th September, 1968.								
AGE	ePZ	062242½						Distant
AGE	iPZ	063800½			d			
21st September, 1968.								
AGE	iPZ	032006½			c	2½°	031928	
	iSZ	35½						
AGE	ePZ	060636½			c			
AGE	ePZ	073507½			c	3°	073422	
	i(S)Z	42						
AGE	ePZ	104930			c	2½°	104852	
	iSZ	59						
AGE	ePZ	132257½			d			Teleseism
AGE	e(P)Z	190303½				1½°	190237	
	iSZ	23						
AGE	iPZ	215047½		1.0	d	2¼°	215011	
	iSZ	5115½						

			T sec	A mm	GM	Dist	H	Remarks
AGENAHAMBO.								
22nd September, 1968.								
AGE	ePZ	111044½			c	2¼°	111006	
	iSZ	1110½						
23rd September, 1968.								
AGE	ePZ	235019			c	5½°	234857	
	iSZ	5122						
24th September, 1968.								
AGE	iPZ	093002	0.2	1.0	d	3½°	092910	
	iSZ	41½						
25th September, 1968.								
AGE	ePZ	024805½			c			Near
AGE	ePZ	170659				2°	170626	
	iSZ	0724						
AGE	iPZ	185533	0.1	1.0	d	2¼°	185456	
	i(S)Z	56(01)						
26th September, 1968.								
AGE	ePZ	125615				2½°	125536	
	iSZ	44½						
AGE	ePZ	144420	0.3	0.5	d			Distant
AGE	ePZ	181007			d			Distant
27th September, 1968.								
AGE	i(P)Z	040300						C.B.M. Distant
AGE	ePZ	165749½			d			Near
AGE	ePZ	190828			d	8½°	190624	Felt Wewak& Yangoru
	iSZ	1004						Epicentre 145°E 4°S Near North Coast of N.G.
AGE	i(P)Z	210047½			d			Distant
AGE	ePZ	211950						Distant
28th September, 1968.								
AGE	iPZ	070559				2½°	070520	C.B.M.
	iSZ	0628½						

1 NOV 1968

PEA SEP-68 No. 42

TERRITORY OF PAPUA AND NEW GUINEA
GEOLOGICAL AND VOLCANOLOGICAL BRANCH
VOLCANOLOGICAL SECTION

PRELIMINARY EARTHQUAKE ANALYSIS
RABAUL CENTRAL OBSERVATORY
1968

Rabaul	RAB	From: OCT. 9. 1968 To : OCT. 15. 1968
Rabaul Harbour Network	WAN SUL RAL TAV VUL	From: OCT. 9. 1968 To : OCT. 15. 1968
Keravat	KRT	From: OCT. 9. 1968 To : OCT. 15. 1968
Esa'ala	ESA	From: To :
Agenahambo	AGE	From: SEP. 28. 1968 To : OCT. 5. 1968
Waris	WAA	Not operational
Ulamona	ULA	Not operational
Piva	PIV	Not operational
Cape Gloucester	CAG	Not operational

STATION PERSONNEL

RAB Central Observatory, Rabaul.

Volcanologist-in-Charge	G.W. D'Addario
Volcanologist	R.F. Heming
Seismologist	M. Mancini
Seismogram Readers	R.A. Page, L.M. Cartwright
Senior Technical Officer	N.O. Myers
Technical Officer	R.J. Conway
Volcanological Assistants	L. Topue, M. Gaiam, E. Ravian
Technical Assistant	P. Daimbari
Trainee Volcanological Assistants	B. Talai, M. Salaiau, C. Matupit
Clerk	J.A. Alcock

KRT Keravat Outstation.

Observer (part-time)	G.E. Chorick

TBL Tabele Observatory.

Observer	V. Kaita

ESA Esa'Ala Observatory.

Observer	F. Dira

AGE Agenahambo Outstation.

Observer (part-time)	B. Kirke

The Rabaul Preliminary Earthquake Analysis (PEA) is produced by the staff under the direction of the Volcanologist-in-Charge from whom additional information and photocopies of seismogram records from all stations may be obtained on request.

Please address all communications to:-

Volcanologist-in-Charge,
Central Observatory,
P.O. Box 386,
RABAUL. T.N.G.

			T sec	A mm	GM	Dist	H	Remarks
RABAUL.								
9th October, 1968.								
RAB	iPZ	011816.6	0.3	1.2	u			Regional
VUL	iPZ	15.7	0.3	3.8	u			
VUL	iPZ	014101.3	0.5	2.0	u			Local
RAB	ePZ	022954½	0.4	1.7	d	3¼°	022903	M_L=4.3
	eSN	3033½						
VUL	iPZ	2950.6	0.4	1.5	u			
RAB	ePZ	024218	0.3	1.5	d	3¾°	024119	M_L=4.4
	iSE	4303.0						
VUL	iPZ	4217.2	0.4	2.0	u	3½°	024122	
	iSZ	59.6						
RAB	iPZ	024755.5	0.3	1.7	u	1½°	024730	M_L=4.0
	iSN	4814.5						
WAN	iPZ	4755.6			u			
RAL	iPZ	55.2		5.6	u	1¼°	024733	
	iSZ	4812.4						
RAB	ePZ	034523	0.4	1.0	u	35°		
	eSE/	5056						
		LZ	18.0	30.0				
		LN	21.0	100.0				
		LE	23.0	52.0				
VUL	iPZ	051420.4	0.3	3.3	d			Local
RAB	iPZ	053923.2	0.4	9.0	d	1°	053904	M_L=3.7
	iSE	37.0						
RAL	iPZ	22.7		2.4	d			
VUL	iPZ	114025.7			u			Local
RAB	iZ	121235.7	0.5	2.0	d			Ship moving in Simpson Harbour Rabaul.
	FZ	1510						
RAB	iPZ	122434.2	0.4	1.5	d	½°	122425	
	iSE	40.7						
SUL	iPZ	34.0	0.3		d			
RAL	iPZ	33.6		2.0	d			
VUL	iPZ	33.8		1.0	u			
	iZ	35.7						
RAB	ePZ	140045	0.5		u			Local
RAB	iPZ	141236.5	0.5	3.6	d	1¼°	141215	M_L=3.6
	iZ	37.4						
	iSE	52.5						
VUL	iPZ	36.0		7.0	d			
KRT	iPZ	35.8	0.5	8.0	d	1¼°	141216	
	iSE	50.4						
VUL	iPZ	150255.1		2.1	d			Regional
RAB	ePZ	171716	0.8	1.0	d	34°		
	eSE/	2244						
RAB	iPZ	173606.7	0.4	5.0	d	1½°	173540	M_L=4.5
	iZ	07.0						
	iZ	08.0						
	iSN	27.0						

			T sec	A mm	GM	Dist	H	Remarks
9th October, 1968 continued.								
RAL	iPZ	173606.5			d	1½°	173541	
	iSZ	25.0						
KRT	iPZ	04.7	0.4	12.2	d	1¼°	173542	
VUL	iPZ	203509.7	0.5	1.0	u			Local
VUL	iPZ	205915.7		3.0	u			Local
10th October, 1968.								
Short Period Z N E Component records all exposed — unreadable P Phases read from Wood Anderson record.								
RAB	eZ/	013613			+			Traces
RAB	e(P)Na	050739			d			Local
WAN	iPZ	39.0			d			
SUL	i(P)Z	39.0			d			C.B.M.
RAL	iPZ	38.8			d			
TAV	iPZ	39.0	(0.2)	13.6	d			
RAB	iPNa	051006.5	0.3	4.0	u	¾°	050953	M_L=3.5
	eSN/	16						
WAN	iPZ	06.0	0.3	7.2	u			
RAL	iPZ	06.6		6.3	u			
TAV	iPZ	07.0	0.3	5.6	u			
VUL	iPZ	08.0	0.4	19.8	u			
RAB	ePNa	100337½				1½°	100314	M_L=4.0
	iSNa	55.0						
SUL	iPZ	38.1	0.5	1.0	u	1¼°	100315	
	iSZ	54.8						
RAL	iPZ	37.5		4.0	u	1¼°	100316	
	iSZ	54.0						
VUL	iPZ	38.2	0.4	3.2	d	1½°	100314	
	iSZ	56.0						
RAB	iPNa	150636.0	0.8	3.0	d	6¾°	150455	M_L=6.9 Felt Siassi Int. III
	i(S)E/	0754.0						
WAN	iPZ	0636.0	(0.8)	(9.0)	d			
RAL	iPZ	36.2		8.0	d			
TAV	iPZ	36.8		17.4	d			
KRT	iPZ	32.6	0.5	3.4	d	6½°	150455	
	iSE	0747.8						
RAB	iPNa	161538.0	0.4	2.0	d	4¼°	161434	M_L=5.8
	iSE/	1626.5						
WAN	iPZ	1532.9	0.5	14.2	d			
SUL	iPZ	38.0	(0.2)	2.0	d			
RAL	iPZ	38.0	0.8	5.7	d			
TAV	iPZ	38.6	0.6	11.7	d			
VUL	iPZ	37.0	0.7	10.0	d			
KRT	iPZ	34.3	0.2	2.7	u	4¼°	161430	
	eE	53						
	iSN	1622.8						

			T sec	A mm	GM	Dist	H	Remarks
10th October, 1968 continued.								
RAB	eZ/	180508			-			Traces
RAB	i(P)Na	185350	0.2	2.0	d	3°	185302	M_L=5.0
	iZ	5419.8						
	eSE/	26						
SUL	iPZ	5347.2			d	3°	185301	
	iSZ	5422.6						
RAL	iPZ	5347.0	0.2	1.0	d	3°	185300	
	iSZ	5423.0						
TAV	iPZ	5347.0	0.3	1.8	d	3°	185300	
	iSZ	5423.0						
VUL	iPZ	5347.0		2.9	d	3°	185301	
	iSZ	5421.8						
11th October, 1968.								
Records not available from Wood Anderson.								
RAB	iPZ	020249.0	0.5	1.5	d			Regional
WAN	iPZ	48.6	0.3	1.2	d			
SUL	iPZ	48.0	0.2	8.0	d			
RAL	iPZ	47.6			d			
TAV	iPZ	47.6			d			
VUL	iPZ	49.5	0.4	6.0	d			
RAB	iPZ	034517.3	0.4	3.0	u	1¼°	034455	
	eSE	34						
RAL	iPZ	17.0	0.2	1.0	u			
VUL	iPZ	16.5	0.2	6.5	u	1¼°	034454	
	iSZ	33.0						
RAB	iPZ	101351.5	0.4	3.0	u	1½°	101325	
	iSN	1411.5						
WAN	iPZ	1351.6	0.4	1.5	u			
SUL	iPZ	51.8	0.3	4.7	u	1½°	101325	
	eSZ	1412						
RAL	iPZ	1351.4	0.3	2.2	u			
TAV	iPZ	51.1	0.3	1.0	u	1¼°	101323	
	iSZ	1412.0						
KRT	iPZ	1348.5	0.4		u	1½°	101325	
	iSE	1406.4						
RAB	iPZ	104802.0	0.4	7.0	d	2½°	104723	
	iSN	32.0						
TAV	iPZ	02.5	0.4	2.0	d	2½°	104722	
	eSZ	33½						

			T sec	A mm	GM	Dist	H	Remarks
11th October, 1968 continued.								
RAB	iPZ	123322.2	0.5	4.0	dSE	1½°	123256	
	iZ	23.2						
	iZ	26.0						
	iS!N	42.5						
WAN	iPZ	22.0	0.2	1.0	d	1½°	123257	
	eSZ	40½						
RAL	iPZ	22.0	0.3	5.0	d			
TAV	iP!Z	22.0			d			
VUL	iPZ	21.1	0.2	8.0	d			
KRT	iPZ	20.4		11.0	d			
RAB	iPZ	151105.0	0.5	1.6	d	3½°	151013	
	eSN	45						
RAB	eZ/	152040			+			Traces
RAB	iPZ	163554.3	0.5	2.0	d	1¾°	163525	
	iSN	3616.0						
RAL	iPZ	3554.0	0.4	2.4	d	1¾°	163525	
	iSZ	3616.0						
TAV	iPZ	3553.6	0.4	1.5	d	1½°	163527	
	eSZ	3614						
VUL	iPZ	3553.6	0.4	2.0	d	2°	163523	
	iSZ	3616.5						
KRT	iPZ	3555.6	0.4		d	1¾°	163527	
	iSE	3617.4						
RAB	eZ/	172412			-			Traces
RAB	eZ/	192840			-			Traces
RAB	iPZ	225355.6	0.4	42.0	u	¾°	225342	M_L=4.6
	iSN/	5406.0						
WAN	iPZ	5355.2	0.4	2.5	u			
SUL	iPZ	55.3	0.5	1.6	u	¾°	225340	
	iSZ	5405.8						
RAL	iPZ	5355.1			u			
TAV	iPZ	55.0			u			
VUL	iPZ	56.1	0.3	16.0	u			
RAB	iPZ	225845.1	0.4	9.0	d	¾°	225830	M_L=4.0
	iSE	56.0						
WAN	iPZ	45.0	0.4	3.2	d	1°	225829	
	iSZ	56.8						
SUL	iPZ	45.0	0.3	5.0	d	1°	225829	
	iSZ	56.7						
RAL	iPZ	44.6	0.3	7.4	d	¾°	225830	
	iSZ	55.1						
TAV	iPZ	44.5	0.3	14.5	d	¾°	225829	
	iSZ	55.6						
VUL	iPZ	44.0	0.3	8.0	d	¾°	225829	
	iSZ	55.4						

			T sec	A mm	GM	Dist	H	Remarks
12th October, 1968.								
RAB	iPZ	011824.0	0.7	1.2	d	1½°	011759	M_L=3.5
	iSE	42.5						
TAV	iPZ	011824.0	0.3	3.0	d	1½°	011800	
	iSZ	42.1						
VUL	iPZ	24.5	0.5	2.6	u	1½°	011801	
	iSZ	42.3						
RAB	iPZ	031219.8			u			Regional
VUL	iPZ	18.8	0.4	7.0	d			
RAB	eZ/	081319			+			Traces
RAB	eiPZ	094842	0.5	6.0	u	1¾°	094813	M_L=3.7
	iZ	44.3						
	eSN/	4904						
RAL	iPZ	43.6	0.9	6.3	u			
TAV	iPZ	43.2		3.3	u			
	iZ	44.0						
VUL	iPZ	42.9	0.3	9.5	u			
RAB	iPZ	115300.0	0.4	2.5	d	2°	115227	M_L=4.0
	iSN	24.8						
TAV	iPZ	5259.8	0.3	4.6	d	2°	115228	
	iSZ	5323.4						
VUL	iPZ	5259.8	0.2	2.0	d	2°	115229	
	iSZ	5323.0						
RAB	iPZ	130614.6	0.6	10.3	u	2¼°	130528	M_L=5.0
	iZ	07.5						
	iSN	32.8						
TAV	iPZ	04.0	1.0	5.0	u	2¼°	130527	
	iSZ	32.3						
VUL	iPZ	03.6	0.8	25.2	u	2¼°	130529	
	iSZ	30.0						
KRT	iPZ	02.9			u	2°	130530	
	iSE	28.3						
RAB	iPZ	192324.9	1.0	9.0	d	28°		M_L=6.9
	eSN/	2802						
13th October, 1968.								
Strong microseismic activity Average T 0.6 A 4.0								
RAL	iPZ	003929.4	0.3	1.8	d	¾°	003916	
	iSZ	39.0						
TAV	iPZ	28.4			d			
VUL	iPZ	015202.5	0.4	2.4	d			Local
VUL	iPZ	051858.0	0.5	2.0	u			Local
TAV	iPZ	074823.9			d		074810	
	iSZ	34.0						
TAV	iPZ	154629.0			d	1¾°	154600	
	iSZ	50.5						

			T sec	A mm	GM	Dist	H	Remarks.
14th October, 1968.								
RAB	iPZ	003739.3	0.5	3.0	u			Regional
RAB	ePZ	004722	0.8	5.0	d			Regional
VUL	iPZ	22.0	0.4	2.5	u			
KRT	iPZ	24.2	0.6		d			
RAB	iPZ	011030.2	0.5	2.5	u	1½°	011006	M_L=3.6
	iSN	48.4						
RAL	iPZ	30.0	0.4	2.4	d	1¾°	011002	
	iSZ	50.5						
TAV	iPZ	29.4		10.4	d			
VUL	iPZ	29.9	0.4	4.3	d	1¾°	011002	
	iSZ	50.4						
RAB	iPZ	030648.5	0.6	4.0	u	43°		M_S=5.9 M_B=5.9
	ePPZ/	0829						
	eSN/	1313						Felt W.A
	eSSE/	1622						reported
	MZ/	2718						damage.
		LZ	20.0	29.0				
		LE	21.0	20.0				
		LN	20.0	16.0				
VUL	iPZ	47.3	0.7	3.0	u			
VUL	iPZ	051701.0	1.0	2.0	u			
RAB	iPZ	055444.5	0.2	2.0	u			Regional C.B.M
RAB	ePZ	062157	0.6	1.2	d			
TAV	iPZ	56.0			u			
VUL	iPZ	56.3	0.4	6.0	d	1¼°	062136	
	iSZ	2211.5						
KRT	iPZ	2155½			d			
RAB	ePZ	063450½	0.4	1.5	d	2¼°	063414	M_L=4.5
	iSE	3518.5						
RAL	iPZ	3449.6	0.6	3.0	d			
VUL	iPZ	46.5	0.4	1.3	d	(2½°)	0634(06)	
	e(S)Z	3517						
RAB	iPZ	064140.5		12.0	d			
WAN	iPZ	40.5	0.3	13.3	u	1¼°	064119	
	iSZ	56.6						
SUL	iPZ	40.5	0.5	1.6	u	1¼°	064118	
	eSZ	57						
RAL	iPZ	40.3			u			
TAV	iPZ	40.3		10.6	u	(1¼°)	0641(19)	
	e(S)Z	56						
VUL	iPZ	40.2			u			
RAB	ePZ	072226	0.6	3.0	d			Local C.B.M
RAB	eZ/	073302			+			Traces

			T sec	A mm	GM	Dist	H	Remarks
14th October, 1968 continued.								
RAB	ePZ	075447	0.4	2.0	d	2½°	075406	M_L=4.7
	iSN	5518.2						
WAN	iPZ	5449.0	0.5	6.4	u			
SUL	iPZ	49.0	0.4	2.9	d			
RAL	iPZ	49.2	0.5	4.4	u			
TAV	iPZ	49.0	0.4	2.4	d			
RAB	ePZ	082109		4.0	u			Local
TAV	iPZ	08.0			d			Local
VUL	iPZ	09.0	0.5	10.0	d			Local
RAB	ePZ/	101341			d			Distant
RAB	ePZ	102219	0.7	4.0	d	1¼°	102159	M_L=4.1
	iSNa	34.0						
WAN	iPZ	19.0			d	1¼°	102159	
	iSZ	34.0						
TAV	iPZ	18.0		2.8	d			
VUL	iPZ	19.3		2.8	d	1¼°	102159	
	iSZ	34.0						
KRT	iPZ	19.6	0.4		d	1¼°	102200	
	iSE	34.8						
RAB	iPZ	120913.0	0.5	2.4	d	1½°	120847	M_L=3.9
	iSE	32.6						
RAB	ePZ	122508.0	0.4	3.0	u			Local
RAL	iPZ	12.5	0.5	1.6	u			
TAV	iPZ	12.3		2.9	u	1¾°	120943	
	iSZ	34.0						
VUL	iPZ	152954.7	0.4	4.0	u	3¼°	152905	
	iSZ	3032.6						
KRT	iPZ	2952.6	0.3	1.1	u			
RAB	ePZ	155630½	0.5	1.2	u	2¼°	155556	M_L=4.3
	iSN	56.0						
TAV	iPZ	29.5			u	(2°)	155556	
	eSZ	54						
VUL	iPZ	30.0				(2°)	1555(58)	
	e(S)Z	54						
RAB	iPZ	160352.0			u	2½°	160311	M_L=4.1
	eSN	0423						
RAB	iPZ	161125.4	0.5	2.4	u			Local
RAB	ePZ	161604½	0.6	1.0	u	2¼°	161529	
	iSN	31.8						
TAV	iPZ	03.5		7.2	d			
RAB	ePZ	163802½			u			Local
RAB	ePZ	174018½	1.0	1.0	u			Distant
RAB	eZ/	175040			-			Traces
RAB	ePZ	182405½	0.4	1.2	u			Local
RAB	iPZ	193208.2			u			Local

			T sec	A mm	GM	Dist	H	Remarks
14th October, 1968 - continued.								
RAB	iPZ	210554.7	0.5	1.4	d			Regional
TAV	iPZ	53.3	0.2	2.0	d			
VUL	iPZ	53.5						
RAB	iPZ	211101.3	0.4	3.0	d			Regional
RAL	iPZ	01.0	0.4	5.5	d			
TAV	iPZ	00.5	0.3	2.0	d			
VUL	iPZ	00.2	0.5	12.5	u			
RAB	ePZ	211302		6.0	u			Regional
WAN	iPZ	02.2		4.0	d			
SUL	iPZ	02.0		4.0	u			
RAL	iPZ	01.5		4.0	u			
TAV	iPZ	01.3	0.4	4.4	u			
VUL	iPZ	01.3	0.2	19.4	u			
RAB	iPZ	213252.8	0.5	1.1	d			Local
RAB	iPZ	224229.8	0.4	3.0	d			Local
15th October, 1968. WWSS Records Fogged.								
RAB	iPZ	020147.0	1.0	2.0	d	(36°)		M_S=5.3
	e(S)	0716						
		LZ	20.0	08.0				
		LN	20.0	12.0				
		LE	22.0	06.0				
WAN	iPZ	0147.0	1.0	1.5	d			
RAB	iPZ	030006.3	0.8	2.0	d			Distant
WAN	iPZ	041915.0	0.2	2.3	u	¾°	041900	
	iSZ	25.5						
RAL	iPZ	15.0			(u)	¾°	041901	
	iSZ	25.0						
TAV	iPZ	15.0		1.0	u	¾°	041900	
	iSZ	26.0						
VUL	iPZ	13.8	0.2	3.5	u	½°	041902	
	i(S)Z	23.0						
RAB	iPZ	045801.8	0.5	34.2	d	2¼°	045725	M_L=5.4
	iSE/	30.0						
WAN	iPZ	01.1	0.5	35.0	d			
SUL	iPZ	01.6	(0.4)	14.8	d			
RAL	iPZ	01.0		16.0	d			
TAV	iPZ	00.8			d			
VUL	iPZ	00.2		11.0	u			
KRT	iPZ	00.0			d	2½°	045721	
	iSE	30.4						

			T sec	A mm	GM	Dist	H	Remarks
15th October, 1968 - continued.								
RAB	iPZ	082333.9	0.8	14.0	u	(1¼°)	082306	M_L=4.6
	i(S)N	55.0						
WAN	iPZ	34.0	0.8	10.0	u			
SUL	iPZ	34.0	0.5	8.5	u			
RAL	iPZ	33.5			u			
TAV	iPZ	33.0		18.2	d			
VUL	iPZ	32.5	0.5	11.0	d			
KRT	iPZ	32.8			d	1½°	082306	
	iSE	52.6						
RAB	iPZ	140155.4	0.5	3.0	d			Regional
WAN	iPZ	55.7	0.8	1.0	d			
SUL	iPZ	55.6	0.7	1.8	d			
VUL	iPZ	54.0	0.3	3.2	u			
KRT	iPZ	53.4	0.3	1.5	u			
RAB	iPZ	141201.5	0.5	10.1	d	1¼°	141140	M_L=4.3
	iSN	17.0						
WAN	iPZ	01.2	0.5	3.9	d	1¼°	141139	
	iSZ	17.8						
TAV	iPZ	01.0	0.4	14.0	d			
KRT	iPZ	1159.6			d	1°	141141	
	iSE	1214.0						
RAB	iPZ	175934.6	0.5	2.0	d	1½°	175908	
	iSN	54.1						
WAN	iPZ	35.0	0.8	1.0	d			
TAV	iPZ	34.2	0.5	5.2	d			
VUL	iPZ	33.6	0.7	1.6	d			
KRT	iPZ	33.2		3.3	d	1¼°	175911	
	iSE	49.9						
RAB	iPZ	183414.4	0.5	1.2	d	1¼°	183352	M_L=3.6
	iSN	31.2						
RAB	iPZ	201503.0	1.0	4.0	d	(28°)		M_S=5.2
	e(S)E/	1952						
		LZ	18.0	18.0				
		LN	22.0	06.0				
		LE	16.0	12.0				
RAB	iPZ	202712.8	0.3	5.0	d	1¼°	202651	M_L=3.8
	iSN	28.3						
WAN	iPZ	12.9			d	1¼°	202653	
	iSZ	28.2						
RAL	iPZ	13.0			d	1¼°	202653	
	iSZ	27.5						
TAV	iPZ	12.9			d			
VUL	iPZ	12.0			u			

			T sec	A mm	GM	Dist	H	Remarks
15th October, 1968 - continued.								
RAB	iPZ	211201.3		9.0	u			Local
WAN	iPZ	01.0	0.2	7.2	u			
	iZ	02.0						
SUL	iPZ	01.0	0.4	18.7	u			
RAL	iPZ	01.0		13.0	u			
TAV	iPZ	01.0			u			
VUL	iPZ	01.3			u			
RAB	iPZ	234233.0	0.4	2.0	u	1°	234217	M_L=3.0
	iSNa	45.0						
WAN	iPZ	32.8			u			
SUL	iPZ	32.4	0.5	2.6	u			
RAL	iPZ	32.2	0.2	2.4	u			
	iPgZ	33.2						
TAV	iPZ	31.8	0.3	13.4	u			
	iPgZ	37.6						
VUL	iPZ	32.4		4.0	d			
RAB	iPZ	234350.8	0.4	1.0	u			
RAL	iPZ	49.8	0.5	2.0	u			
TAV	iPZ	49.6	0.3	6.0	u			
RAB	ePZ	235243½	0.6	11.0	d	1½°	235217	M_L=4.0
	iSN	5303.6						
WAN	iPZ	44.0	0.3	5.4	d			
SUL	iPZ	43.9	0.5	7.5	d			
TAV	iPZ	5242.7	0.5	10.0	d	1¼°	235217	
	iSZ	5302.0						
VUL	iPZ	5242.0	0.4	6.0	d	1¼°	235217	
	iSZ	5301.5						
RAB	iPZ	235658.8	0.4	2.5	u			
TAV	iPZ	57.5	0.6	2.0	d			
VUL	iPZ	57.3			u			

			T sec	A mm	GM	Dist	H	Remarks
AGENAHAMBO.								
28th September, 1968 - 5th October, 1968.								
28th September, 1968.								
AGE	iPZ	085819½			d	2½°	085739	
	iSZ	50						
29th September, 1968.								
AGE	iPZ	064433½				4¼°	064328	
	iSZ	4523						
AGE	ePZ	133200½			d			Distant
AGE	ePZ	172008			d			Near
AGE	ePZ	173929½						Distant
AGE	ePZ	181509½						Distant
AGE	ePZ	194609						
AGE	iPZ	215620½	0.4	1.5	d			Distant
AGE	ePZ	224347			d			Distant
30th September, 1968.								
AGE	ePZ	081424½			d			Distant
1st October, 1968.								
AGE	ePZ	122901½						Teleseism
2nd October, 1968.								
AGE	i(P)Z	053558			u			Regional
AGE	ePZ	130950						Regional
AGE	ePZ	182419			d	(8¾°)	182213)	
	iZ	2519						
	i(S)Z	56½						
3rd October, 1968.								
AGE	ePZ	144207			d			
AGE	iPZ	144635½						Near
AGE	iPZ	235726½				(½°)	235714	
	i(S)Z	35						

4th October, 1968 - Nil recorded.

5th October, 1968 - Nil recorded.

			T sec	A mm	GM	Dist	H	Remarks
TABELE.								
5th September, 1968 - 25th September, 1968.								
5th September, 1968.								
TBL	ePZ	170440½	0.5	1.4	u			Felt Tari Int IV 05.9°S 143°E
TBL	ePZ	183954½			u			Local
6th September, 1968.								
TBL	iPZ	193300½	0.4	2.0	u	1°	193251	
	iSZ	23½						
7th September, 1968.								
TBL	ePZ	064721½		10.8	u			Felt Madang Int. III 05.2°S 145.1°E Manam Int. III 04.1°S 145.1°E
TBL	ePZ	065129½		30.0	u	(1¼°)	065109	In coda of preceding shock.
	e(S)Z	44½						
TBL	iPZ	090310½	0.2	6.8	d			Local
TBL	ePZ	164522½			u	1½°	164456	
	eSZ	42½						
8th September, 1968.								
TBL	ePZ	021546½	0.5	2.0	u			Regional
TBL	ePZ	025417½	0.3	1.9	u			Regional
TBL	ePnZ	151354	0.4	3.0	u	7°	151210	Felt widely over Sepik District
	iZ	56						
	iSZ	1513½						Epicentre 03.9°S 144.4°E
TBL	iPZ	153239½	0.5	3.4	u	(2½°)	153200	
	i(S)Z	3309						
TBL	ePZ	160406	0.3		u			Local
TBL	iPZ	190600½	0.4	4.0	u			Regional
TBL	ePZ	203133			d			Regional
9th September, 1968.								
TBL	ePZ	004018			(u)			
	iZ	21½						
TBL	iPZ	010326	0.3	7.0	u	1¼°	010305	
	iSZ	42						
TBL	iPZ	040004	0.5	3.0	d			Regional
TBL	ePZ	040351			d			In coda of preceding shock.
TBL	ePZ	164624	0.5	2.0	u	2½°	164545	
	iSZ	54						
TBL	iPZ	224716	0.6	1.8	d			Regional
10th September, 1968.								
TBL	iPZ	052532½	0.5	2.0	d			Felt Maprik Int. IV 03.6°S 143°E
	iZ	33						
TBL	iPZ	054331½	0.5	2.0	u			Regional
TBL	ePZ	055418½	0.4	2.0	u			Regional

			T sec	A mm	GM	Dist	H	Remarks
TABELE.								
10th September, 1968 continued.								
TBL	ePZ	070216	0.5	2.5	d	(3°)	070129	
	e(S)Z	51½						
TBL	ePZ	192139½			d			Local
11th September, 1968.								
TBL	ePZ	165534			d			Local
12th September, 1968.								
TBL	iPZ	035849	0.5		d			Regional
TBL	iPZ	225141	0.7	5.0	u			Distant
13th September, 1968.								
TBL	iPZ	103710½	0.4	1.0	d			Local
14th September, 1968.								
TBL	eiPZ	010002			(d)			Regional
TBL	iPZ	012401			u			Near
TBL	iPZ	181116	0.7	1.0	u			Local
15th September, 1968.								
TBL	iPZ	031116½			u	3°	031031	
	eSZ	51						
16th & 17th September, 1968 - Nil recorded.								
18th September, 1968.								
TBL	ePZ	141303½	0.6	2.5	u			Regional
TBL	iPZ	151526½	0.4	1.0	u	1°	151508	
	eSZ	40½						
19th September, 1968.								
Microseismic activity associated with heavy rain between 1321 - 1346 hours.								
20th September, 1968.								
TBL	ePZ	010834			d			
TBL	iPZ	023404	0.5	1.5	d			
TBL	iPZ	043513½	0.5	2.0	d	2½°	043435	
	iSZ	42						
TBL	iPZ	061950½	0.5	1.8	u			
TBL	iPZ	063533½	0.5	1.8	d			
21st September, 1968.								
TBL	iPZ	072517	0.5	1.2	u			Regional
TBL	ePZ	131423½			d			Teleseism
22nd & 23rd September, 1968 - Nil recorded.								

			T sec	A mm	GM	Dist	H	Remarks
TABELE.								
24th September, 1968.								
TBL	iPZ	015247	0.5	2.3	u			Near
TBL	iPZ	233946½			u	½°	233934	
	iSZ	55½						
25th September, 1968.								
TBL	iPZ	015243	0.5	19.4	u	1¾°	015214	
	iSZ	5305						
TBL	i(P)Z	024629	0.5	1.3	u			Near

Rabaul Central Observatory
22nd October 1968.

(G.W. D'ADDARIO)
Volcanologist-in-Charge

		T sec	A mm	GM	Dist	H	Remarks

EMERGENCY FIELD STATION - YANGORU.

03°39'30"S 143°17'30"E

Elev. 219m

Foundation: River gravels resting on calcareous sediments.

	COMP	To	Tg	TRACE SPEED mm/min	APPROX RELATIVE MAGNIFICATION	APPROXIMATE DAMPING
Willmore portable	Z	0.6	0.25	approx 60	3000	underdamped

20th September, 1968.

iPZ i(S)Z	021244 52		0.3	1.5	62km	
iPZ iSZ	023205½ 07			2.0	12km	
iP!Z	023323					Felt Int. IV
e(P)Z iSZ	043519½ 28					Regional
iP!Z	054041					Felt Int. 11-111
e(P)Z iSZ	061943½ 52				½°	Regional
e(P)Z	063659½					Regional
iPZ i(S)Z	073052 54			5.5	16km	
iPZ iSZ	085240½ 42½			1.5	16km	
e(P)Z	115604					Regional
iPZ iSZ	134548 51				24km	
iPZ iSZ	181737½ 42			2.0	u 36km	

Total of 17 local earthquakes identified.

21st September, 1968.

e(P)Z	010740½					Regional
iP!Z	021416					Felt
iPZ iSZ	031808 12			11.5	31km	
iPZ iSZ	042615½ 16½			1.0	u 8km	
iPZ iSZ	050915½ 16½				8km	
iP!Z	051514½					Felt Maprik Int II
iPZ iSZ	051948½ 49½				8km	
iPZ	065048			10.0		
iPZ	065100			4.0		
ePZ	072551					Regional
iPZ i(S)Z	075507 09		0.4	3.5	u	Regional

		T sec	A mm	GM	Dist	H	Remarks
EMERGENCY FIELD STATION - YANGORU.							
21st September, 1968 continued.							
iP!Z	083247	0.4	2.0	d	20km		
i(S)Z	49½						
iP!Z	113310½						
ePZ	131417½						Teleseism
iPZ	134739	0.4	1.0	d	20km		
iSZ	41½						
iP!Z	142450½						
iPZ	195829			d	8km		
i(S)Z	30						
Total of 23 local earthquakes identified.							
22nd September, 1968.							
iP!Z	034437			u			Felt Int. III
iPZ	034901				8km		
i(S)Z	02						
iPZ	035415						
iSZ	46						
iPZ	054345	0.3	1.0		8km		
iSZ	46						
iP!Z	092502						
iPZ	105728	0.3	1.0	u	12km		
iSZ	29½						
iPZ	110343½		4.0	d	20km		
iSZ	46						
ePZ	112907						Regional
iP!Z	115640						Felt Int. III
iPZ	153036	0.4	5.1	u			
iPZ	154111		11.0	u	28km		
iSZ	14½						
iPZ	155611½		.0	u	35km		
iSZ	16						
iPZ	164147		6.0	u			
iPZ	165317		5.0	u			
iPZ	224315		7.5	d			
Total of 19 local earthquakes identified.							
23rd September, 1968.							
iPZ	010023		1.8		24km		
iSZ	26						
iPZ	052613		6.0	u	20km		
iSZ	15½						
iPZ	053119½		11.0	(u)			
iPZ	060742½		2.0	u	24km		
iSZ	45½						
From 230719 - 240724 record only partially readable due to faulty developing.							
e(P)Z	200259						Regional
iSZ	0322½				2^{o}		
Total of 6 local earthquakes identified.							

		T sec	A mm	GM	Dist	H	Remarks
EMERGENCY FIELD STATION - YANGORU.							
24th September, 1968.							
	iP!Z	000014½					
	iPZ	005602		6.5			
	iPZ	024859½		6.4	(d)		
	iP!Z	032100					
	iPZ	041414½	0.3	2.0	(d)	1°	
	iSZ	29½					
	No record from 240730 - 250724. Recording paper upside down.						
	Total of 6 local earthquakes identified.						
25th September, 1968.							
	iPZ	222131	0.4	2.2	d	16km	
	iSZ	33					
	iP!Z	224537					
	Total of 3 local earthquakes identified.						
26th September, 1968.							
	iP!Z	083028½					
	ePZ	162652					Distant
	iZ	53					
	iZ	2744½					
	iP!Z	163016					
	iP!Z	173527½					
	iPZ	200710½		1.0	u	16km	
	iSZ	12½					
	Total of 13 local earthquakes identified.						
27th September, 1968.							
	iPZ	010010		3.0	d	24km	
	i(S)Z	13					
	ePZ	040216	1.0	0.5	d		Distant
	iZ	21					
	iZ	22½					
	iZ	0309					
	iPZ	123256	0.3	2.0	d	32km	
	iSZ	3300					
	iP!Z	124918					
	iPZ	150831			(d)	24km	
	iSZ	34					
	iPZ	155507½		6.5	(d)		
	iPZ	160006			d	24km	
	iSZ	09					
	iP!Z	165606½					
	iPZ	165949½		5.0	u	24km	in coda of preceding shock
	iSZ	52½					
	iP!Z	171142					
	iP!Z	172707			d		
	iP!Z	180555½					

	T sec	A mm	GM	Dist	H	Remarks
EMERGENCY FIELD STATION - YANGORU.						
27th September, 1968 continued.						
iPZ	183627		2.5		16km	
iSZ	29					
Record confused due to overlapping traces and very large number of earthquakes. Only some earthquakes are listed and their arrival times are uncertain.						
iP!Z	190517					
iP!Z	190645					
iP!Z	1920(24½)					
iP!Z	1948(14½)					
iP!Z	1950(36)					
iP!Z	1954(45)			d		
iP!Z	1955 -					
iP!Z	2003(02)			u		
iP!Z	2009(31)					
iP!Z	2058(29)					
iP!Z	2104(21)					Felt But Int. III 143.3°E 03.4°S
iP!Z	2215(53½)					
iP!Z	2237(10½)					
iPZ	2247(33½)		2.5	u	16km	
iSZ	(35½)					
iP!Z	2322(26½)					
iP!Z	234306½					
iP!Z	234627½					
Total of 57 local earthquakes identified.						
28th September, 1968.						
iP!Z	003210					
iP!Z	014526½			d		
iPZ	024253½		2.2	d	20km	
iSZ	56					
iP!Z	030345½					
eiPZ	040106½				32km	
iSZ	10½					
iP!Z	040240½					
iP!Z	0418(41½)			d		
iP!Z	050232½			u		
iPZ	054045½		5.0	u	32km	
iSZ	49½					
iP!Z	054701½					
iP!Z	060004½					
ePZ	060420½			d	51km	
i(S)Z	26½					
iP!Z	061647½			d		
iP!Z	062918½			d		
iP!Z	063926½					

		T sec	A mm	GM	Dist	H	Remarks
EMERGENCY FIELD STATION - YANGORU.							
28th September, 1968 continued.							
iP!Z	0640(21)						
iP!Z	071753						
iP!Z	072740½			d			
iP!Z	073827½						
Seismograph not in operation from 280751 - 281023							
iPZ iSZ	103908½ 15	0.5	2.8	d	51km		
iP!Z	105831						
ePZ	122037						Regional
iP!Z	124907½						
iP!Z	130030½			d			
iPZ iSZ	135341½ 45				28km		
iP!Z	150009						
iP!Z	150240½			u			
iPZ iSZ	154807½ 14½	0.5	1.0	d	55km		
iP!Z	165530½			u			
iPZ iSZ	172233 36½		2.0	d	28km		
iPZ iSZ	173154½ 57½			u	24km		
iP!Z	190739½						
iP!Z	201920½						
iP!Z	204610½						
iPZ i(S)Z	205306 08		2.0		16km		
iPZ iSZ	211345½ 50			d	35km		
iPZ	231334½		30.0	d			
iPZ iSZ	233155 59½				35km		
iP!Z	235430			d			
Total of 77 local earthquakes identified.							
29th September, 1968.							
iP!Z	001708			d			
iP!Z	0018 -						
iPZ iSZ	021809 12	0.2	9.0	d	24km		
iP!Z	022351			d			
iP!Z	024604						
iP!Z	033212						
iP!Z	033544						
iPZ iSZ	035844 46½			d	20km		

	T sec	A mm	GM	Dist	H	Remarks
EMERGENCY FIELD STATION - YANGORU.						
29th September, 1968 continued.						
iP!Z	040721					
iP!Z	042802		d			
iP!Z	052548		d			
iP!Z	072445½					
iPZ	073800	4.0	d	24km		
iSZ	3803					
iPZ	074430	6.0	u	24km		
iSZ	33					
iP!Z	075846½					
iP!Z	083517½					
iP!Z	083936					
iP!Z	085807½		d			
iPZ	093845	1.5	u	39km		
iSZ	50					
iPZ	110903			47km		
iSZ	09					
iPZ	125126½	10.0	u	51km		
iSZ	33					
iPZ	125705		d	43km		
iSZ	10½					
iP!Z	130334					
iP!Z	132722½					
iPZ	133436½	13.5	d			
iPZ	144543		d	20km		
iSZ	45½					
iPZ	153115½	7.5	d	2½°		
iSZ	45					
iPZ	160100			20km		
iSZ	02½					
iP!Z	161026½					
iP!Z	170322½					
i(P)Z	171822½	1.0	u	35km		
iSZ	27					
iP!Z	174801					
iP!Z	181326					
iP!Z	183335½		d			
iPZ	192111	7.0	d	28km		
iSZ	14½					
iPZ	193819½			28km		
iSZ	23					
iPZ	192101			59km		
i(S)Z	08½					

Total of 52 local earthquakes identified.

STATION CLOSED 292041.

1111

4 NOV 1968

PEA OCT-68 No.43

TERRITORY OF PAPUA AND NEW GUINEA
GEOLOGICAL AND VOLCANOLOGICAL BRANCH
VOLCANOLOGICAL SECTION

PRELIMINARY EARTHQUAKE ANALYSIS
RABAUL CENTRAL OBSERVATORY
1968

Rabaul	RAB	From: OCT. 16. 1968 To: OCT. 22. 1968
Rabaul Harbour Network	WAN SUL RAL TAV VUL	From: OCT. 16. 1968 To: OCT. 22. 1968
Keravat	KRT	From: OCT. 16. 1968 To: OCT. 22. 1968
Esa'Ala	ESA	From: SEP. 23. 1968 To: SEP. 30. 1968
Tabele	TBL	From: To:
Agenahambo	AGE	From: To:
Waris	WAA	Not operational
Ulamona	ULA	Not operational
Piva	PIV	Not operational
Cape Gloucester	LAG	Not operational

STATION PERSONNEL

RAB Central Observatory, Rabaul.

Volcanologist-in-Charge	G.W. D'Addario
Volcanologist	R.F. Heming
Seismologist	M. Mancini
Seismogram Readers	R.A. Page, L.M. Cartwright
Senior Technical Officer	N.O. Myers
Technical Officer	R.J. Conway
Volcanological Assistants	L. Topue, M. Gaiam, E. Ravian
Technical Assistant	P. Daimbari
Trainee Volcanological Assistants	B. Talai, M. Salaiau, C. Matupit
Clerk	J.A. Alcock

KRT Keravat Outstation.

Observer (part-time)	G.E. Chorick

TBL Tabele Observatory.

Observer	V. Kaita

ESA Esa'Ala Observatory.

Observer	F. Dira

AGE Agenahambo Outstation.

Observer (part-time)	B. Kirke

The Rabaul Preliminary Earthquake Analysis (PEA) is produced by the staff under the direction of the Volcanologist-in-Charge from whom additional information and photocopies of seismogram records from all stations may be obtained on request.

Please address all communications to:-

Volcanologist-in-Charge,
Central Observatory,
P.O. Box 386,
RABAUL. T.N.G.

			T sec	A mm	GM	Dist	H	Remarks
RABAUL.								
16th October, 1968.								
RAB	iZ	010520.0						Harmonic tremor
	FZ	0630.0						of unknown origin
RAB	iPZ	022754.0	0.6	1.0	u			Regional
WAN	iPZ	53.4			u			
RAB	eZ/	030803			+			Traces
RAB	iPZ	065851.6	0.5	2.5	u			Local
RAL	iPZ	51.5	0.2	0.5	u			
TAV	iPZ	50.2	0.2	1.5	u			
VUL	iPZ	50.8	0.2	1.0	u			
	iZ	53.8						
RAB	ePZ	075321½	1.0	1.0	u	38°	074021	M_S=5.5 M_B=5.3
	e(pP)Z	27						
	eSE/	5920						
		LZ	20.0	9.0				
		LN	20.0	9.0				
		LE	18.0	10.0				
VUL	iPZ	23.0			u			
RAB	ePZ	080950			u			Regional
WAN	iPZ	49.6	0.2	0.4	u			
RAL	iPZ	49.6	0.5	0.5	u			
TAV	eiPZ	49	0.5	2.5	u			
VUL	iPZ	50.6	0.3	0.6	u			
RAB	iPZ	082926.5	0.6	1.0	u			Regional
RAB	iPZ	091519.2	0.5	1.4	d			Regional
VUL	iPZ	18.2		0.8	d			
RAB	iPZ	094322.0	0.6	1.0	d			Regional
RAB	iPZ	094813.4	0.6	16.0	d			
	iZNE	16.8						
WAN	iPZ	13.6			d			
SUL	iPZ	13.4	0.4	13.5	d			
RAL	iPZ	13.8			d			
TAV	iPZ	13.8	0.8	15.0	d			
VUL	iPZ	13.0			d	1¾°	094744	
	iSZ	35.0						
RAB	eZ/	101208			-			Traces

			T sec	A mm	GM	Dist	H	Remarks
16th October, 1968 - continued.								
RAB	iPZ	120053.2	0.4	9.0	d	1°	120036	M_L=3.7
	iSE	0106.5						
WAN	iPZ	0053.4	0.3	3.0	d			
SUL	iPZ	53.4	0.2	15.8	d			
RAL	iPZ	53.0	0.3		d			
TAV	iPZ	52.6			u			
VUL	iPZ	53.2			u			
KRT	iPZ	55.5		5.0	d	1°	120039	
	eSE	0107						
RAB	ePZ	124547	0.5	1.4	d	2½°	124508	M_L=4.9
	eSNa	4616½						
RAL	iPZ	4547.5	0.5	1.3	d			
TAV	iPZ	47.8	0.3	1.6	d			
VUL	iPZ	46.4	0.2	2.5	d	2½°	124507	
	iSZ	4616.0						
RAB	iPZ	140203.8	0.6	3.0	d	4°	140104	M_L=4.8
	iSN	50.0						
TAV	iPZ	04.0	0.6		d			
VUL	iPZ	04.5	0.5		d			
KRT	iPZ	03.8	0.6	1.0	d	4°	140105	
	iSE	48.8						
RAB	iPZ	141638.8	0.4	3.0	d	1½°	141614	M_L=3.6
	iSN	58.2						
WAN	iPZ	38.6	0.2	1.2	d			
SUL	iPZ	38.6	0.2	3.2	d			
RAL	iPZ	38.2	0.4	3.2	d			
TAV	iPZ	37.8	0.3	10.0	d			
VUL	iPZ	37.2	0.5	4.6	d			
KRT	iPZ	36.5	0.2	3.4	d	1½°	141611	
	iSE	55.8						
RAB	iPZ	155957.6	0.5	1.4	d	2¼°	155923	M_L=4.2
	iSE	160023.8						
KRT	iPZ	155955.8	0.2		d	2°	155924	
	iSE	160020.2						
RAB	iPZ	191510.8			d			Local
SUL	iPZ	09.8			d			
RAL	iPZ	09.1			d			
TAV	iPZ	09.0	0.3	10.2	d			
RAB	ePZ	211344½			u			Local
SUL	iPZ	44.0	0.1	2.1	u			
RAL	iPZ	44.0		3.6	u			
TAV	iPZ	43.8			u			
RAB	iPZ	003442.4	0.4	13.2	u	1¾°	003413	
	iSN	3504.6						
WAN	iPZ	3441.4	0.4	6.0	u			
RAL	iPZ	42.0	0.4	2.8	u			
TAV	iPZ	42.0	0.2	10.0	d	2°	003410	
	e(S)Z	3505½						
VUL	iPZ	3440.2		10.0	d	2°	003410	
	iSZ	3503.0						

			T sec	A mm	GM	Dist	H	Remarks
17th October, 1968.								
RAB	iPZ	050914.6			uSW	1°	050858	M_L=4.6
(Lq)	iNoEo	22.0						AZ from Rabaul 20°N
	iSNoEo	27.0						Epicentre 152.8°E 3.3°S
								SSE of Lihir, New Ireland Region. Felt Rabaul Int. III 152.2°E 04.2°S
WAN	iPZ	14.4			u			
SUL	iPZ	15.0	0.4	17.0	u			
RAL	iPZ	14.8			u			
TAV	iPZ	15.0			u			
VUL	iPZ	16.0			u			
KRT	iPZ	18.2			u			C.B.M
RAB	iPZ	060637.6	0.5	11.2	u	¼°	060631	
	iSE	43.0						
WAN	iPZ	37.2			u			
TAV	iPZ	37.6			u	¼°	060630	
	iSZ	44.0						
VUL	iPZ	39.0			u			
RAB	iPZ	061007.6	0.5	7.8	u	¼°	061000	
	iSN	13.3						
WAN	iPZ	07.8	0.2	5.0	u	¼°	061000	
	iSZ	14.0						
RAL	iPZ	07.6	0.4	4.0	u	½°	060958	
	iSZ	14.3						
TAV	iPZ	07.8			u			
VUL	iPZ	09.2			u			
RAB	iPZ	065820.4	0.6	1.6	d	25°		M_B=4.9
	eSE/	0246						
TAV	iPZ	5820.5			d			
RAB	iPZ	071038.4	0.4	2.3	u	¼°	071030	
	iSE	44.5						
WAN	iPZ	38.5			u			
RAL	iPZ	38.8			u			
TAV	iPZ	39.0			u			
VUL	iPZ	40.4			u			
RAB	iPZ	074027.2	0.5	12.6	u	¼°	074019	
	iSN	33.0						
WAN	iPZ	27.2	0.2	11.0	u	¼°	074019	
	iSZ	33.4						
SUL	iPZ	27.6	0.4	6.0	u	½°	074018	
	iSZ	34.8						
RAL	iPZ	27.4	0.4	6.0	u			
TAV	iPZ	27.5			u			
VUL	iPZ	29.0			u			
KRT	iPZ	30.4	0.4		d	¼°	074022	
	iSE	36.0						

			T sec	A mm	GM	Dist	H	Remarks
17th October, 1968 - continued.								
RAB	iPZ	111158.0	0.4	12.5	u	½°	111147	M_L=3.7
	iSN	1206.0						
WAN	iPZ	1158.8	0.3	10.0	u	½°	111149	
	iSZ	1206.0						
SUL	iPZ	1158.8	0.3	4.0	u			
RAL	iPZ	58.6			u			
TAV	iPZ	58.6			u			
VUL	iPZ	59.8			u			
KRT	iPZ	1201.2			u	½°	111149	
	eSE	10						
RAB	iPZ	112451.4	0.4	1.0	d	1°	112434	
	iSN	2504.2						
TAV	iPZ	2450.6	0.2	1.0	d	¾°	112436	
	iSZ	2502.0						
VUL	iPZ	2451.8		0.6	d			
RAB	iPZ	134303.8	0.4	6.0	u			Regional
WAN	iPZ	03.6	0.2	2.6	u			
SUL	iPZ	03.8	0.2	4.0	u			
RAL	iPZ	03.4	0.2	1.2	u			
	iZ	04.0						
TAV	iPZ	03.0			u			
VUL	iPZ	02.6			d			
KRT	iPZ	04.6	0.2	1.2	u			
RAB	iPZ	151150.4	0.4	3.8	u	2½°	151110	M_L=4.8
	iSN	1221.0						
WAN	iPZ	1150.4			u			
SUL	iPZ	50.0			u			
RAL	iPZ	49.8	0.3	5.0	u			
TAV	iPZ	49.8			u			
VUL	iPZ	50.6			u			
KRT	iPZ	51.8	0.4		u	2½°	151111	
	iSE	1222.8						
RAB	iPZ	154138.0	0.6	5.8	d	6¾°	153958	M_L=5.8 M_B=6.0 Felt Lae Int. III 147.0°E 06.7°S
	iZ	39.0						
	iSN/	4255.0						
WAN	iPZ	4138.4	0.5	2.0	d			
RAL	iPZ	39.0	0.4	4.0	d			
TAV	iPZ	39.0	0.5	3.0	d			
VUL	iPZ	38.5	0.4	1.8	u			
KRT	iPZ	36.4	1.0		d			

			T sec	A mm	GM	Dist	H	Remarks
17th October, 1968 - continued.								
RAB	iPZ	155916.0	0.3	5.3	d	¼°	155908	M_L=3.4
	iSE	22.0						
WAN	iPZ	15.8	0.2	5.0	d			
	iSZ	20.0						
SUL	iPZ	16.4	0.2	1.5	d			
RAL	iPZ	16.0	0.2	1.2	d	¼°	155908	
	iSZ	22.2						
KRT	iPZ	18.8			d	½°	155905	
	iSE	28.5						
RAB	iPZ	184957.4	0.4	7.0	d	2°	184927	M_L=3.9
	iSN	5020.0						
WAN	iPZ	4957.2	0.3	9.3	d	1¾°	184928	
	iSZ	5019.0						
RAL	iPZ	4957.0	0.2	1.2	d			
TAV	iPZ	57.4			d	2°	184927	
	iSZ	5020.0						
VUL	iPZ	4956.0			d			
KRT	iPZ	53.6			d			
RAB	iPZ	190412.0	0.5	4.0	u	3¼°	190321	
	iZ	12.5						
	iSN	51.0						
WAN	iPZ	12.4	0.4	1.8	u			
RAL	iPZ	12.5	0.6	3.0	u			
TAV	iPZ	12.8	1.0	2.0	u	3½°	190320	
	iSZ	52.4						
VUL	iPZ	11.1	0.5	3.0	u	(3½°)	1903(15)	
	i(S)Z	54.0						
RAB	iPZ	191009.5	0.4	4.0	d	1¾°	190940	
	iSN	31.6						
WAN	iPZ	09.8	0.2	3.6	d	1¾°	190941	
	iSZ	31.8						
TAV	iPZ	09.8		2.0	d			
VUL	iPZ	08.5	0.2	2.8	d			
RAB	iPZ	210249.1	0.9	1.0	d	28°		M_B=5.1 M_S=5.5
	eSN/	0738						
		LZ	19.0	16.0				
		LN	19.0	44.0				
		LE	17.0	12.0				
RAB	iPZ	220030.0	0.5	15.0	u	½°	220020	M_L=3.7
	iSN	37.0						
WAN	iPZ	30.0	0.4	2.0	u	½°	220020	
	iSZ	37.0						
SUL	iPZ	30.2	0.2	5.7	u	½°	220020	
	iSZ	37.5						
RAL	iPZ	30.2	0.5	5.0	u	½°	220021	
	iSZ	36.2						
VUL	iPZ	32.0	0.2	18.2	u	½°	220022	
	iSZ	38.6						
KRT	iPZ	33.6			u	½°	220023	
	iSE	42.0						

			T sec	A mm	GM	Dist	H	Remarks
18th October, 1968.								
		The records from the Wood Anderson seismograph are not available for study.						
RAB	iPZ	025220.5	0.4	5.4	u	32°	024617	M_B=5.7
	eSE/	5733						
RAL	iPZ	5221.0	0.6	4.0	u			
TAV	iPZ	20.8	0.5	4.8	u			
VUL	iPZ	21.1	0.5	5.0	u			
RAB	eZ/	035304			+			Traces
RAB	ePZ	060141	0.4	1.0	u			Distant
RAB	ePZ	061829	0.8	1.0	d			Distant
RAB	iPZ	111050.2	0.5	5.0	u			Regional
	iZ	51.8						
RAL	iPZ	49.2	0.3	5.0	u			
TAV	iPZ	49.0			u			
VUL	iPZ	50.5	0.2	1.5	d			
	iZ	51.0						
RAB	ePZ	112632½	0.6	1.0	d	27°	112100	
	eSE/	3110						
RAB	iPZ	124159.0	0.4	2.0	u	1½°	124135	
	iSN	4216.6						
VUL	iPZ	4158.0	0.2	2.8	u	1¼°	124137	
	iSZ	4214.0						
RAB	iPZ	145836.8	0.4	3.3	u			Regional
RAL	iPZ	35.8	0.2	4.2	u			
TAV	iPZ	35.2			u			
RAB	iPZ	161451.5	0.3	1.8	u	1¾°	161424	M_L=3.8
	iSE	1512.5						
RAL	iPZ	1451.0	0.3	2.0	u	1½°	161425	
	iSZ	1511.0						
TAV	iPZ	1450.7	0.3	3.0	u	1½°	161424	
	eSZ	1511						
VUL	iPZ	1450.5	0.5	3.6	u	1¾°	161421	
	iSZ	1512.0						
RAB	iPZ	170006.3	0.4	2.0	d	2°	165935	M_L=4.1
	iSN	29.8						
TAV	iPZ	05.5	0.4	2.5	d	2°	165934	
	e(S)Z	29						
VUL	iPZ	05.5		3.5	u	2°	165934	
	iSZ	29.5						
KRT	iPZ	04.4	0.4	2.8	d	1¾°	165937	
	iSZ	25.2						

			T sec	A mm	GM	Dist	H	Remarks
18th October, 1968 - continued.								
RAB	iPZ	183819.2	0.5	17.3	d	1½°	183753	M_L=4.4
	iZ	20.0						
	iSE	39.0						
RAL	iPZ	19.1	0.5	20.0	d	1½°	183754	
	iSZ	38.0						
TAV	iPZ	18.6		12.8	d			
VUL	iPZ	18.0	0.5	11.2	d			
KRT	iPZ	17.4	0.2		d	1½°	183754	
	iSE	35.0						
RAB	iPZ	194702.8	0.3	1.0	d	1¾°	194635	
	iSN	23.5						
RAL	iPZ	02.7	0.3	3.0	d			
TAV	iPZ	02.2	0.5	7.0	d	1½°	194636	
	eSZ	22						
VUL	iPZ	01.4		1.6	u			
RAB	iPZ	233025.0	0.4	20.0	d	¾°	233010	M_L=4.2
	iSN	36.4						
RAL	iPZ	24.3			d			
TAV	iPZ	24.2			d			
VUL	iPZ	25.4			d			
19th October, 1968.								
RAB	iPZ	004021.0	0.4	1.2	d	2¼°	003944	
	eSN	49						
TAV	iPZ	20.2	0.4	2.4	d			
VUL	iPZ	22.0		2.0	d			
RAB	iPZ	013245.8	0.5	2.0	d	1¼°	013223	M_L=3.3
	iSN	3302.6						
RAL	iPZ	3245.0			d			
TAV	iPZ	44.7			d			
VUL	iPZ	44.6			d			
RAB	iPZ	020902.5	0.4	2.0	d	5½°	020742	
	eSN/	1004						
TAV	iPZ	0902.0	0.3	1.2	d			
RAB	iPZ	021936.4	0.4	9.0	u			Local
	eSN/	41						
WAN	iPZ	36.5	0.2	7.2	u			
SUL	iPZ	36.1	0.3	8.0	u			
RAL	iPZ	36.1		2.6	u			
TAV	iPZ	35.4		5.1	u			
VUL	iPZ	35.4		11.3	d			
RAB	iPZ	022441.8			d	1¾°	022414	M_L=4.5
	iSN	2502.7						
WAN	iPZ	2441.8		2.1	d			
TAV	iPZ	41.4			d			
VUL	iPZ	40.4			d			

			T sec	A mm	GM	Dist	H	Remarks
19th October, 1968 - continued.								
RAB	iPZ	034126.4	0.6	1.4	d			
RAB	iPZ	041420.0	0.5	1.0	u	2¼°	041346	M_L=4.0
	iSN	46.0						
WAN	iPZ	19.6			u			
RAB	iPZ	070107.8	0.4	25.0	u			Local
WAN	iPZ	07.7			u			
SUL	iPZ	07.6			u			
RAL	iPZ	07.5			u			
TAV	iPZ	07.5			u			
RAB	iPZ	112549.5	0.5	3.4	u	1½°	112526	M_L=4.0
	eSN	2607						
WAN	iPZ	2549.5			u			
SUL	iPZ	49.7			u			
RAL	iPZ	49.6		1.4	u			
TAV	iPZ	49.6		2.4	d			
VUL	iPZ	49.0			u			
RAB	eZ/	174410			+			Traces
RAB	iPZ	200406.8	0.5	3.2	u			Local
WAN	iPZ	06.5			u			
SUL	iPZ	06.4		6.0	u			
RAL	iPZ	06.2	0.2	5.0	u			
TAV	iPZ	06.3		7.2	u			
VUL	iPZ	06.2		7.8	d			
RAB	iPZ	213012.0	0.4	14.0	u	1¼°	212951	M_L=3.9
	iSN	28.1						
WAN	iPZ	11.8			u			
SUL	iPZ	11.9			u			
RAL	iPZ	11.7		7.0	u			
TAV	iPZ	11.0	0.5	6.8	d			
KRT	iPZ	11.2			d	1¼°	212951	
	iSE	26.5						
RAB	iPZ	213052.4	0.5	1.4	d			
RAB	eZ/	215805			+			Traces

			T sec	A mm	GM	Dist	H	Remarks
20th October, 1968.								
Microseismic activity associated with strong winds.								
		Average T 0.6		A 4.8.				
RAB	iPZ	002645.0	0.4	12.7	u	¼°	002639	M_L=3.0
	eSN/	50.0						
WAN	iPZ	44.8			u			
SUL	iPZ	44.6			d			
RAL	iPZ	44.5			d			
TAV	iPZ	44.8			d			
VUL	iPZ	45.5			d			
RAB	iPZ	012615.5	0.5	4.0	d			Local
WAN	iPZ	15.4	0.2	3.0	d			
SUL	iPZ	15.2		5.8	d			
RAL	iPZ	15.2		3.0	d			
TAV	iPZ	14.6			d			
VUL	iPZ	14.4		15.4	d			
RAB	iPZ	025348.4	0.5	3.0		(½°)	0253(39)	M_L=2.9
	e(S)N/	56						
WAN	iPZ	47.9						
SUL	iPZ	48.4	0.3	2.2	u			
RAL	iPZ	48.0	0.3	4.0	u			
TAV	iPZ	48.0	0.3	2.0	u			
VUL	iPZ	47.8	0.4	6.5	u			
RAB	ePZ	071605½	0.5	2.0	u	33°		M_S=6.0 M_B=5.9
	eSN/	2216						
		LZ	18.0	23.0				
		LN	17.0	26.0				
		LE	19.0	40.0				
RAB	iPZ	105031.0	0.4	2.0	d			Local
WAN	iPZ	30.8	0.2	2.0	u			
SUL	iPZ	30.8		3.0	d			
RAL	iPZ	30.6		3.0	u			
TAV	iPZ	30.6	0.4	3.8	d			
VUL	iPZ	30.7	0.5	3.6	d			
RAB	e(P)Z/	122905			(u)	46°		
	eSE/	3648						
RAB	iPZ	165232.7	0.7	2.0	d			Local
WAN	iPZ	33.2		3.0	d			
TAV	iPZ	31.8			d			
VUL	iPZ	30.4	0.2	2.0	d			
RAB	eZ/	181028			-			Traces

			T sec	A mm	GM	Dist	H	Remarks
20th October, 1968 - continued.								
RAB	iPZ	190617.6	0.3	1.5	u			Regional
WAN	i(P)Z	17.0		1.0	d			
SUL	iPZ	17.0		2.6	d			
RAL	iPZ	16.5	0.3	1.4	d			
TAV	iPZ	16.3	0.5	7.8	d			
VUL	iPZ	17.3	0.4	3.0	u			
21st October, 1968.								
		Very strong microseismic activity. Average T 0.6 A 4.4						
		The records from the Wood Anderson seismographare not available for study.						
VUL	iPZ	002641.5	0.4		u	4¾°	002530	
	iSZ	2736.6						
RAB	iPZ	025748.5	0.5	2.9	d			Local. C.B.M
RAL	iPZ	46.0	0.2	2.1	d			
TAV	iPZ	45.6			d			
VUL	iPZ	46.9	0.3	6.4	d	¼°	025739	
	iSZ	53.0						
VUL	iPZ	051110.3	0.2	4.8	u	¼°	051102	
	iSZ	16.0						
RAB	iPZ	064744.9			u			Regional C.B.M
VUL	iPZ	44.8	0.6	12.9	u			
RAB	iPZ	100821.8	0.6	5.0	d			C.B.M
VUL	iPZ	18.5	0.5	3.2	d	3°	100734	
	iSZ	52.5						
TAV	iPZ	130109.3	0.3	4.2	d	(1¼°)	1300(47)	
	i(S)Z	26.0						
RAL	iPZ	142441.6	0.3	9.8	u			Local
TAV	iPZ	40.3	0.2	4.6	u			
VUL	iPZ	40.4	0.5	13.5	u			
RAB	iPZ	175946.3	0.3	5.2	d	1¼°	175926	C.B.M
	iSN	180001.3						
WAN	iPZ	175946.8	0.2	5.0	d	(1°)	1759(28)	
	i(S)Z	180000.9						
RAL	iPZ	175946.1	0.2	5.7	d	(1°)	1759(29)	
	i(S)Z	59.4						
TAV	iPZ	46.0			d			
VUL	iPZ	47.1	0.2	10.4	d	(1°)	1759(30)	
	i(S)Z	180000.0						
KRT	iPZ	175948.7	0.2	6.6	d	1¼°	175927	
	iSE	180004.8						

			T sec	A mm	GM	Dist	H	Remarks
21st October, 1968 - continued.								
RAB	iPZ	220244.6	0.4	34.8	u	¼°	220238	
	iSE/	50.0						
WAN	eiPZ	44½			u			
SUL	iPZ	45.0	0.3	25.0	u	¼°	220237	
	iSZ	51.0						
RAL	iPZ	44.6			u			
TAV	iPZ	44.9			u			
KRT	iPZ	48.4			u	½°	220236	
	iSE	57.3						
22nd October, 1968.								
RAB	eZ/	083216			-			Traces
RAB	iPZ	085036.1	0.4	2.1	d			Local
RAB	iPZ	094521.0	0.5	1.5	u			Regional
WAN	iPZ	20.6	0.4	0.8	u			
SUL	iPZ	20.6	0.3	1.0	u			
RAL	ePZ	20			u			
TAV	iPZ	20.2	0.4	3.2	u			
VUL	iPZ	19.7	0.3	10.0	u			
KRT	iPZ	21.6			u			
RAB	iPZ	133301.5	0.5	2.4	u			Regional
WAN	iPZ	01.1	0.3	0.8	u			
SUL	iPZ	00.9	0.3	1.2	u			
RAL	iPZ	01.1	0.4	3.0	u			
TAV	iPZ	00.6	0.9	3.0	u			
VUL	iPZ	00.0	0.5	13.0	u			
KRT	iPZ	02.0		3.3	u			
RAB	iPZ	152333.0	0.3	2.3	d	¼°	152325	M_L=2.9
	iSE	39.0						
WAN	iPZ	32.8	0.3	3.0	d			
	iZ	40.0						
SUL	ePZ	33	0.6	0.8	u	½°	152323	
	iSZ	39.6						
RAL	iPZ	32.6			u	¼°	152325	
	iSZ	38.4						
TAV	iPZ	33.0	0.3	5.2	u	½°	152323	
	iSZ	39.6						
RAB	ePZ	165750½	0.4	2.0	d			
RAL	iPZ	50.0			d			
TAV	iPZ	48.0	0.4	3.0	u			
VUL	iPZ	49.8	0.5	1.0	d	½°	165739	
	iSZ	57.4						

			T sec	A mm	GM	Dist	H	Remarks
22nd October, 1968 - continued.								
RAB	iPZ	173132.4	0.3	4.0	d	1¼°	173110	M_L=3.8
	iSN	49.0						
WAN	iPZ	32.4	0.5	1.0	d	1¼°	173111	
	iSZ	48.3						
VUL	iPZ	31.6	0.2	16.0	d	1¼°	173109	
	iSZ	48.2						
KRT	iPZ	30.4	0.3	2.3	d	1°	173112	
	iSN	44.3						
RAB	ePZ	232207	0.5	1.7	u	1¾°	232138	C.B.M
	iSN	29.0						
VUL	iPZ	07.2	0.3	2.3	u	1¾°	232139	
	iSZ	28.0						

			T sec	A mm	GM	Dist	H	Remarks
ESA'ALA								
23rd - 30th September, 1968.								
23rd September, 1968.								
ESA	iPZ	233904	0.2	1.2	d	4¾°	233752	
	eSN/	58½						
24th September, 1968.								
ESA	iPZ	011210	0.2	7.0	d	¾°	011155	
	eSN/	21						
ESA	eZ/	034242			+			Traces
ESA	iPZ	055629	0.2	1.0	d			Regional
ESA	ePZ	084914	1.0	1.0	d	14¼°		
	eSN/	5151						
ESA	iPZ	090411½			u			Near
ESA	iPZ	093013	0.3	0.8	u			Regional
ESA	ePZ	170929	0.4	1.0	u			Near
ESA	iPZ	174656	0.3	6.0	u	½°	174645	
	iSN/	4704						
ESA	iPZ	202555½	0.5	4.0	u			Local
ESA	iPZ	203541½			u			Near
ESA	iPZ	205850			u			Local
ESA	iPZ	211425	0.5	1.5	d			Near
25th September, 1968.								
ESA	ePZ	002112	0.6	2.0	u			Near
ESA	iPZ	024120½	0.2	1.5	d	4½°	024013	
	iSN/	4212					Epicentre 148.3°E 06.3°S	
							New Britain Region.	
ESA	ePZ	071017	0.7	1.2	d	42°		
	eSN/	1635						
ESA	iPZ	075805	0.2	1.0	u			Near
ESA	ePZ	105716			d	7¾°	105521	
	eSN/	5845						
ESA	eZ/	144042			-			Traces
26th September, 1968.								
ESA	ePZ	024540	0.6	2.0	d			Near
ESA	ePZ	061436	0.3	0.6	u	3¾°	061340	
	eSN/	1519					Epicentre 154.0°E 08.9°S	
							Dentrecasteaux Is. Region	
ESA	ePZ	084652½	0.4	1.2	d	26°		
	iZ	54						
	eSN/	5119						
ESA	iPZ	100123	0.2	1.0	u			Near
ESA	iPZ	104546	0.4	1.0	d	2¼°	104512	
	eSN/	4612						
ESA	iPZ	125632	0.2	2.0	d	5½°	125509	
	eSN/	5736						
ESA	ePZ	144459½	0.5	1.2	d	30°		
	eSN/	4905						

			T sec	A mm	GM	Dist	H	Remarks
ESA'ALA - continued.								
26th September, 1968 - continued.								
ESA	ePZ	162857	0.4	0.6	d			Distant
ESA	ePZ eSN/	180947½ 1541	0.6	1.0	d	37½°		
27th September, 1968.								
ESA	iPZ	030647	0.2	2.0	u			Local
ESA	iPZ	030739½			u			Local
ESA	iPZ eSN/	040354 0727	0.5	4.0	d	22°		
ESA	iPZ	051546			u			Regional
ESA	iPZ	051706			u			Regional
ESA	iPZ	054620			u			Regional
ESA	ePZ/ eSN/	164809 4938			u	7¾°	164614	
ESA	e(P)Z/	165821			u			Near
ESA	iPZ/ iZ/ e(S)N/	190901 05 1100			u	(10½)°	1906(28)	
ESA	ePZ/	210106			d			Near
28th September, 1968.								
ESA	ePZ e(S)N/	070016½ 0105	0.2	1.0	d	(4¼°)	0659(13) Epicentre 148.3°E 06.3°S New Britain Region	
ESA	ePZ e(S)N/	074042½ 4239	0.5	1.2	d	(10½°)	073812 Epicentre 142.1°E 04.2°S Near North Coast of N.G.	
ESA	ePZ	100206½			d			Distant
ESA	iPZ	115806	0.4	2.5	d			Regional
ESA	ePZ/	141228			u			Distant
29th September, 1968.								
ESA	iPZ	035544	0.5	1.7	d			Distant
ESA	ePZ	051744½	0.5	0.6	u			
ESA	iPZ	064505½	0.2	3.0	d			Near
ESA	ePZ eSN/	172040 2237	0.5	1.0	10½°		171809 Epicentre 144.1°E 02.1°S New Guinea Region.	
ESA	ePZ eSN/	174001 4201	0.2	1.0	u	10¾°	173727	
ESA	ePZ eSN/	181540 1739	0.5	1.0	u	10½°	181307	
ESA	ePZ eSN/	194634½ 5029	0.4	1.0	d	22°		
ESA	iPZ iZ eSN/	215645 54 5849	0.2	1.0	d	11°		

			T sec	A mm	GM	Dist	H	Remarks
ESA'ALA - continued.								
29th September, 1968 - continued.								
ESA	ePZ eSN/	224411 4614	0.4	1.0	d	11°		
30th September, 1968.								
		The records from the Willmore portable seismograph are not available for study.						
ESA	eZ/	114419			-			Distant
ESA	eZ/	142116			+			Distant

Rabaul Central Observatory,
25th October, 1968.

(G.W. D'ADDARIO)
VOLCANOLOGIST-IN-CHARGE.

13 NOV 1968 11

PEA OCT-68 No. 44

TERRITORY OF PAPUA AND NEW GUINEA
GEOLOGICAL AND VOLCANOLOGICAL BRANCH
VOLCANOLOGICAL SECTION

PRELIMINARY EARTHQUAKE ANALYSIS
RABAUL CENTRAL OBSERVATORY
1968

Rabaul	RAB	From: OCT. 23. 1968 To: OCT. 29. 1968
Rabaul Harbour Network	WAN SUL RAL TAV VUL	From: OCT. 23. 1968 To: OCT. 29. 1968
Keravat	KRT	From: OCT. 23. 1968 To: OCT. 29. 1968
Esa'Ala	ESA	From: OCT. 1. 1968 To: OCT. 7. 1968
Tabele	TBL	From: SEP. 26. 1968 To: OCT. 9. 1968
Agenahambo	AGE	From: To:
Waris	WAA	Not operational
Ulamona	ULA	Not operational
Piva	PIV	Not operational
Cape Gloucester	LAG	Not operational

STATION PERSONNEL

RAB Central Observatory, Rabaul.

Volcanologist-in-Charge	G.W. D'Addario
Volcanologist	R.F. Heming
Seismologist	M. Mancini
Seismogram Readers	R.A. Page, L.M. Cartwright
Senior Technical Officer	N.O. Myers
Technical Officer	R.J. Conway
Volcanological Assistants	L. Topue, M. Gaiam, E. Ravian
Technical Assistant	P. Daimbari
Trainee Volcanological Assistants	B. Talai, M. Salaiau, C. Matupit
Clerk	J.A. Alcock

KRT Keravat Outstation.

Observer (part-time)	G.E. Chorick

TBL Tabele Observatory.

Observer	V. Kaita

ESA Esa'Ala Observatory.

Observer	F. Dira

AGE Agenahambo Outstation.

Observer (part-time)	B. Kirke

The Rabaul Preliminary Earthquake Analysis (PEA) is produced by the staff under the direction of the Volcanologist-in-Charge from whom additional information and photocopies of seismogram records from all stations may be obtained on request.

Please address all communications to:-

Volcanologist-in-Charge,
Central Observatory,
P.O. Box 386,
RABAUL. T.N.G.

			T sec	A mm	GM	Dist	H	Remarks
RABAUL.								
23rd October, 1968.								
RAB	ePZ/	021014			u	23°	020514	M_S=5.3
	eSE/	1420						
		LZ	20.0	19.0				
		LN	22.0	15.0				
		LE	21.0	17.0				
RAB	iPZ	023658.0	1.0	9.0	u	10½°	023428	M_B=6.5
	iPPZ/	3710.0						
	iSN/	3858.0						
RAL	ePZ	3657½	1.0	2.5	u			
TAV	ePZ	58½	1.0	3.4	u			
KRT	iPZ	56.8	1.0	8.0	d			
RAL	iPZ	0436	0.3	0.8				Harmonic
	FZ	49						tremor
RAB	iPZ	055013.0	0.5	2.8	d			
WAN	iPZ	12.6	0.6	4.5	d			
TAV	iPZ	14.0	0.3	0.9	d			
SUL	iPZ	092458.0		1.5	d			
RAL	iPZ	57.4			d			
TAV	iPZ	57.2			d			
VUL	iPZ	58.0	0.5	4.0	d			
RAB	iPZ	095056.7	0.4	1.9	d			Regional
WAN	iPZ	56.4	0.3	1.6	d			
RAL	iPZ	57.8			d			
TAV	iPZ	58.0			d			
VUL	iPZ	58.2			d			
RAB	iPZ	111350.0	0.5	3.5	u	1¾°	111321	M_L=4.6
	iSN	1412.0						
WAN	ePZ	1350		2.5	u	2°	111320	
	iSZ	1412.6						
RAL	iPZ	1350.1	0.5	5.0	u	2°	111320	
	iSZ	1413.3						
TAV	iPZ	1349.6			d			
VUL	iPZ	49.5	0.5	19.7	d			
KRT	iPZ	50.4	0.7		u	1¾°	111321	
	iSE	1411.9						
RAB	ePZ	131114			+			Regional
SUL	iPZ	12.2	0.2	1.0	u			
RAL	ePZ	13	0.6	0.8	u			
TAV	iPZ	12.4	0.3	1.4	u			
VUL	iPZ	11.9	0.3	3.3	u			
RAB	iPgZ	131842.6	0.5	1.4	d			Regional

			T sec	A mm	GM	Dist	H	Remarks
23rd October, 1968 - continued.								
SUL	iPZ	134954.8			u			
RAL	iPZ	55.0			d			
TAV	ePZ	54½			u	1¼°	134933	
	iSZ	5010.8						
VUL	iPZ	4954.0			u	1¼°	134931	
	iSZ	5010.5						
RAB	iPZ	163419.0	0.5	2.7	d	4½°	163311	
	iSE	3511.0						
RAL	ePZ	3417½			d			
TAV	ePZ	17	0.4	3.0	d	4½°	163311	
	iSZ	3508.2						
VUL	iPZ	3417.2	0.3	2.5	d			
KRT	iPZ	17.4	0.2	0.7	d			
RAL	iPZ	172138.2	1.0	4.7	d			Local
TAV	iPZ	37.7	0.3	2.5	d			
VUL	iPZ	37.0	0.5	8.7	d			
WAN	iPZ	184244.5			u			
RAL	iPZ	44.0	0.5	5.0	u			
TAV	iPZ	44.0	0.4	3.6	u			
VUL	iPZ	43.0	0.2	14.0	u			
KRT	iPZ	45.0	0.2	3.2	u			
	iSE	48.2						
RAB	ePZ/ es	210651 6840	1.0	17.0	d	9¾°	210431	M_L=7.3 M_B=7.3

23.

Epicentre 142.8°E 3.0°S

Felt:

Wewak Int. VII-VIII	3.5°S 143.6°E
Hawaiian River Int. VII-VIII	3.5°S 143.5°E
Boram Int. VII	3.7°S 143.7°E
Maprik Int V	3.6°S 143.0°E
Nuku Int. V	3.6°S 142.2°E
Yangoru Int. IV	3.7°S 143.3°E
Ambunti Int. IV	4.3°S 142.9°E
Imonda Int. III	3.3°S 141.3°E
Tabele Int. I	4.1°S 145.0°E
Aitape Int. III	3.1°S 142.3°E

Wewak: Damage to structure, collapse of brick walls & water tanks.

Boram: Airport subsided six inches over an area of 150 squ. ft. with quarter inch cracks appearing.

			T sec	A mm	GM	Dist	H	Remarks
24th October, 1968.								
RAB	iPZ	234909.0		2.0	d			Regional
RAB	ePZ eSE/	004808 5246	0.6	1.2	d	26½°		M_B=5.5
RAB	ePZ iSN/	020432 0622.0	0.6	1.2	u	9¾°	020210	M_B=6.0
RAB	eZ/	044756			+			Traces
RAB	eZ/	054546			-			Traces
RAB	iPZ	063441.7	0.3	2.4	u			Regional
RAB	iPZ iSN	092248.1 2321.8	0.5	2.0	u	2¾°	092203	M_L=4.4
SUL	iPZ	2246.8			u			
TAV	iPZ	45.8			u			
VUL	iPZ	47.1	0.4	3.8	u			
KRT	iPZ iSE	45.1 2317.5	0.4	1.2	u	2¾°	092203	
RAB	iPZ iSN	120353.5 0426.6	0.4	1.0	d	2¾°	120310	M_L=4.3
RAB	iPZ iSN	131035.5 55.0	0.4	2.0	d	1½°	131009	M_L=3.6
WAN	iPZ	35.4			d			
RAL	iPZ	34.6	0.7	4.0	u			
TAV	iPZ	34.0	0.3	3.1	d			
VUL	iPZ	33.7	0.3	2.0	u			
KRT	iPZ iSE	32.2 49.8	0.3	3.0	d	1½°	131008	
RAB	iPZ iZ eSE/	140408.0 09.5 0837	0.6	2.0	u	26¾°		M_B=5.4
WAN	iPZ	0407.9			u			
KRT	iPZ	07.4	0.5	1.4	u			
RAB	iPZ iZ	143832.6 34.7	0.4	1.0	u			Regional
WAN	iPZ	33.9		4.0	u			
SUL	iPZ	33.1	0.2	2.0	u			
RAL	iPZ	33.0			u			
TAV	iPZ	33.0	0.2	1.9	u			
VUL	iPZ	31.5			d			
KRT	iPZ	35.2	0.2	1.0	u			
RAB	iPZ iSE	151402.5 36.0	0.5	1,0	u	2¾°	151318	M_L=4.7
WAN	iPZ	03.6			u			
KRT	iPZ iSE	151358.4 1431.4		0.6	u	2¾°	151315	

			T sec	A mm	GM	Dist	H	Remarks
24th October, 1968 - continued.								
RAB	iPZ	155449.2	0.4	5.0	u			Local
	iSN	51.0						
WAN	iPZ	49.0	0.2	9.0	u			
SUL	iPZ	48.8	0.4	10.2	u			
RAL	iPZ	48.8			u			
TAV	iPZ	48.7			u			
VUL	iPZ	49.0	0.2	13.3	u			
KRT	iPZ	50.0	0.2	2.0	u			
RAB	ePZ	155654	0.8	1.0	d	27°		M_B=5.9
	eSN/	0133						
RAB	iPZ	183009.0	0.5	3.4	u	2°	182936	M_L=4.0
	iSN	33.9						
WAN	iPZ	08.8			u			
TAV	iPZ	08.5			d			
RAB	eZ/	200052			-			Traces
RAB	iPZ	200126.9	0.2	1.0	u			Regional
RAL	iPZ	25.3		3.0	u			
TAV	iPZ	25.5		2.4	u			
VUL	iPZ	27.5		0.6				
RAB	ePZ	210056	0.8	1.0	d	29°		
	eSN/	0542						
RAB	iPZ	224512.0	1.0	4.5	u			Distant
25th October, 1968.								
RAB	iPZ	004430.6	0.5	56.2	d	1¼°	004411	M_L=4.3
	iSN	46.0						
WAN	iPZ	30.3	0.5	32.0	d			
SUL	iPZ	30.0	0.5	22.7	d			
RAL	iPZ	30.0			d			
TAV	iPZ	29.8			d			
VUL	iPZ	29.6			d			
KRT	iPZ	29.6			d			
RAL	iZ	0202	0.14	0.8				Harmonic tremor
	FZ	0210						
RAB	iPZ	033224.6	0.5	3.7	u	2¾°	033140	M_L=4.4
	iSN	58.5						
TAV	iPZ	25.0			u			
VUL	iPZ	22.1	0.4	8.0	u			
KRT	iPZ	21.4	0.3	1.4	u	2½°	033141	
	iSE	52.5						
RAB	i(P)Z	034033.5	0.5	2.6	d			Regional
VUL	iPZ	30.8	0.5	6.2	u			

			T sec	A mm	GM	Dist	H	Remarks
25th October, 1968 - continued.								
RAB	iPZ	081733.5	0.6	16.0	u	2°	081703	M_L=4.6
	iSZ	56.0						
WAN	iPZ	33.3	0.2	19.0	d	1¾°	081704	
	iSZ	55.4						
SUL	iPZ	33.4	0.4	4.8	d	2°	081702	
	iSZ	57.0						
RAL	iPZ	34.3	0.4	11.4	u			
TAV	iPZ	33.4			d			
VUL	iPZ	32.7			u	1¾°	081705	
	iSZ	54.0						
KRT	iPZ	30.6			u	1¾°	081703	
	iSE	51.8						
RAB	iPZ	092712.9	0.5	8.6	u	½°	092703	M_L=3.3
	iSN	20.2						
WAN	iPZ	12.8	0.3	9.1	u			
RAL	iPZ	13.2	0.2	3.4	u			
TAV	iPZ	13.6	0.2	4.2	u			
VUL	iPZ	14.2	0.4	7.0	u			
RAB	iPZ	094523.5	0.4	5.0	u	½°	094513	M_L=3.0
	iSN	31.1						
WAN	iPZ	23.4	0.2	5.3	u			
RAL	iPZ	24.0	0.2	2.5	u			
TAV	iPZ	24.0	0.2	2.9	u			
VUL	iPZ	25.0	0.4	3.0	u			
RAB	eZ/	100738			-			Traces
RAB	iPZ	104406.0	0.4	5.2	u	½°	104355	M_L=3.2
	iSN	13.6						
WAN	iPZ	06.0	0.2	5.2	u			
RAL	iPZ	06.4	0.2	2.0	u			
TAV	iPZ	06.8	0.2	3.0	u			
VUL	iPZ	07.5			u			
RAB	eZ/	110043			+			Traces
RAB	eZ/	120440			+			Traces
RAB	iPZ	124158.0	0.6	0.8	u	¾°	124146	M_L=3.1
	iSN	4207.4						
TAV	iPZ	4157.6			u			
VUL	iPZ	59.5	0.3	2.3	u			
RAB	iPZ	130219.3	0.4	5.0	u	½°	130208	M_L=3.1
	iSN	26.8						
WAN	iPZ	19.0	0.3	5.6	u			
RAL	iPZ	20.0	0.3	2.0	u			
TAV	iPZ	20.0	0.2	2.6	u			
VUL	iPZ	20.5	0.2	4.7	u			
RAB	eZ/	135456			+			Traces

			T sec	A mm	GM	Dist	H	Remarks
25th October, 1968 - continued.								
RAB	ePZ/ eSE/	160541 0830			u	15¼°	160230	
RAB	iPZ	174737.4	0.3	33.6	u			Regional
WAN	iPZ	37.0	0.3	29.0	u			
SUL	iPZ	37.0	0.2	39.9	u			
RAL	iPZ	37.0			u			
TAV	iPZ	36.9			u			
VUL	iPZ	37.0			u			
KRT	iPZ	38.9		13.0	u			
RAB	ePZ iSN	180811 28.2	0.5	7.0	u	1¼°	180748	M_L=4.0
WAN	iPZ	10.2	0.5	1.0	d			
RAL	iPZ	10.1	0.2	4.1	d			
TAV	iPZ	09.8			d			
VUL	iPZ	10.0	0.2	18.0	d			
KRT	iPZ iSE	10.2 26.6	0.2		d	1¼°	180749	
RAB	iPZ	190818.0	0.8	12.8	d			Regional
WAN	iPZ	18.0	0.4	9.3	d			
SUL	iPZ	17.8	0.5	6.5	d			
RAL	iPZ	17.1	0.6		d			
TAV	iPZ	17.0			d			
VUL	iPZ	17.9			d			
KRT	iPZ	19.9	0.4		u			
26th October, 1968.								
Strong microseismic activity from 252300 - 261300 hours.								
RAB	iPZ iSN	060354.0 0428.0	0.5	16.0	d	3°	060309	
WAN	iPZ	0353.5	0.3	10.0	d			
VUL	iPZ	51.3			d			
KRT	iPZ	50.2	0.4		u			
RAB	iPZ iSN	102108.2 16.0	0.5	4.0	d	½°	102057	
WAN	iPZ iSZ	08.1 15.0	0.2	6.0	d	½°	102059	
RAL	iPZ	08.0	0.3	4.0	d			
TAV	iPZ	08.0			d			
VUL	iPZ	09.6	0.2	1.0	d			
RAB	iPZ iSN	103632.3 3706.0	0.5	3.0	u	3°	103548	
WAN	iPZ i(S)Z	3632.0 3704.5	0.4	2.0	d	(2¾°)	1035(49)	
TAV	iPZ	3629.5			u			
VUL	iPZ	29.5			u			

			T sec	A mm	GM	Dist	H	Remarks
26th October, 1968 - continued.								
RAB	iPZ	151024.0	0.4	2.0	u	2½°	150943	M_L=4.3
	iZ	28.1						
	iSN	55.3						
WAN	iPZ	23.5	0.3	1.0	u	2¾°	150940	
	eSZ	56						
VUL	iPZ	21.0	0.4	4.0	u	2¾°	150938	
	iSZ	54.0						
KRT	iPZ	19.2			u	2¾°	150937	
	iSE	50.9						
RAB	iPZ	162919.2	0.3	1.7	u	2¾°	162837	M_L=4.5
	iZ	20.6						
	eSN	51						
WAN	iPZ	20.6	0.2	1.0	d	2¾°	162839	
	iSZ	52.2						
KRT	iPZ	16.3	0.5		u	2¾°	162834	
	iSE	48.3						
RAB	ePZ	185940	0.4	2.0	d	1¾°	185913	M_L=4.0
	iSN	190000.5						
WAN	iPZ	185940.3	0.2	1.0	d			
RAL	iPZ	40.0	0.3	1.0	d			
TAV	iPZ	39.4	0.2	1.5	d	1½°	185916	
	iSZ	57.5						
VUL	iPZ	39.0	0.2	3.7	u	1½°	185915	
	iSZ	57.2						
KRT	iPZ	39.2	0.3	2.4	u	1½°	185914	
	iSE	57.9						
RAB	iPZ	190947.0	0.4	9.0	d	1½°	190922	M_L=4.2
	iZ	51.0						
	iSN	1006.0						
WAN	iPZ	0947.0	0.3	7.0	d	1¼°	190924	
	iSZ	1004.0						
SUL	iPZ	0947.0	0.2	1.0	d	1¼°	190924	
	iSZ	1004.0						
RAL	iPZ	0946.0	0.2	7.4	d	1¼	190923	
	iSZ	1003.0						
TAV	iPZ	0946.0			d			
VUL	iPZ	46.7			d			
KRT	iPZ	47.2	0.4		d	1½°	190921	
	iSE	1007.2						
RAB	iPZ	201209.8	0.5	4.0	d	4½°	201103	M_L=4.7 M_B=5.1
	eSE	1301						
WAN	iPZ	1209.5	0.5	1.8	d			
TAV	iPZ	10.0	0.6	1.8	d			
VUL	iPZ	08.7	0.4	1.0	d			
RAB	iPZ	210954.0	0.5	1.4	u			
TAV	iPZ	52.6	0.5	1.2	d	2°	210922	
	iSZ	1015.5						

			T sec	A mm	GM	Dist	H	Remarks
26th October, 1968 - continued.								
RAB	iPZ	220314.0	0.4	1.5	u			Local
SUL	iPZ	13.3	0.2	2.0				
RAL	iPZ	13.2	0.5	5.0	u			
TAV	iPZ	13.0	0.2	5.6	u			
VUL	iPZ	12.6	0.2	2.0	u			
RAB	iPZ	231140.0	0.5	16.0	u	1½°	231114	M_L=5.0
	iSE	1200.0						
WAN	ePZ	1139½		28.0	u			
SUL	ePZ	39½	0.6	13.0	u			
RAL	iPZ	39.0		15.5	u			
TAV	iPZ	39.5			u			
VUL	iPZ	39.4			u			
27th October, 1968.								
RAB	iPZ	001021.3	0.5	4.0	u			Regional
TAV	iPZ	21.5	0.5	2.5	u			
VUL	ePZ	20½	4.0	3.2	u			
RAB	iPZ	030852.8	0.5	6.0	d	1¾°	030825	M_L=4.3 C.B.M
	iSN	0914.0						
WAN	iPZ	0852.4	0.5	8.8	d			
RAL	ePZ	52½		11.0	d			
TAV	iPZ	52.5			d			
VUL	iPZ	52.0	0.4	13.0	u			
KRT	iPZ	52.5	0.2		u	1¾°	030825	
	iSE	0913.0						
RAB	ePZ	053556	0.5	7.0		1½°	053530	M_L=4.2
	iSN	3616.2						
WAN	iPZ	3556.5	0.2	3.0	d			
RAL	iPZ	56.2		5.0	d			
TAV	iPZ	55.7			d			
VUL	iPZ	55.5		10.0	d	1½°	053530	
	iSZ	3614.0						
KRT	iPZ	3555.5			d	1½°	053530	
	iSE	3614.0						
RAB	ePZ	085953½	0.4	2.0		¾°	085938	M_L=3.2
	iSN	090004.2						
WAN	iPZ	085953.5			u			
RAL	ePZ	53			u	¾°	085938	
	iSZ	090003.5						
TAV	iPZ	085953.0	0.2	2.0	u	¾°	085939	
	iSZ	090003.0						
VUL	ePZ	085954			u			

			T sec	A mm	GM	Dist	H	Remarks
27th October, 1968 - continued.								
RAB	iPZ	091126.0	0.5	2.5	d	1¾°	091058	M_L=4.0
	iSN	46.5						
TAV	iPZ	25.0		5.0	d	1½°	091100	
	eSZ	43½						
VUL	iPZ	25.0		3.0	d	1½°	091101	
	iSZ	43.3						
KRT	iPZ	25.3	0.3	2.3	d	1½°	091101	
	iSE	43.7						
RAB	iPZ	091620.4	0.5	4.0	d	1½°	091554	M_L=4.1
	iSN	40.0						
WAN	ePZ	20½			d	1½°	091555	
	eSZ	39						
SUL	iPZ	20.5			u			
RAL	ePZ	20		3.0	d	1½°	091555	
	iSZ	38.5						
TAV	iPZ	19.9		8.0	d	1½°	091556	
	iSZ	38.0						
VUL	iPZ	19.9		5.7	d	1½°	091556	
	iSZ	38.0						
KRT	iPZ	19.7	0.4		d	1½°	091556	
	iSE	37.9						
RAB	iPZ	100428.8	0.3	3.6	u			Regional
WAN	iPZ	28.7	0.2	5.0	u			
SUL	iPZ	28.0	0.5	3.2	u			
RAL	iPZ	28.2			u			
TAV	iPZ	28.5	0.2	3.0	d			
VUL	iPZ	29.4	0.4	1.5	u			
RAB	iPZ	102947.7	0.4	3.9	u			
WAN	iPZ	47.2	0.2	0.3				
RAL	iPZ	47.0	0.6	6.0	d			
VUL	iPZ	46.2	0.4	2.0	d			
KRT	iPZ	45.2	0.2	3.0	u	1¼°	102923	
	iSE	3002.0						
RAB	eiPZ	134803½	0.5	4.0	d	28°		
	eSE/	5240						

			T sec	A mm	GM	Dist	H	Remarks
28th October, 1968.								
		The records of the W.W.S.S. LP Z component are not available for study.						
RAB	iPZ	015742.0	0.4	1.9	u			
RAL	iPZ	42.8			u			
TAV	iPZ	42.5			u			
VUL	iPZ	43.4	0.3	2.1	u	2°	015710	
	iSZ	5808.0						
RAB	ePZN/	022946			u	13¼°	022636	
	eSN/	3214						
RAB	iPZ	132814.2	0.5	6.0	d			Regional
WAN	iPZ	14.0	0.2	3.0	d			
SUL	iPZ	13.9	0.3	3.0	d			
RAL	iPZ	14.0	0.3	3.0	d			
TAV	iPZ	13.0	0.2	3.1	u			
VUL	iPZ	13.0	0.3	4.6	u			
RAB	iPZ	135108.2	0.3	54.3	u	½°	135056	M_L=4.4
	iSN/	17.0						
WAN	iPZ	08.0			u			
SUL	iPZ	07.8	0.3	41.2	u			
RAL	iPZ	07.8			u			
TAV	iPZ	07.4			u			
VUL	iPZ	08.2			u			
KRT	iPZ	09.0			u	½°	135058	
	iSE	17.2						
RAB	iPZ	150507.6	0.4	6.0	d	1½°	150441	M_L=4.1
	iSE	28.0						
WAN	iPZ	07.7	0.2	2.0	u	1½°	150441	
	iSZ	27.4						
SUL	iPZ	07.6	0.3	1.0	u			
RAL	iPZ	07.7			u			
TAV	iPZ	07.5	0.4	2.3	u			
VUL	iPZ	06.8	0.4	14.8	d	1½°	150443	
	iSZ	24.9						
KRT	iPZ	04.9			d	1½°	150442	
	iSE	22.8						
RAB	iPZ	185922.9	0.5	2.5	u			
WAN	iPZ	22.6			u			
SUL	iPZ	22.8	0.3		u			
RAL	iPZ	22.5	0.4	2.3	u			
TAV	iPZ	22.0	0.3	2.8	d			
VUL	iPZ	21.6	0.2	3.0	u			
KRT	iPZ	20.2	0.2	3.0	d	1¼°	185859	
	iSE	35.8						

			T sec	A mm	GM	Dist	H	Remarks
28th October, 1968 - continued.								
RAB	iPZ	195020.2	0.3	5.0	d			Regional
WAN	iPZ	20.0	0.4	2.0	d			
SUL	iPZ	19.9	0.4	2.6	d			
RAL	iPZ	20.0	0.4	2.1	d			
TAV	iPZ	19.9	0.3	7.1	u			
VUL	iPZ	19.0		29.2	u			
KRT	iPZ iSE	20.6 24.3			u			
RAB	i(P)Z e(S)E/ eE/	195831.1 5924 200016	0.5	2.6	u	(2¾°)	1957(48)	
RAB	ePZ/ iSN/ eSScPE/ ePKKSZ/	233612 3921 4422 000736			d	18°	233202	M_B=5.8
29th October, 1968.								
		Harbour Network - SUL - No record from 2150 - 0512 hours due to equipment maintenance and tests.						
		Harbour Network - VUL - No record from 2158 - 0512 hours due to equipment maintenance and tests.						
RAB	ePZ/ eSZ	041309 1859½	6.0	3.0	u	39°	040600	
RAB	iPZ iSE	060035.6 55.7	0.3	2.0	u	1½°	060009	M_L=4.0
WAN	iPZ iSZ	34.5 54.4	0.4	1.0	u	1½°	060008	
RAL	iPZ iSZ	35.0 54.1	0.2		u	1½°	060010	
TAV	iPZ	34.0	0.2	1.2	d			
RAB	eZ/	065704			+			Traces
RAB	iPZ iSE	090551.5 54.4	0.4	2.0	u	¼°		M_L=2.3
WAN	iPZ	50.8		1.4	u			
RAL	iPZ	51.0		2.0	d			
TAV	iPZ	50.3		7.0	u			
VUL	iPZ	51.2		3.4	d			
KRT	iPZ iSN	52.5 58.5			d	¼°	090545	
RAB	iPZ	091841.4	0.6	2.0	u			Regional
WAN	iPZ	41.0	0.2	2.7	u			
SUL	iPZ	41.0			d			
RAL	iPZ	41.0			u			
TAV	iPZ	40.0	0.2		u			
VUL	iPZ	40.0	0.4	1.0	d			

			T sec	A mm	GM	Dist	H	Remarks
29th October, 1968.- continued.								
RAB	ePZ/ eSN/	114013 4416			+	24°		
RAB	iPZ	164903.4	0.4	2.0	d			Regional
WAN	iPZ	03.2			u			
SUL	iPZ	03.1			u			
RAL	iPZ	03.1	0.2	3.8	d			
TAV	iPZ	02.6	0.2	1.9	d			
VUL	iPZ	02.8			d			
KRT	iPZ iSE	05.3 08.6			u			
RAB	ePZ/ eSN/ MZ/	170610 0806 1415			u	10½°		
RAB	ePZ iSEa	171947½ 2007.0	0.3	7.0	u	1½°	171921	M_L=4.0
WAN	iPZ iSZ	1947.7 2006.8	0.5		d	1½°	171923	
SUL	iPZ	1947.8	0.4	3.8	d			
RAL	iPZ	47.7	0.4	4.0	d			
TAV	iPZ iSZ	46.9 2006.4	0.6		u	1½°	171920	
VUL	iPZ	1947.1						
KRT	iPZ iSN	47.1 2005.3	0.3	6.0	u	1½°	171923	

			T sec	A mm	GM	Dist	H	Remarks
ESA'ALA								
1st - 7th October, 1968.								
1st October, 1968.								
ESA	ePZ iSN/	005608 5911	1.0	2.0	d	7°		
ESA	iPZ	082914½		5.0	u			Local
ESA	iPZ	111708			d			Local
ESA	iPZ	144545			u			Local
ESA	iPZ	221212	0.5	2.3	d			Distant
2nd October, 1968.								
	Willmore record fogged.							
ESA	ePZ/ iSN/	182545 2637	1.0	3.0	u	4½°	182437	Epicentre Vitiaz Strait East New Britain Region
3rd October, 1968.								
ESA	iPZ/	001957		16.0	u			Local
ESA	iPZ/	035542½	0.4	5.0	u			Local
ESA	ePZ/ iPPZ/ iSN/ epPcPZ/	080951½ 1020 1357½ 1435	1.0	3.0	u	23½°		
ESA	e(P)Z/ i(S)N/	144747 4856			d	(6°)	144618)	
ESA	iPZ/ iSN/	145244 5344	0.8	6.0	u	5¼°	145126	Epicentre 4.0°S 150.0°E North New Britain Region
4th October, 1968.								
ESA	ePZ/ iSN/	065433 5502	1.0	3.0	d	2½°	065355	
ESA	ePZ/ i(P)PZ/ iSN/	073130 3159 3559		9.0	u	27°		
5th October, 1968.								
ESA	iPZ/	135525	0.6	3.0	d			Local
6th October, 1968.								
ESA	ePZ/	052055			d			Distant
ESA	ePZ/ ePcPZ/ iSN/ iSSN/ iSSSN/	085243 5356½ 5958 090342 0529			u	52°		
ESA	iP!Z/	125247			uSW			Local
7th October, 1968.								
ESA	ePZ/ iSN/	002511½ 2702			u	9¾°	002249	
ESA	iPZ/	125004½	0.5	7.0	u			Local
ESA	iPZ/ iSN/	192548 2616	1.0	31.0	u	2¼°	192511	

			T sec	A mm	GM	Dist	H	Remarks
TABELE.								
26th September - 9th October, 1968.								
26th September, 1968.								
TBL	iPZ	164618	0.4	3.0	d			Regional
TBL	ePZ	181541½						Teleseism
27th September, 1968.								
TBL	ePgZ iPnZ	040737½ 39			d			
TBL	ePZ iSZ	165633 39	0.7	3.0	u	¼°	165625	
TBL	iPZ	190712	0.5	3.0	d			Felt - refer PEA No. 40 pp 11.
TBL	ePZ iSZ	193651 3715	0.5	1.5	d	2°	193619	
TBL	ePZ	205826	0.3	2.0	u			Phases unable to be identified due to over-lapping traces from previous shock
TBL	i(P)Z iSZ	211010 44	0.4	1.0	d	(2¾°)	210925)	
TBL	iPZ i(S)Z	211726 42	0.8	10.2	d	(1¼°)	211705)	
TBL	iPZ	213448	0.8	4.0	d			Phases unable to be identified due to over-lapping traces from previous shock
TBL	iPZ iSZ	215603 14	0.5	4.0	d	¾°	215548	
TBL	ePZ iSZ	235547 5618	0.3	2.0	u	2½°	235506	
28th September, 1968.								
TBL	ePZ iSZ	014548½ 4614½	0.5	1.0	d	2¼°	014514	
TBL	ePZ	071815	0.5	2.3	d			Regional
TBL	ePZ iSZ	073853½ 3911½	0.5	4.2	d	1½°	073830	
TBL	ePZ	122010			(u)			Distant
TBL	ePZ	170348½						Regional
TBL	iPZ iSZ	210912½ 30½	0.4	18.0	d	1½°	210849	
TBL	ePZ iSZ	211941½ 2014½				2¾°	211858	
TBL	ePZ	233531½						Regional

TABELE - continued.

			T sec	A mm	GM	Dist	H	Remarks
29th September, 1968.								
TBL	ePZ	001729½				2°	001656	
	iSZ	54½						
TBL	ePZ	043823½				2°	043753	
	iSZ	46½						
TBL	ePZ	064458	0.2	8.2	d			Local
TBL	ePZ	171847	0.5	3.0	d	1°	171831	
	iSZ	59						
TBL	ePZ	172809½				2°	172736	
	i(S)Z	34						
TBL	iPZ	174423			u	1½°	174358	
	iSZ	41½						
TBL	ePZ	181346½	0.6	4.0	d	1¾°	181319	
	iSZ	1407½						
TBL	ePZ	185854½	0.3	1.2	u	1½°	185828	
	iSZ	5914½						
TBL	iPZ	215457½	0.5	6.0	d			Regional
TBL	ePZ	220116½				1¼°	220055	In coda of predeeding shock.
	iSZ	32½						
TBL	iPZ	224229	0.5	3.6	d			Traces from previous shocks overlapping.
30th September, 1968.								
TBL	iPZ	005319	0.6	1.8	d	2¾°	005234	
	iSZ	52½						
TBL	ePZ	040548	0.7	2.0	d			Regional
TBL	iPZ	081403	0.5	6.0	d	2¼°	081326	
	iSZ	31						
TBL	iPZ	142206			d			Distant
TBL	iPZ	145737				3½°	145643	
	iSZ	5817½						
TBL	ePZ	151742	0.4	4.0	u			Local
TBL	iPZ	222133	0.3	2.0	d			Regional
1st October, 1968.								
TBL	ePZ	012819						Local
TBL	ePZ	122947	0.3	2.6	u			Regional
TBL	ePZ	172601½			d	2¾°	172518	
	iZ	20						
	iSZ	34						
2nd October, 1968.								
TBL	ePZ	182738	0.3	8.0	u			Local
3rd October, 1968.								
TBL	iPZ	021957	0.2	3.0	u			Local
TBL	iPZ	104945½	0.5	5.0	d	¼°	104938	
	iSZ	51						

			T sec	A mm	GM	Dist	H	Remarks
TABELE - continued.								
3rd October, 1968 - continued.								
TBL	iPZ iSZ	232554 2604	0.5	2.8	d	¾°	232540	
TBL	iPZ iSZ	235104½ 22	0.2	3.0	u	1½°	235041	
4th October, 1968.								
TBL	iPZ	003139	0.5	1.0	d			Regional
TBL	iPZ iSZ	133106 20½	0.5	2.4	d	1¼°	133046	
TBL	ePZ	151632			d			Regional
TBL	ePZ	164036	0.2	1.5	d			Regional
5th October, 1968.								
TBL	ePZ iSZ	124918 47½				2½°	124839	
6th October, 1968.								
TBL	ePZ iSZ	030924 (46)			(u)	1¾°	030855	
TBL	ePZ iZ	154339 52½			u			
TBL	iPZ iSZ	203316 49	0.4	1.0	u	2¾°	203233	
7th October, 1968.								
Strong microseismic activity between 1703 - 1826 Hours G.M.T.								
TBL	ePZ iSZ	002637 58½		2.C	d	1¾°	002608	
TBL	ePZ iZ	192852½ 55½			u			Local
TBL	ePZ	210129½						Teleseism
8th October, 1968.								
TBL	iPZ iZ iSZ	095447 50 5505	0.3	3.0	(d)	1½°	095423	
TBL	ePZ	153412			d			Regional
TBL	iPZ iSZ	165132 59			(u)	2¼°	165056	
TBL	iPZ iSZ	171921 46½			d	2¼°	171847	

9th October, 1968.

Nil recorded.

Rabaul Central Observatory,
1st November, 1968.

G.W. D'ADDARIO

VOLCANOLOGIST-IN-CHARGE

18 NOV 1968 1111

PEA NOV-68 No. 45

TERRITORY OF PAPUA AND NEW GUINEA
GEOLOGICAL AND VOLCANOLOGICAL BRANCH
VOLCANOLOGICAL SECTION

PRELIMINARY EARTHQUAKE ANALYSIS
RABAUL CENTRAL OBSERVATORY
1968

Rabaul	RAB	From: OCT. 29. 1968 To: NOV. 5. 1968
Rabaul Harbour Network	WAN SUL RAL TAV VUL	From: OCT. 29. 1968 To: NOV. 5. 1968
Keravat	KRT	From: OCT. 30. 1968 To: NOV. 4. 1968
Esa'Ala	ESA	From: OCT. 7. 1968 To: OCT. 21. 1968
Tabele	TBL	From: OCT. 10. 1968 To: OCT. 24. 1968
Agenahambo	AGE	From: OCT. 6. 1968 To: OCT. 26. 1968
Waris	WAA	Not operational
Ulamona	ULA	Not operational
Piva	PIV	Not operational
Cape Gloucester	LAG	Not operational

STATION PERSONNEL

RAB Central Observatory, Rabaul.

Volcanologist-in-Charge	G.W. D'Addario
Volcanologist	R.F. Heming
Seismologist	M. Mancini
Seismogram Readers	R.A. Page, L.M. Cartwright
Senior Technical Officer	N.O. Myers
Technical Officer	R.J. Conway
Volcanological Assistants	L. Topue, M. Gaiam, E. Ravian
Technical Assistants	P. Daimbari
Trainee Volcanological Assistants	B. Talai, M. Salaiau, C. Matupit
Clerk	J.A. Alcock

KRT Keravat Outstation.

Observer (part-time)	G.E. Chorick

TBL Tabele Observatory.

Observer	V. Kaita

ESA Esa'Ala Observatory.

Observer	F. Dira

AGE Agenahambo Outstation.

Observer (part-time)	B. Kirke

The Rabaul Preliminary Earthquake Analysis (PEA) is produced by the staff under the direction of the Volcanologist-in-Charge from whom additional information and photocopies of seismogram records from all stations may be obtained on request.

Please address all communications to:-

Volcanologist-in-Charge,
Central Observatory,
P.O. Box 386,
RABAUL.

SEISMOGRAPH STATIONS

STATION	CODE	SOUTH LATITUDE	EAST LONGITUDE	ELEV. (m)	FOUNDATION
NEW GUINEA					
Rabaul	RAB	04°11'28.6"	152°10'11.4"	183.5	Basalt Flow
Wanliss Street	WAN*	04°11'39.6"	152°10'32.5"	25.0	Basalt Flow
Sulphur Creek	SUL*	04°13'09.8"	152°10'33.3"	8.5	Unconsolidated volcanic ash
Rabaulanakaia	RAL*	04°13'13.0"	152°12'07.0"	91.0	Unconsolidated volcanic ash
Tavurvur	TAV*	04°13'52.18"	152°13'12.99"	27.0	Andesite Flow
Taviliu	VUL*	04°16'58.2"	152°08'44.6"	332.2	Unconsolidated volcanic ash
Keravat	KRT	04°21'10.5"	152°03'06"	20.0	Alluvium
Tabele	TBL	04°06'04.67"	145°00'41.37"	179.5	Basalt Flow
Waris	WAA	04°07'00"	145°06'00"	48.0	Lapilli Tuff
Piva	PIV	06°12'00"	155°03'30"	60.0	Alluvium
Cape Gloucester	LAG	04°27'20"	148°26'00"	24.0	Lapilli Tuff
Ulamona	ULA	04°59'24.0"	151°16'30.0"	17.0	Lapilli Tuff
PAPUA.					
Agenahambo	AGE	08°48'49"	148°05'56"	303.0	Unconsolidated volcanic ash
Esa'Ala	ESA	09°44'18.2"	150°48'50.7"	46.4	Granite Gneiss

* RABAUL HARBOUR NETWORK

STATION INSTRUMENTATION

STATION & INSTRUMENTS	COMP.	To.	Tg.	TRACE SPEED mm/min	APPROXIMATE RELATIVE MAGNIFICATION	APPROXIMATE DAMPING
NEW GUINEA.						
Rabaul Central Observatory RAB						
World-wide Standard	Z	1.0	0.74	60	12,500	Critical
	N.E	1.0	0.74	60	6,250	Critical
	Z/N/E/	15.0	100.0	15	750	Critical
Benioff VR 14.7Kg.	Zh	1.0	0.02	180+	4,000	Critical
+ Recording is triggered by the onset of any earthquake with pre-determined minimum amplitude. Recorder is stopped automatically by hour break pulse.						
Omori 15Kg	No	3.6	-	24	12	10.1 Air
Omori 15Kg	Eo	3.8	-	24	10	10.1 Air
Wood-Anderson Torsion	Na, Ea	0.8	-	60	2,800	Critical
Rabaul Harbour Network						
Readings from the Harbour Network are entered in the PEA only for large earthquakes, with impulsive and sharply defined onset of phases.						
WAN° Benioff VR 14.7Kg	Z	1.0	0.02	60	5,700	Critical
SUL° Benioff VR 14.7Kg	Z	1.0	0.02	60	1,425	Critical
RAL° Benioff VR 14.7Kg	Z	1.0	0.02	60	5,700	Critical
TAV° Benioff VR 14.7Kg	Z	1.0	0.02	60	11,400	Critical
VUL° Benioff VR 14.7Kg	Z	1.0	0.02	60	5,700	Critical

Station & Instruments	Comp	To	Tg	Trace Speed mm/min	Approximate Relative Magnification	Approximate Damping
Rabaul Harbour Network (continued)						
Benioff MC 50Kg	Z	1.2	0.2	15	20% sensitivity	critical
Benioff MC 50Kg	N,E	1.2	0.2	15	10% sensitivity	critical
ULA Ulamona Field Station						
Willmore portable	Z	0.6	0.25	60	3000	underdamped
PIV Piva Field Station						
Willmore portable	Z	0.6	0.25	60	3000	underdamped
WAA Waris Field Station						
Willmore portable	Z	0.6	0.25	60	3000	underdamped
LAG Cape Gloucester						
Willmore portable	Z	0.6	0.25	60	3000	underdamped
TBL Tabele Observatory						
Benioff VR 107.5Kg	Z	1.0	0.2	60	1350	critical
(PAPUA)						
ESA Esa'Ala Observatory						
Benioff VR 107.5Kg	Z	1.0	0.2	15	36000	critical
Benioff VR 107.5Kg	N,E	1.0	0.2	15	18000	critical
Benioff VR 107.5Kg	Z/N/E/	1.0	60.0	30	50% sensitivity	critical
AGE Agenahambo Station						
Willmore portable	Z	0.6	0.25	60	3000	underdamped

o Signals from these stations are telemetered by land line to Helicorders (Geotech Mod. 2484) at the Central Observatory.

oo Signals from this station are telemetered via VHF to its Helicorder at the Central Observatory.

N.B. These field stations consist of a permanent building in which instruments are installed when necessary.

Details of emergency field stations within the Territory will be listed when in operation.

VR Variable Reluctance

MC Moving-coil

Relative magnification curves of seismograph systems installed in the stations controlled by the Rabaul Central Observatory are listed once a month in the PEA.

PRESENTATION OF DATA.

(reviewed in November, 1967)

All times are reduced to Greenwich Mean Time (GMT) which is 10 hours behind Eastern Standard Time.

At RAB and Harbour Network, the time signal is marked every minute on each seismogram record from the Observatory crystal chronometer. Second marks from radio signal VNG (Australia) are recorded on World Wide Standard System S.P.=N component only according to the W.W.S.S. programme, at six hour intervals. Primary time is provided by W.W.S.S. equipment and secondary time by a Labtronic crystal chronometer with the accuracy of ± 5ms per day compared with VNG (Aust.) with the aid of a chronoscope.

At TBL and AGE, the time signal is derived from a spring driven chronometer (Mercer) and marked each minute on records. Time accuracy is determined by comparison with signals from WWVH daily. Linear correction is applied to the daily drift.

On all seismogram records time increases from left to right and time break is upward.

At RAB* and Harbour Network the recording drum of each seismograph is driven by a 110VAC 60Hz synchronous motor. The 110VAC is frequency regulated by a crystal chronometer.

* The Omori recording drum is driven by a nonregulated 50Hz frequency supply.

At ESA and KRT power for recorder motors is frequency regulated by a crystal chronometer at 50Hz. Power for AGE and TBL and field stations is supplied by a 50Hz free running oscillator.

Direction of Motion.

Upward direction of ground motion corresponds to upward trace motion on vertical seismogram records. Direction of component of ground motion to North or East corresponds to upward trace motion on horizontal seismogram records.

Vertical trace motion from impulsive onset of longitudinal waves of compressional or dilational ground movement is indicated by "u" or "d" accompanied by N,S,E, or W as per trace motion amplitude on horizontal seismogram records, to represent vectorially the direction of ground motion. "+" or"-" indicates upward or downward motion of the ground respectively, from a wave not known to be of the longitudinal type.

Accuracy of Readings.

When readings are given with a decimal figure they are to 1/10 of a second. Other readings have been made to the nearest half second.

Crustal Phases.

Px Sx Crustal phases other than Pn and Sn for local and near earthquakes.

Felt Intensity.

Information on maximum intensities of shocks reported felt is included. Intensities are given in Roman numerals based on the Modified Mercalli Scale of 1931.

Determination of Epicentre.

Where no source is cited, the determination of epicentral distance and origin time for local and regional earthquakes is carried out at the Central Observatory, Rabaul, from the S-P travel times, assuming a normal depth of the focus.

Geographical Designation of Epicentre.

The regional names which follow the co-ordinates of epicentres located at the Central Observatory are meant only to supplement the co-ordinates and normally follow well known geographical rather than geological features. Use is made of the full degree blocks according to the method defined by E.A. Flinn and E.R. Engdahl in "A PROPOSED BASIS FOR GEOGRAPHICAL AND SEISMIC REGIONALIZATION", Seismic Data Laboratory Report No. 101, U.I.D. Inc., Alexandria, Virginia, 1964, adopted by the U.S.C.G.S. for computer requirements.

Magnitude Definition and Determination.

M_L - Local Magnitude (Richter, 1935) is calculated from the recorded trace amplitude of the Wood-Anderson torsion seismographs of stated physical constants (installed at the Observatory in November, 1967).

Maximum trace amplitude (0 to peak) expressed in millimetres and tenths is measured directly on both components. Magnitude is determined independently and the arithmetic mean taken. M_L values are given to the tenth of a unit.

The station correction factor is assumed to be zero until better known.

M_S - Surface Wave Magnitude (Gutemberg & Richter, 1956) is calculated from the amplitude of surface waves of period near 20 seconds for shallow distant earthquakes.

M_B - Body Wave Magnitude is calculated from the ratio of amplitude over period for body waves on S.P.-Z of World Wide Seismograph System only when depth is known. The magnification factor for the standard seismograph is taken into account.

m - Unified Magnitude (Gutemberg & Richter, 1956) has the following relation to M_L, M_S and M_B.

$$m = 1.7 + 0.8\ M_L - 0.01\ M^2_L$$

$$m = M_B \text{ (without correction)}$$

$$m = 2.5 + 0.63\ M_S$$

Local Magnitude of earthquakes recorded at RAB with clear S-P interval is tabulated on a Day-Distance (in Central Angle Degrees) graph which is added to the PEA monthly.

Symbols.

i - impulsive and sharply defined beginning of a phase.

e - emergent and poorly defined beginning of a phase.

T - Period in seconds.

A - Peak to Trough trace amplitude in millimetres.

GM- Ground motion.

Dist - Epicentral distance in central angle degrees.

H - Origin time.

h - Focal depth in kilometres.

CBM - Confused by microseisms.

TOTAL NUMBER OF EARTHQUAKES AS RECORDED AND CLASSIFIED AT EACH STATION FOR THE MONTH OF OCTOBER 1968

LOCAL -0 -.9°					NEAR 0.9° -9°					REGIONAL					DISTANT 9° - 45°					TELESEISM 45°- -					TRACES				
54	10	7	12	10	129	34	16	28	43	44					46					2					28				
22	22	4	6	7	63	21	7	24	64		19		8			20		4			1		1						

RAB	WAN	SUL	RAL	TAV
VUL	ESA	TBL	AGE	KRT

OBSERVATORIES

RABAUL CENTRAL (W.W.S.S.)- RAB.
ESA'ALA - ESA.
TABELE - TBL.

RABAUL OUTER NETWORK

KEREVAT - KRT.

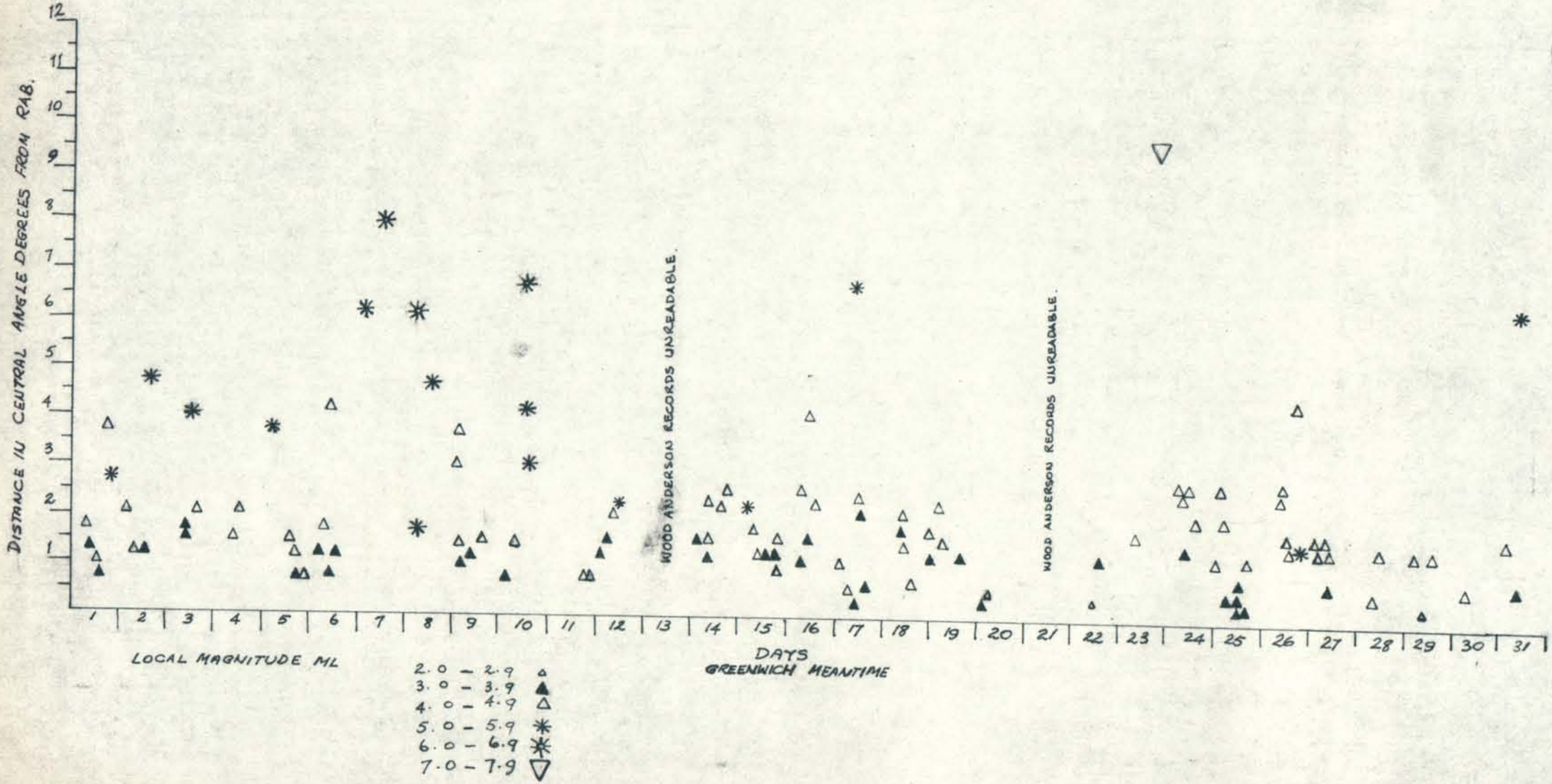
RABAUL INNER NETWORK

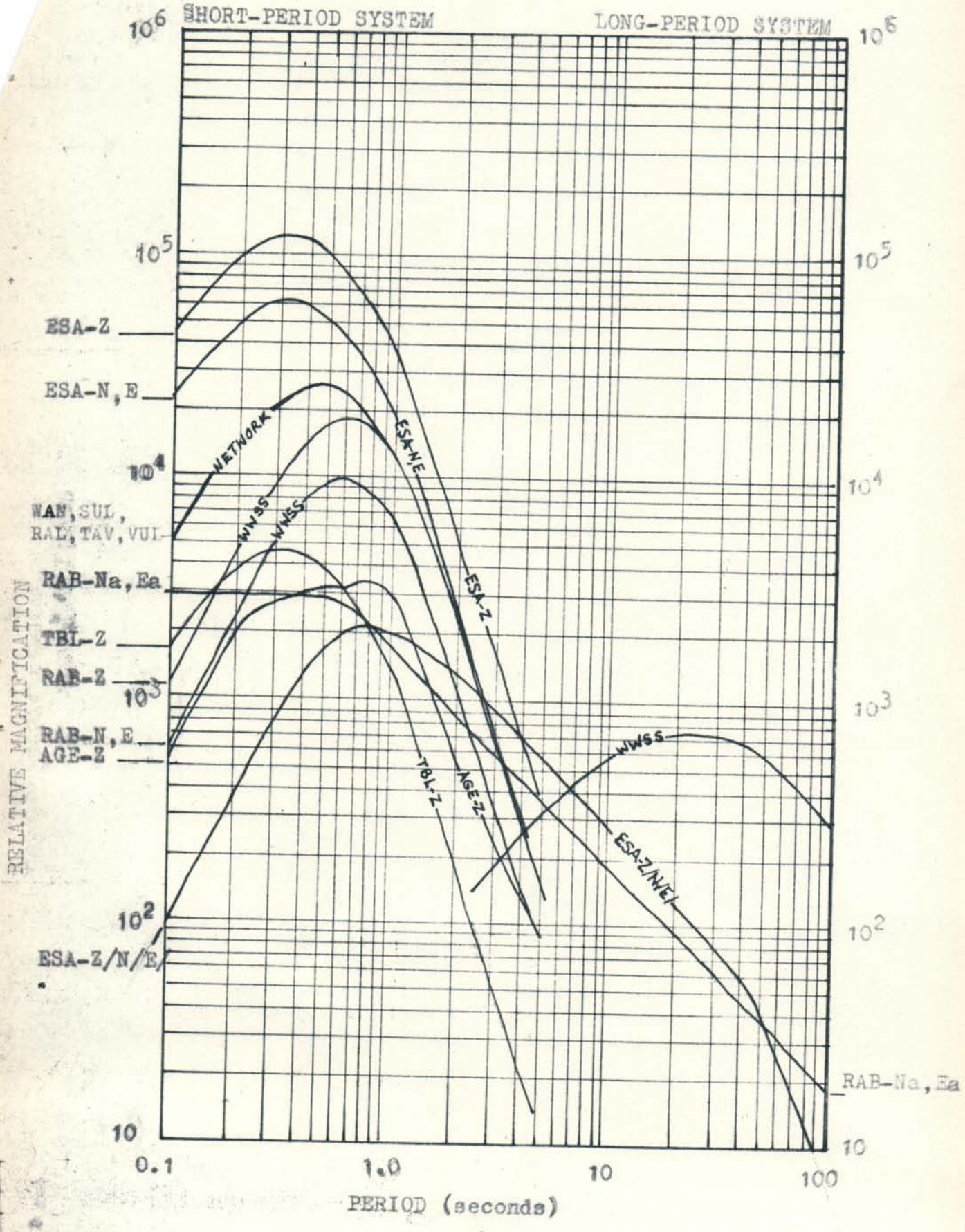
WANLISS STREET - WAN.
SULPHUR CREEK - SUL.
RABALANAKAIA - RAL.
TAVURVUR - TAV.
TAVILIU - VUL.

STATION

AGENAHAMBO - AGE.

MAGNITUDE OF REGIONAL EARTHQUAKES WITH A CLEAR S-P INTERVAL.
OCTOBER, 1968.





FREQUENCY RESPONSE CURVES OF THE INSTRUMENTS

GWDA Nov.67

			T sec	A mm	GM	Dist	H	Remarks
RABAUL.								
29th October, 1968.								
RAB	eSN/	223840						M_S=6.5
		LZ	20.0	55.0				Onset of shock lost whilst changing record.
		LN	20.0	34.0				
		LE	18.0	25.0				
WAN	ePZ	2831			d	80°		
RAB	iPZ	224527.4	0.6	3.4	d			Local
SUL	iPZ	26.7	0.3	3.0	d			
RAL	iPZ	26.1		3.3	u			
TAV	iPZ	26.0			u			
VUL	iPZ	27.7		4.5	u			
30th October, 1968.								
		RAL & TAV - No record from 2200 - 2242 hours due to equipment maintenance. WAN - No record from 2344 - 2301 hours due to equipment maintenance.						
RAB	ePZ	001256	0.5	1.5	d			Distant
RAB	iPZ	081911.0	0.3	9.0	d	¾°	081856	M_L=4.5
	iSN	22.0						
WAN	iPZ	10.9	0.2	24.7	d	¾°	081856	
	iSZ	22.0						
SUL	iPZ	11.0	0.3	15.5	d			
RAL	iPZ	10.5			d			
TAV	iPZ	10.1			d			
VUL	iPZ	09.9			d			
KRT	iPZ	10.1			d	½°	081859	
	iSE	18.4						
RAB	eZ/	095054			+			Traces
RAB	iPZ	154944.5	0.5	1.7	u			Epicentre in Escape Bay, Rabaul. N.E. New Britain Region.
SUL	iPZ	43.5	0.2	1.1	u			
RAL	iPZ	43.1		3.9	d			
TAV	iPZ	43.0			d			
VUL	iPZ	44.6	0.4	0.6	d			
RAB	iPZ	155042.4	0.6	1.6	u			Epicentre in Escape Bay, Rabaul. N.E. New Britain Region.
WAN	iPZ	42.0	0.2	0.6	u			
SUL	iPZ	41.4	0.1	1.2	d			
RAL	iPZ	41.2		3.3	d			
TAV	iPZ	40.8		3.6	d			
VUL	i(P)Z	(42.6)	0.5	2.0	u			

			T sec	A mm	GM	Dist	H	Remarks
31st October, 1968.								
RAB	iPZ	040403.0	0.7	3.4	d	1¾°	040333	M_L=4.0
	iSN	25.6						
TAV	iPZ	01.9	1.0	0.4	d			
VUL	iPZ	02.2	0.3	3.6	d	1½°	040337	
	iSZ	21.6						
RAB	iPZ	091210.0	0.9	2.9	u	6½°	091034	M_L=5.5 M_B=6.3
	iSE/	1324.0						
TAV	eiPZ	1211	0.8	2.6	u			
KRT	iPZ	10.5	1.0	4.2	d			
RAB	iPZ	094422.6	0.5	2.6	u	¾°	094408	M_L=3.1
	iSN	33.4						
RAL	iPZ	22.4	0.2	0.8	d	¾°	094410	
	iSZ	31.5						
TAV	iPZ	22.2		2.5	d	¾°	094410	
	iSZ	31.1						
VUL	iPZ	23.8	0.6	2.4	d	½°	094413	
	iSZ	31.7						
1st November, 1968.								
RAB	ePZ/	014219			u	53°	013325	
	eSZ/	4948						
RAB	EZ/	043712			-			Traces
RAB	ePZ/	132430		4.0	d	25°		
	eSE/	2846						
Strong microseismic activity from 312311 - 011445 hours.								
2nd November, 1968.								
Strong microseismic activity all day.								
RAB	iPZ	033826.6	0.3	4.0	u	(1°)	0338(08)	M_L=3.7
	e(S)N	(41)						
WAN	iPZ	26.0	0.2	4.0	u	1¼°	033805	
	iSZ	41.5						
SUL	iPZ	26.0	0.2	1.5	u	1¼°	033805	
	iSZ	41.8						
RAL	iPZ	25.8	0.2	2.0	u	1°	033807	
	iSZ	40.0						
TAV	iPZ	26.0	0.4	6.7	d	1°	033807	
	iSZ	40.4						
VUL	iPZ	26.0	0.3	6.6	d	1°	033807	
	iSZ	40.2						
KRT	iPZ	27.4			d	1¼°	033805	
	iSE	44.3						

			T sec	A mm	GM	Dist	H	Remarks
2nd November, 1968 - continued.								
RAB	iPZ	075251.0	0.3	4.5	u	½°	075240	
	eSN/	59						
WAN	iPZ	50.3	0.2	3.0	u	½°	075241	
	iSZ	57.6						
SUL	iPZ	50.2	0.2	5.0	u	½°	075241	
	iSZ	57.5						
RAL	iPZ	50.1	0.2	4.8	u	½°	075241	
	iSZ	57.2						
TAV	iPZ	50.0	0.2	4.0	u	½°	075240	
	iSZ	57.2						
VUL	iPZ	50.0	0.1	4.0	u	½°	075240	
	iSZ	56.8						
RAB	i(P)Z	0952(01.0)			d			Regional
WAN	iPZ	00.8	0.2	2.5	d			
SUL	iPZ	00.2	0.2	3.5	d			
RAL	iPZ	00.2	0.2	8.0	u			
TAV	iPZ	5159.8	0.2	2.0	d			
VUL	iPZ	59.0	0.2	8.4	d			
RAB	eZ/	105544			-			Traces
RAB	iPZ	131906.0	0.2	4.0	u			Local
WAN	iPZ	06.2	0.2	3.0	u			
SUL	iPZ	05.0		5.0	u			
RAL	iPZ	05.0	0.2	4.0	u			
TAV	iPZ	05.0	0.3	5.8	u			
VUL	iPZ	05.1	0.2	7.0	u			
RAB	iPZ	132122.9	0.2	4.0	u			Local
WAN	iPZ	23.3			u			
SUL	iPZ	22.0	0.2	3.0	u			
RAL	iPZ	22.2	0.2	6.0	u			
TAV	iPZ	22.0	0.2	3.0	u			
VUL	iPZ	22.0	0.2	4.0	u			
RAB	iPZ	165216.3	0.4	4.2	u			
WAN	i(P)Z	(16.5)	0.2	3.1	u	(¾°)	1652(01)	
	iSZ	27.0						
SUL	iPZ	16.5				¾°	165201	
	iSZ	27.0						
RAL	iPZ	16.8	0.1	3.0		½°	165205	
	iSZ	26.0						
TAV	iPZ	16.0			u	½°	165204	
	iSZ	25.0						
VUL	iPZ	17.0	0.2	1.0		¾°	165202	
	iSZ	28.0						

			T sec	A mm	GM	Dist	H	Remarks
2nd November, 1968 - continued.								
RAB	iPZ	174132.0			u	¾°	174118	M_L=4.2
	iSE/	42.0						
WAN	iPZ	32.0	0.2	15.0	u	½°	174121	
	iSZ	40.4						
SUL	iPZ	31.8	0.2	6.0	u	½°	174122	
	iSZ	39.0						
RAL	iPZ	31.4	0.2	20.8	u	¾°	174118	
	iSZ	41.5						
TAV	iPZ	31.2			u	¾°	174117	
	iSZ	40.7						
VUL	iPZ	32.8			u	(¾°)	1741(19)	
	i(S)Z	42.8						
KRT	iPZ	33.8			u	¾°	174119	
	iSE	45.2						
RAB	iPZ	213802.0	0.4	9.0	u	¾°	213748	M_L=3.8
	eSN/	12						
WAN	iPZ	02.0	0.3	7.0	d	½°	213751	
	iSZ	10.0						
SUL	iPZ	02.0	0.2	6.0	d	½°	213751	
	iSZ	10.0						
RAL	iPZ	01.8	0.3	9.0	d	(¾°)	2137(50)	
	i(S)Z	11.0						
TAV	iPZ	01.0	0.3	3.2	u			
VUL	iPZ	01.0			d			
KRT	iPZ	04.5	0.3	1.8	u	(¾°)	2137(49)	
	i(S)E	15.0						
3rd November, 1968.								
RAB	iPZ	031217.0	0.8	7.0	u	4¾°	031104	M_L=5.6 M_B=6.2
	iSN/	1313.0						
WAN	iPZ	1216.9	0.4	3.8	d			
SUL	iPZ	16.8	0.6	1.8	u			
RAL	iPZ	17.0	0.3		u			
TAV	iPZ	15.9			d			
VUL	iPZ	14.8	0.3	4.7	d			
KRT	iPZ	15.0	0.4	3.8	d			
RAB	iPZ	084121.0			d			
WAN	iPZ	20.6			d			
SUL	iPZ	20.3		17.2	d			
RAL	iPZ	20.2		22.8	u			
TAV	iPZ	20.5		22.0	d			
VUL	iPZ	21.5		1.9	u			

			T sec	A mm	GM	Dist	H	Remarks
3rd November, 1968 - continued.								
RAB	iPZ	085651.0	0.5	8.0	d			
SUL	iPZ	51.0			d			
RAL	iPZ	50.9			d			
TAV	iPZ	50.2			d			
VUL	iPZ	50.1		3.8	d			
KRT	iPZ	50.8	0.2	3.5	u	1°	085632	
	iSE	5705.2						
RAB	iPZ	142934.5	0.4	11.0	u	1¼°	142914	M_L=3.8
	iSE/	49.6						
WAN	iPZ	34.1	0.3	4.2	u	1¼°	142913	
	iSZ	50.0						
SUL	iPZ	34.2			u	1¼°	142914	
	iSZ	49.0						
RAL	iPZ	33.9	0.2		u	1°	142915	
	iSZ	47.4						
TAV	iPZ	33.3	0.3		d	1¼°	142912	
	iSZ	48.9						
VUL	iPZ	34.1		16.5	d			
KRT	iPZ	34.3	0.2	2.0	u	1¼°	142914	
	iSE	49.1						
RAB	iPZ	212601.8	0.4	7.0	u	¾°	212550	M_L=3.5
	iSE	11.2						
WAN	iPZ	01.3		3.0	u			
RAL	iPZ	01.9			u			
TAV	iPZ	02.0			u			
VUL	iPZ	01.9		6.0	u			
KRT	iPZ	01.9	0.4		u	¾°	212548	
	iSN	11.6						
RAB	ePZ/	233608			d	2¼°	233531	
	iSE/	36.0						

4th November, 1968.

LP Z Component record fogged.
Strong microseismic activity between 032236 - 040630 hours and between 041300 - 042223 hours.

RAB	iPZ	060643.0	1.0	7.0	d	1½°	060618	M_L=4.5 M_B=5.3
	eSE/	0702						
WAN	iPZ	0643.0	0.2	1.0	u	1½°	060618	
	iSZ	0701.5						
SUL	iPZ	0642.9	0.3		u	1½°	060619	
	iSZ	0701.0						
RAL	iPZ	0642.9			u	1½°	060619	
	iSZ	0701.0						
TAV	iPZ	0641.8			d	1½°	060617	
	iSZ	0700.9						
VUL	iPZ	0643.0			d	(1½°)	0606(19)	
	i(S)Z	0701.0						
KRT	iPZ	0643.1			d	1½°	060617	
	iSE	0703.2						

			T sec	A mm	GM	Dist	H	Remarks
4th November, 1968 - continued.								
RAB	ePZ	091150½	0.8	11.0	u	14°		
	iSE/	1424.5						
	eLrZ/	1916						
WAN	iPZ	1150.7	0.8	4.0	u			
SWL	iPZ	51.0	1.3		d			
RAL	iPZ	50.3	1.0	9.0	u			
TAV	iPZ	50.0	1.0	9.1	u			
VUL	iPZ	50.9	1.0	9.0	u			
RAB	iPZ	123104.0	0.3	8.0	u	½°	123053	
	iSN/	12.0						
WAN	iPZ	03.5	0.6	3.1	u			
SUL	iPZ	03.2	0.7	3.4	u			
RAL	iPZ	03.0	0.8	3.5	u			
TAV	iPZ	03.0	0.8	6.6	u			
VUL	iPZ	03.6			u			
KRT	iPZ	04.0			u			
RAB	iPZ	192653.0	0.6	2.0	d	1¾°	192625	M_L=5.2
	iZ	57.4						
	iSN/	2714.0						
RAL	iPZ	2652.4			u	1¾°	192623	
	iSZ	2713.9						
TAV	iPZ	2653.0			d	1¾°	192625	
	iSZ	2714.4						
VUL	iPZ	2653.9		5.8	u			
KRT	iPZ	54.8			u	2°	192623	
	iSE	2718.6						
RAB	iPZ	210026.0	0.9	4.0	d	4¾°	205914	M_L=4.6
	eSE/	0121						
RAL	iPZ	0026.0			u	4¾°	205916	
	iSZ	0120.0						
TAV	iPZ	0027.0			d	4¾°	205917	
	ePZ	0120½						
VUL	iPZ	0026.5			d	4¾°	205916	
	iSZ	0120.8						
RAB	ePZ	235257½	0.3	2.0	d			Regional

5th November, 1968.

Very strong microseismic activity between 042237 - 051230 hours.

Harbour Network - Power failure between 042351 - 050001

RAB	iPZ	031137.8	0.8	32.3	d	2°	031105	M_L=6.0
	iZ	40.0						
	iSEo	1203.0						
WAN	iPZ	1139.0		16.2	d			
SUL	iPZ	39.4		30.2	d			
RAL	iPZ	39.2			d			
TAV	iPZ	38.2			d			
VUL	iPZ	38.5	0.2	2.1	u			

			T sec	A mm	GM	Dist	H	Remarks
5th November, 1968 - continued.								
RAB	iPZ	032642.2	0.3	5.0	d	2°	032612	C.B.M.
	iSNa	2705.4						
WAN	iPZ	2641.2	0.5		u	2°	032611	
	iSZ	2704.6						
RAL	iPZ	2641.0	0.4	6.2	u	2°	032611	
	iSZ	2704.2						
TAV	iPZ	2639.2			u			
VUL	iPZ	40.7	0.3	17.0	d			
RAB	iPZ	143430.6	0.5	4.2	d	1½°	143407	M_L=3.8 C.B.M
	iSE	48.5						
WAN	iPZ	30.4	0.2	1.6	d	1½°	143407	
	iSZ	48.2						
RAL	iPZ	30.6	0.1	1.0	u			
TAV	iPZ	30.5		0.5	u			
VUL	iPZ	29.6		9.8	d	(1¼°)	1434(08)	
	i(S)Z	46.0						
RAB	iPZ	222129½	0.3	1.5	d			Distant

			T sec	A mm	GM	Dist	H	Remarks
ESA'ALA								
7th October - 21st October, 1968.								
7th October, 1968.								
ESA	ePZ eSN/	235214 5600			u	28°		
8th October, 1968.								
ESA	iPZ iSN/	044113 4203	0.5	3.0	u	4¼°	044008	
ESA	iPZ iSN/	075250 080126				61°		
		LZ LN	20.0 20.0	10.0 16.0				
ESA	ePZ	120608	0.3	3.4	u			Regional
ESA	iPZ	133320	0.2	2.4	u			Regional
ESA	ePZ/ iSN/	152757 2840			u	3¾°	152701	
9th October, 1968.								
ESA	ePZ	022955½	0.3	2.0	d			Regional
ESA	iPZ	024220½	0.2	2.0	d			Regional
ESA	ePZ/	034418½			d			Teleseism
ESA	ePZ/	171611½			d			Distant
10th October, 1968.								
ESA	iPZ/ i(S)N/	150535½ 0622½			d	(4°)	1504(34)	Felt Siassi Int. III 5.9°S 147.9°E
ESA	iPZ/ e(S)N/	161436½ 1521½			d	(3¾°)	1613(38)	
L P Records hard to read due to overlapping traces.								
11th October, 1968.								
ESA	iPZ/	092636			u			Local
ESA	ePZ/	123303			d			Regional
ESA	iPZ/	135832			u			Local
12th October, 1968.								
ESA	iPZ	012110	0.2	1.3	u			Regional
ESA	iPZ iSN/	192214 2641			d	25°		
13th October, 1968.- Nil recorded.								
14th October, 1968.								
ESA	iPZ e(S)N/	004625½ 4738	0.4	2.0	d	(6½°)	0044(51)	
ESA	iPZ	030510½	0.5	1.0	d			Felt West. Australia. Damage reported.

			T sec	A mm	GM	Dist	H	Remarks
ESA'ALA - continued.								
14th October, 1968 - continued.								
ESA	ePZ eSN/	055340 5612	0.5	1.0	d	29°		
ESA	iPZ	064135	0.5	1.0	d			Regional
ESA	iPZ	075300½	0.5	1.5	d			Regional
15th October, 1968.								
ESA	iPZ	002948	0.3	1.2	d			Regional
ESA	iPZ	021827	0.6	2.0	u			Distant
ESA	iPZ/	201420			d			Distant
ESA	ePZ/ iSN/	205911 58			u	4°	205810	
16th October, 1968.								
ESA	eZ/	075905			+			Traces
ESA	iPZ i(S)N/	122607 37	0.2	3.0	u	(2½°)	1225(28)	
ESA	ePZ	124458½			u			Regional
ESA	iPZ	140742	0.4	5.0	u			Regional
ESA	ePZ e(S)N/	155927 160009			d	(3½°)	1558(32)	
17th October, 1968.								
ESA	ePZ eSN/	050934 1052	0.5	1.0	d	6¾°	050753 Epicentre New Ireland Region 3.3°S 152.8°E	
ESA	eZ/	082010			+			Traces
ESA	eZ/	105727			-			Traces
ESA	iPZ/ iSN/	154037 4142			u	5¾°	153913 Epicentre East New Guinea Region 6.7°S 147.0°E	
ESA	ePZ/	210131			u			Distant
18th October, 1968.								
ESA	ePZ	025205	0.4	2.0	u			Distant
ESA	ePZ	060028	0.4	0.8	u			Distant
ESA	ePZ/ iSN/	171707 26			d	1½°	171642 Epicentre East New Guinea Region 8.5°S 150.9°E	
ESA	ePZ/ eSN/	172853 2009			d	1¼°	172832	
19th October, 1968.								
ESA	ePZ	002445	0.5	1.0	d			Regional
ESA	iPZ	020851	0.3	0.6	d			Near
ESA	eZ/	063355			-			Traces
ESA	eZ/	165709			-			Traces

			T sec	A mm	GM	Dist	H	Remarks
ESA'ALA - continued.								
20th October, 1968.								
ESA	ePZ	021141	0.4	1.0	u			Regional
ESA	ePZ/	071529			u			Distant
ESA	eZ/	123005			+			Traces
21st October, 1968.								
ESA	iPZ	220715	0.4	6.0	u	½°	220705	
	eSN/	22						

			T sec	A mm	GM	Dist	H	Remarks
AGENAHAMBO.								
6th October, - 26th October, 1968.								
6th October, 1968.								
AGE	ePZ	122848½			u	2¾°	122805	
	iSZ	2921½						
AGE	iPZ	144226	0.1	1.0	u	½°	144215	
	iSZ	33½						
7th October, 1968.								
AGE	iPZ	143626½			u	2½°	143546	
	iSZ	57½						
AGE	ePZ	192634½			d			Regional
8th October, 1968.								
AGE	iPZ	121344½	0.5	2.0	u	1¼°	121323	
	iSZ	1400½						
AGE	ePZ	153543			u	(2½°)	1535(04)	
	i(S)Z	36(13)						
AGE	ePZ	165452			d			Teleseism
9th October, 1968 - Nil recorded.								
10th October, 1968.								
AGE	iP!Z	150616			d			Felt Siassi Int III 5.9°S 147.9°E
AGE	iPZ	161516			d			Regional
11th October, 1968.								
AGE	ePZ	123416½			d	5°	123301	
	iSZ	3514½						
12th October, 1968.								
AGE	iPZ	012056½				(2¾°)	0120(13)	
	i(S)Z	21(29)						
AGE	ePZ	130652			u	4½°	130544	
	eSZ	0744						
AGE	ePZ	173756				3½°	173702	
	iSZ	3837						
AGE	ePZ	192345½	0.5	0.4	u			Distant
13th October, 1968.								
AGE	ePZ	135853			u	1¼°	135833	
	iSZ	5908						
14th October, 1968.								
AGE	iPZ	004704			u			Regional
AGE	ePZ	030604½			d			Felt West. Aust. Damage reported.
AGE	e(P)Z	1617(08)				(6¼°)	1615(35)	
	iSZ	1820						

			T sec	A mm	GM	Dist	H	Remarks
AGENAHAMBO - continued.								
15th October, 1968.								
AGE	iPZ	131157½		1.0	u	(5°)	1310(43)	
	iZ	1250½						
	i(S)Z	54½						
AGE	iPZ	200001½			u	2¼°	195926	
	iSZ	28½						
16th October, 1968.								
AGE	ePZ	155328½	0.3	2.0	u	4¼°	155226	
	iSZ	5416½						
AGE	iPZ	220015			d			Regional
17th October, 1968.								
AGE	ePZ	051044			d		Epicentre: 43 pp 10.	Refer PEA No.
AGE	iPZ	103501			u	2¾°	103419	
	iSZ	34						
AGE	iPZ	154106			u			Felt Lae Int. II-III 6.7°S 147.0°E
AGE	ePZ	190355			d	2¾°	190313	
	iSZ	0427						
18th October, 1968.								
AGE	ePZ	025255½			u			Distant
AGE	i(P)Z	0934(57½)			u			Local
AGE	iPZ	125148½	0.1	1.2	u	2¾°	125105	
	iSZ	5221½						
AGE	ePZ	170046½			u	3°	170001	
	iSZ	0121½						
AGE	ePZ	171824½			u	3¼°	171735	
	iSZ	1902½						
AGE	ePZ	183917½			d	5¼°	183758	
	iSZ	4018						
19th October, 1968.								
AGE	ePZ	140550½			d	(2½°)	1405(11)	
	i(S)Z	0620½						
AGE	iPZ	183113½	0.2	0.5	u	3°	183029	
	iSZ	47½						
AGE	ePZ	215216½			u	(2½°)	2151(38)	
	i(S)Z	45½						
20th October, 1968.								
AGE	ePZ	021206½				(1¼°)	0211(44)	
	i(S)Z	23½						
21st October, 1968.								
AGE	iPZ	065255			d			Regional
AGE	iPZ	201646			u	(½°)	2016(34)	
	i(S)Z	55						

			T sec	A mm	GM	Dist	H	Remarks
AGENAHAMBO - continued.								
22nd October, 1968.								
AGE	iPZ	015646½						Regional
AGE	ePZ	021332½			u	2¼°	021257	
	iSZ	59½						
AGE	ePZ	190847				(1¼°)	1908(24)	
	e(S)Z	0903½						
23rd October, 1968.								
AGE	ePZ	023627			d	(6½°)	0234(50)	
	e(S)Z	3742						
AGE	ePZ	210638			d			
24th October, 1968.								
AGE	ePZ	013637						Distant
AGE	iPZ	020423	0.3	1.0	d			Distant
AGE	ePZ	063234			d	2½°	063156	
	iSZ	3303						
AGE	ePZ	155642			d			Teleseism
AGE	ePZ	165825½			d			Distant
25th October, 1968 - Nil recorded.								
26th October, 1968.								
AGE	ePZ	060414	0.7	0.5	d	3½°	060322	
	iSZ	54½						

			T sec	A mm	GM	Dist	H	Remarks
TABELE.								
10th October - 24th October, 1968.								
10th October, 1968.								
TBL	iPZ eSZ	141540½ 1604	0.4	3.0	d	2°	141509	
TBL	ePZ	151334	0.5	3.0	u			Near
TBL	iPZ	154501	0.3	3.0	d			Near
TBL	iPZ eSZ	162241½ 2349	0.3	3.0	d	6°	162114	
11th October, 1968 - Nil recorded.								
12th October, 1968.								
TBL	iPZ	192113	0.5	2.0	d			Regional
13th October, 1968.								
TBL	ePZ eSZ	100857 0915	0.4	1.5	u	1½°	100833	
14th October, 1968.								
TBL	iPZ	005410½	0.4	3.0	d			Near
TBL	ePZ	031305½	0.5	1.0	d			Felt West. Australia Reported damage
TBL	ePZ	060301	0.5	1.0	u			Distant
TBL	iPZ iZ	101106 19	0.3	2.0	u			Near
15th October, 1968.								
TBL	iPZ eSZ	092323 47	0.5	1.5	d	2°	092251	
TBL	ePZ	201408	0.4	1.0	d			Distant
16th October, 1968.								
TBL	iPZ	210608½	0.3	3.0	d			
17th October, 1968.								
TBL	ePZ	051057½			d			Epicentre New Ireland Region. 152.8°E 3.3°S
TBL	ePZ iZ iSZ	154046 53 4149			d	4½°	153937	Felt Lae Int. III. Epicentre East New Guinea Region. 6.7°S 147.0°E
18th October, 1968.								
TBL	iPZ iSZ	140533½ 46½	0.4	7.0	d	1°	140516	
TBL	iPZ iSZ	161343½ 1401½	0.3	9.5	d	1½°	161320	
19th October, 1968 - Nil recorded.								

SEE BEFORE

			T sec	A mm	GM	Dist	H	Remarks
TABELE - continued.								
20th October, 1968.								
TBL	ePZ iZ	164819½ 27½			d			Regional
21st October, 1968.								
TBL	iPZ	064758½	0.3	25.0	u			Regional
22nd October, 1968 - Nil recorded.								
TBL								
23rd October, 1968.								
TBL	iPZ i(S)Z	023617 46	0.2	12.0	u	(2½°)	0235(39)	
TBL	ePnZ iPgZ	210611½ 13½			d			Refer PEA No.44 pp 2.
TBL	iPZ i(S)Z	213702 16	0.5	3.4	d	(1°)	2136(43)	In coda of preceeding shock
TBL	iPZ	220141	0.4	1.5	d			Regional
TBL	iPZ	223849	0.3	1.0	d			Regional
TBL	iPZ	232252			d			Regional
TBL	e(P)Z i(S)Z	2348(19) 45			d	(2¼°)	2347(45)	
24th October, 1968.								
TBL	ePZ	004809½			d			Distant
TBL	iPZ	014514½	0.3	1.0	d			Regional
TBL	iPZ iZ iSZ	020351½ 53½ 0424½	0.2	1.8	d	2¾°	020308	
TBL	ePZ iSZ	044554½ 4616½			u	1¾°	044525	
TBL	e(P)Z	0443(14½)			d			Regional
TBL	ePZ iSZ	063336½ 3427½	0.2	1.4	d	4½°	063230	

Rabaul Central Observatory,
8th November, 1968.

G.W. D'ADDARIO

VOLCANOLOGIST-IN-CHARGE.

25 NOV 1968

PEA NOV-68 No.46.

TERRITORY OF PAPUA AND NEW GUINEA
GEOLOGICAL AND VOLCANOLOGICAL BRANCH
VOLCANOLOGICAL SECTION

PRELIMINARY EARTHQUAKE ANALYSIS
RABAUL CENTRAL OBSERVATORY
1968

Rabaul	RAB	From: NOV. 6. 1968 To: NOV. 12. 1968
Rabaul Harbour Network	WAN SUL RAL TAV VUL	From: NOV. 6. 1968 To: NOV. 12. 1968
Keravat	KRT	From: NOV. - 5. 1968 To: NOV. 11. 1968
Esa'Ala	ESA	From: OCT. 22. 1968 To: OCT. 28. 1968
Tabele	TBL	From: To:
Agenahambo	AGE	From: To:
Waris	WAA	Not operational
Ulamona	ULA	Not operational
Piva	PIV	Not operational
Cape Gloucester	LAG	Not operational

STATION PERSONNEL

RAB Central Observatory, Rabaul.

Volcanologist-in-Charge	G.W. D'Addario
Volcanologist	R.F. Heming
Seismologist	M. Mancini
Seismogram Readers	R.A. Page, L.M. Cartwright
Senior Technical Officer	N.O. Myers
Technical Officer	R.J. Conway
Volcanological Assistants	L. Topue, M. Gaiam, E. Ravian
Technical Assistants	P. Daimbari
Trainee Volcanological Assistants	B. Talai, M. Salaiau, C. Matupit
Clerk	J.A. Alcock

KRT Keravat Outstation.

Observer (part-time)	G.E. Chorick

TBL Tabele Observatory.

Observer	V. Kaita

ESA Esa'Ala Observatory.

Observer	F. Dira

AGE Agenahambo Outstation.

Observer (part-time)	B. Kirke

The Rabaul Preliminary Earthquake Analysis (PEA) is produced by the staff under the direction of the Volcanologist-in-Charge from whom additional information and photocopies of seismogram records from all stations may be obtained on request.

Please address all communications to:-

Volcanologist-in-Charge,
Central Observatory,
P.O. Box 386,
RABAUL.

			T sec	A mm	GM	Dist	H	Remarks
KERAVAT.								
5th November, 1968.								
KRT	iPZ	031139.4		3.0	d			
KRT	iPZ	143428.6	0.2	4.8	d	1°	143410	
	iSE	43.0						
RABAUL.								
6th November, 1968.								
RAB	iPZ	003058.6	0.4	1.2	d	2½°	003019	
	iSE	3128.6						
RAL	iPZ	3055.5			d			
TAV	iPZ	55.5	0.2	1.0	d	2¼°	003019	
	iSZ	3123.3						
VUL	iPZ	3054.2			d			
RAB	ePZ	004851½	0.5	1.0	u	28°		
	eSN/	5328						
RAB	iPZ	171445.2	0.3	1.0	d	2°	171413	
	iSN	1509.0						
RAL	iPZ	1445.5			d			
TAV	iPZ	44.2	0.2	1.0	d			
VUL	iPZ	44.3			u			
KRT	iPZ	41.6	0.3	1.1	u			
RAB	eZ/	205828			+			Traces
RAB	ePZ	220536	0.8	1.4	d	5¾°	220412	M_B=5.4
	iSN	0641.1						
TAV	iPZ	0536.0	0.2	1.9	d			
VUL	iPZ	35.6	0.3	2.0	d			
RAB	iPZ	221454.0	0.4	1.2	u	5¼°	221337	M_B=5.3
	iSN	1553.2						
7th November, 1968.								
RAB	eZ/	010840			+			Traces
RAB	ePZ/	033954			d	7¾°	033800	
	eSE/	4122						
	MZ/	5450						
RAB	ePZ	040813½				1¼°	040751	M_L=4.6
	iSN	30.2						
WAN	iPZ	13.2	0.2	5.0	u	1¼°	040751	
	iSZ	30.0						
SUL	iPZ	13.8	0.3	2.6	d	1¼°	040751	
	iSZ	30.8						
RAL	iPZ	12.5	0.1	4.0	u	1¼°	040750	
	iSZ	29.0						
TAV	iPZ	12.8		11.8	u	1½°	040749	
	iSZ	31.0						
VUL	iPZ	13.8	0.3	31.0	u	1¼°	040752	
	iSZ	30.2						
KRT	iPZ	12.3	0.2	2.4	u	1¼°	040751	
	iSE	28.7						

			T sec	A mm	GM	Dist	H	Remarks
7th November, 1968 - continued.								
RAB	ePZ/ eSN	054940 5041			u	5¼°	054821	
RAB	ePZ iSNa	091637 57.0				1½°	091611	M_L=4.5
WAN	iPZ iSZ	37.2 57.0	0.3	4.2	d	1½°	091611	
SUL	iPZ iSZ	37.6 58.4	0.3	2.0	u	1¾°	091610	
RAL	eiPZ iZ iSZ	36½ 37.8 55.2	0.5	6.4	d	1½°	091611	
TAV	iPZ	36.9	0.3	26.0	d			
VUL	iPZ iSZ	37.8 56.5	0.5	7.0	d	1½°	091613	
KRT	iPZ iSE	37.8 57.7	0.4	1.8	d	1½°	091612	
RAB	eZ/	093354			+			Traces
RAB	eZ/	140404			+			Traces
RAB	ePZ	142036½						Distant
WAN	iPZ	37.0	1.0	2.6	d			
RAL	iPZ	37.1	1.0	2.2	d			
TAV	iPZ	37½	1.0	4.9	d			
VUL	iPZ	37.0	1.0	3.0	d			
KRT	iPZ	34.7	0.5	3.2	d			
RAB	eiPZ iSE	143826 44.2				1½°	143802	M_L=4.2
WAN	eiPZ iZ iSZ	26½ 26.4 43.4	0.3	6.4	u	1¼°	143804	
SUL	iPZ iSZ	26.6 43.3	0.5	5.8	d	1¼°	143804	
RAL	eiPZ iZ iSZ	25½ 26.1 42.9	0.5	4.4	u	1¼°	143803	
TAV	eiPZ iZ iSZ	25 26.0 42.2	0.3	43.2	u	1¼°	143802	
VUL	iPZ iSZ	25.8 41.3	0.3	28.8	u	1¼°	143804	
KRT	iPZ iSE	23.9 41.4	0.2	1.6	u	1¼°	143801	

			T sec	A mm	GM	Dist	H	Remarks
7th November, 1968 - continued.								
RAB	ePZ	173433				1¾°	173404	M_L=4.4
	iSN	55.0						
WAN	iPZ	33.2	0.2	1.0	u	1¾°	173405	
	iSZ	54.0						
RAL	iPZ	33.0	0.1	2.9	u	1½°	173407	
	iSZ	53.0						
TAV	iPZ	32.3	0.3	15.6	d	1¾°	173405	
	iSZ	53.0						
VUL	iPZ	33.0	0.3	9.9	d	1¾°	173404	
	iSZ	54.8						
KRT	iPZ	32.4	0.2	2.5	u	1¾°	173404	
	iSE	53.5						
RAB	ePZ	175609½						Regional
WAN	iPZ	09.4	0.5	3.5	d			
SUL	iPZ	09.7	0.4	2.0	d			
RAL	iPZ	09.6	0.5	2.4	d			
TAV	iPZ	10.0	0.5	4.0	d			
VUL	iPZ	08.4	0.4	7.0	d			
KRT	iPZ	04.7	0.4	5.4	d			
8th November, 1968.								
		TAV - SP Z recorder fault. No record from 0542 - 2203 hours.						
RAB	eZ/	022122			+			Traces
RAB	iPZ	025221.0	0.5	15.0	u			
WAN	iPZ	20.6	0.2	6.0	u			
SUL	iPZ	20.4	0.2	10.6	u			
RAL	iPZ	20.4		28.3	u			
TAV	iPZ	20.3			u			
VUL	iPZ	20.6	0.2	33.2	u			
KRT	iPZ	20.4	0.3		u	¼°	025212	
	iSE	26.1						
RAB	e(P)Z	0746(51)			u	(18°)		
	eSE/	5056						
RAB	i(P)Z	124830.5			u			Distant
RAB	eiPZ	125928	0.5	9.9	u	2°	125858	M_L=5.1
	iZ	30.0						
	iSE/	51.0						
	iE	130034.1						
WAN	iPZ	125928.0	0.3	11.2	u	2°	125858	
	iZ	30.0						
	iSZ	50.7						
SUL	eiPZ	28½	0.4	6.5	u	1¾°	125859	
	iZ	30.0						
	iSZ	50.3						
RAL	eiPZ	28		15.6	u	(1¾°)	1258(59)	
	iZ	30.0						
	i(S)Z	50.0						

			T sec	A mm	GM	Dist	H	Remarks
8th November, 1968 - continued.								
TAV	iPEw	125928.8	0.2	4.0	u			
VUL	iPZ	28.2	0.4	53.6	u	(2°)	1258(58)	
	iZ	29.7						
	i(S)Z	50.8						
KRT	ePZ	29½		3.6	u	1¾°	125900	
	iSE	51.1						
RAB	i(P)Z	1309(19.6)	0.5	1.6	d	(2°)	1308(48)	
	iSN	43.2						
RAB	eiPZ	140214	0.5	1.0	d			Regional
	iZ	14.8						
RAB	iPZ	151327.4	0.5	1.0	d	1¼°	151305	M_L=4.1
	iSE	44.5						
WAN	iPZ	28.2	0.2	1.5	d	(1¼°)	1513(07)	
	i(S)Z	43.8						
RAL	iPZ	28.5	0.1	1.6	d	1¼°	151308	
	iSZ	43.8						
TAV	iPEw	26.8	0.1	1.0	u	1¼°	151305	
	iSEw	43.0						
VUL	iPZ	26.3	0.4	1.6	u	1¼°	151305	
	iSZ	42.2						
KRT	iPZ	24.5	0.2	6.2	d	1°	151306	
	iS!E	38.9						
RAB	eZ/	152546			-			Traces
RAB	iPZ	165839.0	0.5	7.5	d	2°	165807	M_L=4.7
	iZ	40.0						
	iSE	5903.2						
WAN	eiPZ	5838½	0.3	5.4	d	2°	165805	
	iZ	39.1						
	iSZ	5903.0						
SUL	iPZ	5839.2	0.5	1.6		2°	165807	
	iSZ	5902.8						
RAL	eiPZ	5838	0.4	9.0	d			
	iZ	40.0						
TAV	iPEw	39.0	0.1	2.0	u			
VUL	iPZ	38.3	0.5	7.2	u			
	iZ	39.9						
KRT	ePZ	39½	0.5	5.4	u	2°	165809	
	iSE	5902.5						
RAB	eiPZ	171556	0.5	8.0	u	2°	171524	M_L=4.7
	iZ	57.5						
	iSE	1620.0						
WAN	eiPZ	1556	0.3	2.0		2°	171523	
	iZ	57.4						
	iSZ	1621.0						
SUL	eiPZ	1557	0.4	3.2	u	2°	171525	
	iZ	57.7						
	iSZ	1620.9						
RAL	eiPZ	1556	0.3	9.3	u	2¼°	171522	
	iZ	57.5						
	iSZ	1621.5						
TAV	iPEw	1556.0	0.2	1.0	u			

			T sec	A mm	GM	Dist	H	Remarks
8th November, 1968 - continued.								
VUL	iPZ	171556.0	0.5	5.0	u	2°	171524	
	iSZ	1619.8						
KRT	iPZ	1556.8	0.5	3.0	d	2°	171526	
	iSE	1619.5						
RAB	iPZ	172149.6	0.5	1.0	u	1¾°	172122	
	iSN	2210.3						
WAN	iPZ	2149.3			u	1¾°	172122	
	iSZ	2210.0						
VUL	iPZ	2148.0		1.8	u	1½°	172123	
	iSZ	2207.3						
KRT	ePZ	2149½			u	1½°	172126	
	iSE	2207.8						
RAB	iPZ	183302.0	0.4	1.6	u			Distant
RAB	eZ/	192407			+			Traces
9th November, 1968.								
RAB	eZ/	022405			-			Traces
RAB	e(P)Z	043720			u			Distant
RAB	iPZ	085147.1	0.4	6.0	u	¾°	085132	M_L=3.9
	iSN	58.4						
WAN	iPZ	47.1	0.3	4.6	u	¾°	085133	
	iSZ	57.9						
SUL	iPZ	47.1		2.3	u	¾°	085132	
	iSZ	58.2						
RAL	iPZ	46.6	0.1	5.0	u	¾°	085132	
	iSZ	57.8						
TAV	iPZ	46.5			u			
VUL	iPZ	48.0		0.5	d			
RAB	eZ/	140826			-			Traces
RAB	eZ/	175722			+			Traces
RAB	iPZ	192505.5	0.4	1.2	u	1¼°	192445	M_L=4.1
	iSE	20.0						
RAB	iPZ	203614.0	0.8	1.0	d	43°		M_S=7.3
	iSN/	4222.0						
	iSSE/	4338.0						
	e(Lq)E/	4644						
		LN	18.5	80.0				
		LE	20.0	264.0				
RAB	iPZ	215506.0	0.5	4.6	d	1°	215448	M_L=4.0
	iSE	19.0						
WAN	iPZ	05.8			d	¾°	215452	
	iSZ	16.2						
RAL	iPZ	05.0	0.6	0.6	d	¾°	215449	
	iSZ	16.0						
TAV	iPZ	05.0	0.4	4.0	d			
RAB	iPZ	224634.0	0.4	1.6	u	2¾°	224552	
	iSN	4706.2						

			T sec	A mm	GM	Dist	H	Remarks
10th November, 1968.								
		H..RBOUR NETWORK - No records from 1606 - 1837 hours due to power failure.						
RAB	iPZ	015609.0	0.5	1.5	u			Regional
RAB	eZ/	121336			-			Traces
RAB	iPZ iSN	160251.5 0306.0	0.3	3.0	u	1¼°	160231	M_L=3.4
WAN	iPZ	0251.2	0.1	0.2	d			
RAL	iPZ	51.4	0.2	0.4	u			
TAV	iPZ iSEw	50.6 0303.4	0.2	0.4	d	1°	160233	
KRT	iPZ iSN	0250.6 0303.2	0.2	2.3	u	1°	160233	
RAB	ePZ eSE/	164614 4827	0.8	1.2	d	12°		
RAB	ePZ eSE/	170921½ 1528	0.5	2.0	d	38½°		
11th November, 1968.								
RAB	ePZ	010203	0.5	1.6	u			Distant
RAB	iPZ iSN	045232.1 57.0	0.5	6.0	d	2°	045159	M_L=4.1
WAN	iPZ iSZ	32.1 57.0		4.0	d	2°	045159	
TAV	iPZ	32.8			d			
VUL	iPZ iSZ	30.8 56.0	0.2	1.0	d	2°	045158	
RAB	iPZ	050013.4	0.4	1.0	d			Regional
RAL	iPZ	13.6	0.6	0.4	d			
TAV	iPZ	13.6	0.4	1.0	d			
VUL	iPZ	13.2	0.4	2.8	u			
RAB	ePZ eSN	093818 4224	1.0	0.9	u	25°		
RAB	iPZ iSN	105457.3 5518.0	0.4	3.5	d	1¾°	105429	M_L=4.3
WAN	iPZ iSZ	5457.6 5517.3	0.2	2.0	u	1½°	105431	
RAL	iPZ iSZ	5458.0 5517.2			u	1½°	105433	
TAV	iPZ iSZ	5457.4 5516.0			u	1½°	105432	
VUL	iPZ iSZ	5456.6 5514.6	0.6	17.7	d	1½°	105433	
KRT	ePZ eSN	5455 5514½	0.4		u	1½°	105429	

			T sec	A mm	GM	Dist	H	Remarks
11th November, 1968 - continued.								
RAB	iPZ	115557.3	0.4	9.0	u	1¾°	115530	M_L=4.3
	iZ	57.6						
	iSN	5617.9						
WAN	iPZ	5557.2	0.2	1.3	u	1½°	115531	
	iSZ	5617.0						
SUL	iPZ	5557.0			u			
RAL	iPZ	57.0			u			
TAV	iPZ	57.3			d	1¾°	115530	
	iSZ	5618.0						
VUL	iPZ	5556.3			d			
KRT	ePZ	5555			d	1½°	115531	
	iSN	5613						
RAB	ePZ	144928½	1.0	1.6	d	48°		M_S=5.9
	iSN/	5605.0						
	iSSE/	5928.0						
	eZ/	150214						
		LZ	20.0	20.0				
		LN	19.0	22.0				
RAB	ePZ	154512½	1.0	1.7	u			Distant

HARBOUR NETWORK - No record from 0520 - 0523 hours due to maintenance of equipment.

12th November, 1968.								
RAB	iPZ	005135.6	0.6	1.8	d	42°		M_B=5.7
	iZ	36.7						
	iSN/	5733.0						
WAN	iPZ	5137.0	0.7	1.0	d			
RAL	iPZ	36.0	0.5	3.0	u			
TAV	iPZ	36.0	1.0	1.0	d			
VUL	iPZ	37.0	0.5	4.0	d			
KRT	iPZ	37.4	0.3	4.4	d			
RAB	iPZ	021712.5	0.5	3.0	u	1°	021656	M_L=3.9
	iSE	24.5						
TAV	iPZ	12.0			u			
VUL	iPZ	13.0	0.4	2.0	u	1°	021657	
	iSZ	24.5						
KRT	iPZ	13.8			d	1°	021658	
	iS!N	25.8						
RAB	iPZ	032014.2	0.4	3.0	d	1½°	031949	M_L=3.9
	iSE	33.0						
WAN	iPZ	15.5	0.2	2.5		1½°	031952	
	iSZ	33.0						
VUL	iPZ	13.3	0.3	4.0	u	1¼°	031951	
	iSZ	31.3						
KRT	i(P)Z	(12.1)			u	(1¼°)	0319(51)	
	iS!N	27.8						

			T sec	A mm	GM	Dist	H	Remarks
12th November, 1968 - continued.								
RAB	iPZ	050013.5	0.3	2.0	u	½°	050004	M_L=3.5
	iSN	20.0						
WAN	iPZ	13.0	0.2	1.0	u	½°	050003	
	iSZ	20.0						
RAL	iPZ	14.0			u	½°	050004	
	iSZ	21.3						
TAV	iPZ	13.8	0.3	1.0	u	¾°	050002	
	iSZ	22.4						
VUL	iPZ	14.5	0.3	2.0	u	¾°	050002	
	iSZ	23.0						
RAB	ePZ	090550	1.0	2.0	u	48°		M_B=5.1
	eSN/	1234						
RAB	ePZ	100115	1.0	2.0	u	43°		M_B=4.7
	eSE/	0726						
RAB	iPZ	114655.0	0.3	2.0	u	1¼°	114632	
	iSN	4712.0						
RAL	iPZ	4654.0			u	1¼°	114633	
	iSZ	4710.0						
TAV	iPZ	4654.0			d			
VUL	iPZ	55.0	0.3	1.3	u			
KRT	ePZ	56	0.2	3.0	d	1,.°	114631	
	iS!N	4715.0						
RAB	e(P)Z	1924(16½)	0.5	4.0	d	(5½°)	1922(56)	
	iZ	25.7						
	eSN/	2518						
TAV	iPZ	2414.0	0.3	1.5	u	5½°	192252	
	iSZ	2517.0						
VUL	iPZ	2413.5	0.2	1.2	u			
KRT	ePZ	18			u	5¼°	192300	
	iSN	2517.5						
RAB	iPZ	192649.3	0.4	1.5	u	3¾°	192551	
	iSE	2734.5						
RAB	ePZ	202840½	0.5	1.0	u	8¼°	202642	
	iZ	46.4						
	eSN/	3012						

			T sec	A mm	GM	Dist	H	Remarks
ESA'ALA.								
22nd October, 1968 - 28th October, 1968.								
22nd October, 1968.								
ESA	iPZ	015615	0.2	1.0	u			Regional
ESA	iPZ	021303	0.5	4.0	u			Regional
23rd October, 1968.								
ESA	ePZ iSN/	023559 3746	0.3	1.4	d	9½°	123341	
ESA	ePZ/ eSN/	210657½ 0819		10.0	u	7¼°	210511	
24th October, 1968.								
ESA	ePZ/ eSN/	004718 5204½	1.0	2.0	u	30°		
ESA	ePZ/ eSN/	020338 0649			u	11½°		
ESA	iPZ/ ePPZ/ eSN/ eSSN/	155606 5656 160057 0222			u	28°		
25th October, 1968.								
ESA	iPZ/	090919			u			Local
ESA	iPZ/	091244			d			Local
ESA	iPZ/	151820½			d			Local
26th October, 1968.								
ESA	iPZ/ iSN/	060304½ 43	0.9	3.0	d	3¼°	060213 Epicentre 7.7°S 150.5°E New Britain Region.	
ESA	iPZ/	152842			u			Local
ESA	iPZ/	153359			d			Local
ESA	iPZ/	224315			u			Local
27th October, 1968.								
ESA	iPZ	004819	0.2	7.8	u			Local
ESA	iPZ/	125257½			u			Regional
ESA	iPZ	125723½			u			Local
ESA	ePZ/	134712½			d			Regional
ESA	iPZ/	173316½			d			Local
28th October, 1968.								
ESA	iPZ/	053110			(d)			Local
ESA	ePZ/	071212	0.9	4.0	(u)			Local
ESA	iPZ/	104410			d			Local

Rabaul Central Observatory,
14th November, 1968.
G.W. D'ADDARIO - VOLCANOLOGIST-IN-CHARGE.

PEA NOV-68 No. 47.

TERRITORY OF PAPUA AND NEW GUINEA
GEOLOGICAL AND VOLCANOLOGICAL BRANCH
VOLCANOLOGICAL SECTION

PRELIMINARY EARTHQUAKE ANALYSIS
RABAUL CENTRAL OBSERVATORY
1968

Rabaul	RAB	From: NOV. 13. 1968 To: NOV. 19. 1968
Rabaul Harbour Network	WAN SUL RAL TAV VUL	From: NOV. 13. 1968 To: NOV. 19. 1968
Keravat	KRT	From: NOV. 13. 1968 To: NOV. 19. 1968
Esa'Ala	ESA	From: To:
Tabele	TBL	From: OCT. 24. 1968 To: NOV. 5. 1968
Agenahambo	AGE	From: OCT. 26. 1968 To: NOV. 8. 1968
Waris	WAA	Not operational
Ulamona	ULA	Not operational
Piva	PIV	Not operational
Cape Gloucester	LAG	Not operational

STATION PERSONNEL

RAB Central Observatory, Rabaul.

Volcanologist-in-Charge	G.W. D'Addario
Volcanologist	R.F. Heming
Seismologist	M. Mancini
Seismogram Readers	R.A. Page, L.M. Cartwright
Senior Technical Officer	N.O. Myers
Technical Officer	R.J. Conway
Volcanological Assistants	L. Topue, M. Gaiam, E. Ravian
Technical Assistants	P. Daimbari
Trainee Volcanological Assistants	B. Talai, M. Salaiau, C. Matupit
Clerk	J.A. Alcock

KRT Keravat Outstation.

Observer (part-time)	G.E. Chorick

TBL Tabele Observatory.

Observer	V. Kaita

ESA Esa'Ala Observatory.

Observer	F. Dira

AGE Agenahambo Outstation.

Observer (part-time)	B. Kirke

The Rabaul Preliminary Earthquake Analysis (PEA) is produced by the staff under the direction of the Volcanologist-in-Charge from whom additional information and photocopies of seismogram records from all stations may be obtained on request.

Please address all communications to:-

Volcanologist-in-Charge,
Central Observatory,
P.O. Box 386,
RABAUL.

RABAUL.

13th November, 1968.

W.W.S.S - The records from the Wood Anderson seismograph from 0024 - 2257 hours are not available for study.

			T sec	A mm	GM	Dist	H	Remarks
RAB	iPZ iSE	001316.0 54.0	0.5	3.0	u	3¼°	001226	M_L=4.8
RAB RAB	eZ/ iPZ iSE	051114 070424.6 50.0	0.4	3.0	+ d	2°	070352	Traces
RAB	iPZ iSE	140151.2 0231.5	0.2	1.8	d	3½°	140059	
WAN	iPZ iSZ	0151.8 0231.2	0.1	0.8	d	3¼°	140101	
SUL	iPZ	0151.8			d			
KRT	iPZ iS!E	48.6 0226.7	0.2	3.4	d	3¼°	140059	
RAB	iPZ iSE	142639.0 2701.0	0.4	1.8	d	1¾°	142610	
TAV	iPZ	2637.0	0.2	4.0	d			
VUL	iPZ iSZ	37.6 57.8	0.3	1.4	d	1½°	142611	
KRT	iPZ iSE	37.2 56.8	0.3	2.2	d	1½°	142611	
RAB	iPZ iSE	153011.4 31.0	0.5	2.6	d	1½°	152945	
WAN	iPZ iSZ	10.0 31.0	0.5	1.0	d	1¾°	152942	
SUL	iPZ iSZ	11.4 30.6			d	1½°	152946	
RAL	iPZ i(S)Z	11.0 30.0	0.6	0.8	d	(1½°)	1529(46)	
TAV	iPZ i(S)Z	10.2 28.0	0.3	3.0	d	(1½°)	1529(46)	
VUL	iPZ iSZ	10.4 30.6	0.5	3.8	u	1½°	152944	
KRT	iPZ iSE	10.7 29.3		2.0	d	1½°	152946	
RAB	iPZ iPcPZ/ iSN/ eSSN/ e(Lq)N/	185001.6 5104 5638 190042 0227	0.5	2.0	d	56°		
WAN	iPZ	185001.0			d			
TAV	iPZ	01.6	0.5	2.1	d			
VUL	iPZ	02.0			d			
KRT	ePZ	02			d			

		T sec	A mm	GM	Dist	H	Remarks

14th November, 1968.

W.W.S.S. - The records from the Wood Anderson seismograph are not available for study.

W.W.S.S. - S.P. Z record read from HBR. NETWORK WAN Z component from 1300 hours to 2237 hours.

W.W.S.S. & HBR. NETWORK - Switched to Secondary time from 2203 hours.

RAB	iPZ	070944.0	0.4	3.0	u	1¾°	070915	
	iSN	1005.6						
WAN	iPZ	0943.8		0.6	u	1¾°	070915	
	iSZ	1005.3						
VUL	iPZ	0942.8	0.3	4.5	u	1¾°	070915	
	iSZ	1003.5						
RAB	iPZ	092553.0	1.0	2.0	d	9¼°	092338	M_B=5.7
	e(S)N/	2738						
WAN	ePZ	2553	0.9	0.8	d			
RAL	ePZ	53½	1.0	0.8	u			
TAV	ePZ	54	0.8	1.0	u			
VUL	ePZ	53	1.0	1.6	d			
KRT	ePZ	52			u			
RAB	iPZ	114142.5	0.9	2.3	u			Distant
RAB	iPZ	121933.8	0.8	1.1	u	42°	121200	M_B=5.5
	eSN/	2530						
RAB	iSN	161308.5						
WAN	eiPZ	1225	0.3	1.7	d	3¾°	161128	
	iZ	26.0						
RAL	eiPZ	26	0.5	1.0	d			
	iZ	26.5						
TAV	eiPZ	25½	0.8	1.2	d			
	iZ	26.0						
VUL	iPZ	25.0	0.5	5.4	d			
	iZ	34.3						
KRT	iPZ	23.4	0.2	3.0	d	3¾°	161125	
	iSE	1308.0						
RAB	iSN	200232.0						
WAN	iPZ	13.6	0.2	2.0	u	1½°	200150	
	iSZ	31.6						
TAV	iPZ	13.6	0.4	2.6	d			
VUL	iPZ	12.2	0.4	1.9	d	1½°	200148	
	iSZ	30.0						
RAB	iSN	203322.0						
WAN	iPZ	00.2	0.2	1.6	u	1¾°	203231	
TAV	iPZ	00.1			u			
VUL	iPZ	3259.6	0.4	5.0	d	1¾°	203232	
	iSZ	3320.8						

			T sec	A mm	GM	Dist	H	Remarks
14th November, 1968 - continued.								
RAB	iSN	205159.5						
WAN	iPZ	42.0			d	1½°	205118	
	iSZ	59.6						
SUL	iPZ	42.0			d			
RAL	iPZ	42.0		2.0	d			
TAV	iPZ	42.0	0.4	3.6	d			
VUL	iPZ	41.3	0.3	9.8	d			
KRT	iPZ	40.0			u	1¼°	205120	
	iSE	54.7						
RAB	ePZ	231406			d	26°		M_S=5.0
	iPPZ/	46						
	eSN/	1834						
	LN		20.0	6.8				
15th November, 1968.								
		W.W.S.S. & HBR. NETWORK on Secondary time all day. KRT. records unreadable due to faulty developing.						
RAB	ePZ	033906	0.4	2.0	u	7°	033722	M_L=2.9 M_B=5.9
	iSN/	4026						
RAB	iPZ	063814.4	0.4	2.0	d	3¾°	063717	M_L=5.0
	iSN	58.6						
RAB	ePZ	071257½	0.4	2.0	u	4½°	071149	M_L=5.4
	iSN	1350.2						
RAB	ePZ	075430½	0.5	1.0	u	4½°	075324	M_L=5.2
	iSN	5521.5						
RAB	iPZ	075631.5	0.5	3.0	d	3½°	075537	M_L=5.8 M_B=6.1
	iSE	5713.5						
SUL	iPZ	5631.5			d			
RAL	iPZ	29.5		1.7	d			
TAV	ePZ	30			d	3½°	075535	
	eSEw	5712						
VUL	iPZ	5630.0	0.4	4.0	u			
RAB	iPZ	080032	0.4	1.0	d	4¼°	075929	In coda of pre eeding shock Regional
	iSE	0120.0						
RAB	ePZ	193558.5	0.5	2.0	u			
16th November, 1968.								
		W.W.S.S. & HBR. NETWORK on Secondary time all day.						
RAB	iPZ	002814.7	0.7	1.8	d	17°		M_B=4.7
	eSE/	3118						
RAB	ePZ	013944½	0.3	2.0	u	3¾°	013846	M_L=5.1
	iSN	4029.5						
WAN	iPZ	3946.0	0.3	2.2	d			
SUL	iPZ	44.0	0.3	1.0	u			
VUL	iPZ	44.8	0.5	2.5	d			
KRT	iPZ	42.8	0.2	3.0	d			
RAB	eZ/	035442			+			Traces

			T sec	A mm	GM	Dist	H	Remarks
16th November, 1968 - continued.								
RAB	ePZ eSN/	075121½ 5558	1.0	1.0	u	29°		M_S=6.0
		LZ	18.0	48.0				
		LE	21.0	158.0				
RAB	iPZ iSN	094436.6 4511.2	0.4	5.2	u	3°	094351	M_L=4.5
WAN	iPZ iSZ	4436.5 4510.0	0.2	1.4	d	3°	094352	
SUL	iPZ iSZ	4436.7 4510.4	0.2	1.0	u	3°	094352	
RAL	iPZ iSZ	4436.0 4510.0			d	3°	094351	
TAV	iPZ iSZ	4435.5 4508.0	0.4	2.8	u	2¾°	094352	
VUL	iPZ iSZ	4436.4 4510.0	0.5	5.0	u	3°	094352	
RAB	ePZ iSE	121709 56.0	0.5	1.0	d	4°	121608	M_L=4.6 M_B=4.6
RAB	iPZ iSE	165312.0 28.0	0.6	36.2	d	1¼°	165251	M_L=4.3
WAN	iPZ iSZ	11.4 28.7	0.5	11.0	d	1¼°	165249	
SUL	iPZ	11.4	0.2	7.3	d			
RAL	iPZ iSZ	11.0 25.0	0.5	7.0	d	1°	165252	
TAV	iPZ	11.0			d			
VUL	iPZ eSZ	10.8 27	0.5	8.0	d	1¼°	165249	
KRT	iPZ eSE	10.5 27	0.2	10.2	d	1¼°	165248	
RAB	ePZ eSN/	181406½ 1834	0.7	1.4	u	28½°		M_B=4.9
RAB	iPZ eSN/	211708.5 1826	0.8	6.8	d	6¾°	211527	M_L=5.4 M_B=5.3
WAN	iPZ	1709.0	0.4	2.0	u			
TAV	iPZ	09.4	0.5	2.8	d			
VUL	iPZ	08.5	1.0	3.5	u			
KRT	ePZ	07½			u			
17th November, 1968.								
RAB	iPZ	003825.2	0.9	13.0	u			
WAN	iPZ	25.0	0.7	4.0	u			
RAL	iPZ	25.0	0.7	5.0	u			
TAV	iPZ	24.5	0.8	6.0	u			
KRT	iPZ	24.9			u			

			T sec	A mm	GM	Dist	H	Remarks
17th November, 1968 - continued.								
W.W.S.S. & HBR. NETWORK on Secondary time all day.								
RAB	iPZ	052402.0	0.4	3.2	d	22½°		M_S=5.4 M_B=5.5
	eSE/	2808						
		LZ	19.0	30.0				
		LN	18.0	22.0				
		LE	19.0	24.0				
WAN	iPZ	2402.0			d			
RAL	iPZ	02.2			d			
TAV	iPZ	02.5	0.5	2.0	d			
VUL	iPZ	02.2	0.5	1.5	d			
RAB	ePZ	080138			d	55°		M_S=5.8
	eSE/	0914						
		LZ	20.0	22.5				
		LN	20.0	16.0				
		LE	20.0	9.0				
RAB	ePZ	131202	0.5	2.0	u	25½°		M_B=5.7
	eSE/	1636						
RAB	eZ/	235544			-			Traces
18th November, 1968.								
W.W.S.S. & HBR. NETWORK on Secondary time all day.								
KRT - Records not available. Will be included in PEA NOV-68 No. 48.								
RAB	iPZ	024312.8	0.3	2.0	d	5½°	024151	M_L=6.3 M_B=5.6
	iP*	20.8						Felt Kieta Int.
	iSN/	4416.0						IV. 6.2° S 155.6° E
	iLrZ/	34						
WAN	iPZ	4312.2	0.3	1.8	u	5½°	024152	
	iSZ	4414.2						
SUL	e(P)Z	43(10½)			d	(5¼°)	0241(52)	
	iSZ	4410.5						
RAL	ePZ	4310½	0.7	1.5	u	5½°	024150	
	iSZ	4412.5						
TAV	iPZ	4310.0			d			
VUL	iPZ	09.8	0.5	3.4	u	5¼°	024153	
	iP*	16.0						
	iSZ	4409.0						
RAL - Harmonic tremor from 0645 to 0700 hours T=0.16 A=6.0								
RAB	iPZ	214319.4	0.3	3.0	d	4½°	214213	M_L=5.8 M_B=5.4
	iSE/	4410						
WAN	iPZ	4318.8	0.5	1.2	d			
	iZ	24.8						
SUL	iPZ	19.7	0.3	1.8	u			
RAL	iPZ	17.4	0.5	2.0	d			
TAV	iPZ	16.4	0.2	1.2	u			
VUL	iPZ	14.6	0.5	2.5	u			
	iZ	20.0						

			T sec	A mm	GM	Dist	H	Remarks
18th November, 1968 - continued.								
RAB	iPZ	215113.5	0.5	3.6	d	6¾°	214934	M_L=5.8 C.B.M.
	iSN/	5230						
RAB	iPZ	233916.9	0.8	22.0	d	1°	233858	M_L=4.2
	iSN	31.2						
WAN	iPZ	16.8		8.0	d			
SUL	iPZ	16.9		7.0	u	1°	233858	
	eSZ	31						
RAL	iPZ	16.4		4.0	d			
TAV	iPZ	16.1			d	1¼°	233856	
	iSE	31.0						
VUL	iPZ	16.0	0.5	21.0	d	1°	233857	
	iSZ	30.0						
KRT	iPZ	16.0				1°	233857	
	iSE	30.4						
19th November, 1968.								
W.W.S.S. & HBR. NETWORK on Secondary time all day.								
W.W.S.S. & HBR. NETWORK - No record from 2306 - 0338 hours due to maintenance of equipment.								
HBR. NETWORK - No record from 0430 - 0450 hours due to maintenance of equipment.								
RAB	ePZ/	094314			u	5½°	094151	
	eSE/	4418						
RAB	iPZ	152826.1	0.4	3.0	u			Regional
RAL	iPZ	26.2	0.4	3.0	u			
TAV	iPZ	26.3	0.3	13.4	u			
VUL	iPZ	28.0	0.5	10.6	d			
KRT	iPZ	29.6	0.2	3.0	u			
RAB	iPZ	153654.2			u			
SUL	iPZ	54.6	0.3	4.7	u			
RAL	iPZ	54.5			u			
TAV	iPZ	54.2			u			
VUL	iPZ	56.0						
KRT	iPZ	57.5			u	¾°	153645	
	iSE	3706.9						

			T sec	A mm	GM	Dist	H	Remarks
TABELE.								
24th October - 5th November, 1968.								
24th October, 1968.								
TBL	ePZ	155654			d			Distant
TBL	ePZ	210055			d			Distant
25th October, 1968 - Nil recorded.								
26th October, 1968.								
TBL	ePZ	172211½	0.4	1.7	d			
27th October, 1968.								
TBL	iPZ	160456	0.5	5.8	u	2°	160424	
	iSZ	0520						
28th October, 1968.								
TBL	ePZ	022935						Distant
TBL	ePZ	233728			d			Distant
29th October, 1968 - Nil recorded.								
30th October, 1968.								
TBL	iPZ	085741	0.5	4.0	d	2°	085708	
	iSZ	5806						
TBL	iPZ	212020	0.4	5.8	u			Local
31st October, 1968.								
TBL	ePZ	091152				1½°	091128	
	iSZ	1210						
1st November, 1968.								
TBL	e(P)Z	1323(20½)						Distant
TBL	iPZ	214642½	0.5	4.0	d	½°	214632	
	iSZ	50½						
2nd November, 1968.								
TBL	iPZ	083001	0.4	9.2	d			Local
TBL	ePZ	084044			d	2¼°	084008	
	iZ	57						
	iSZ	4111						
3rd November, 1968.								
TBL	ePZ	160534½	0.2	1.8	d			Regional
TBL	iPZ	233338½	0.2	2.0	d			Regional
4th November, 1968.								
TBL	ePZ	091252						Regional
TBL	ePZ	165401	0.2	5.8	d	1°	165342	
	i(S)Z	15						
5th November, 1968.								
TBL	ePZ	222018½	0.2	3.0	u	1¼°	221956	
	iSZ	35½						

			T sec	A mm	GM	Dist	H	Remarks
AGENAHAMBO.								
26th October, 1968 - 8th November, 1968.								
26th October, 1968.								
AGE	ePZ	201148½			d	2½°	201110	
	iSZ	1217						
27th October, 1968.								
AGE	iPZ	001017½	0.2	1.0	u	1¼°	000956	
	iSZ	33½						
AGE	ePZ	160458½			d			Regional
28th October, 1968.								
AGE	ePZ	021340			d	(2½°)	0213(01)	
	i(S)Z	1410						
AGE	ePZ	135227	0.3	1.5	u			Regional
AGE	ePZ	234341			u			Distant
29th October, 1968.								
AGE	ePZ	162159½	0.2	0.6	(d)	(3¼°)	1621(11)	
	i(S)Z	22(36½)						
AGE	iPZ	112646½	0.1	1.0	d	3½°	112554	
	iSZ	2726½						
AGE	ePZ	184216			d	2¾°	184134	
	iSZ	47½						
30th October, 1968 - Nil recorded.								
31st October, 1968.								
AGE	ePZ	091147½			u			Regional
1st November, 1968.								
AGE	iPZ	050135			(u)			Local
2nd November, 1968								
AGE	iPZ	114306	0.4	2.0	d	2°	114234	
	iSZ	29½						
3rd November, 1968.								
AGE	ePZ	023747			d	2¼°	023711	
	iSZ	3813½						
AGE	ePZ	031257			d	(2¾°)	0312(14)	
	i(S)Z	1329½						
AGE	ePZ	160621½			u	4½°	160513	
	iSZ	0714						
AGE	iPZ	215524½			(d)	2°	215453	
	iSZ	48½						
AGE	ePZ	220424½			u			Local C.B.M

			T sec	A mm	GM	Dist	H	Remarks
AGENAHAMBO - continued.								
4th November, 1968.								
AGE	iPZ iSZ	013229 48½	0.2	1.8	d	1½°	013203	
AGE	ePZ	091212	0.2	1.0	u			Regional
AGE	ePZ iSZ	123210 3319			d	6°	123041	
AGE	ePZ iSZ	192756½ 2916			d	7°	192613	
5th November, 1968.								
AGE	ePZ i(S)Z	031242½ 1348			u	(5¾°)	0311(17)	
6th & 7th November, 1968 - Nil recorded.								
8th November, 1968.								
AGE	iPZ iSZ	015559½ 5606			u	½°	015550	
AGE	ePZ	124701			d			Teleseism
AGE	ePZ iSZ	130121 28½			d	½°	130110	

Rabaul Central Observatory,

22nd November, 1968.

G.W. D'ADDARIO

VOLCANOLOGIST-IN-CHARGE.

PEA NOV-68 No. 48

TERRITORY OF PAPUA AND NEW GUINEA
GEOLOGICAL AND VOLCANOLOGICAL BRANCH
VOLCANOLOGICAL SECTION

PRELIMINARY EARTHQUAKE ANALYSIS
RABAUL CENTRAL OBSERVATORY
1968

Rabaul	RAB	From: 20th. Nov. 1968 To: 26th. Nov. 1968
Rabaul Harbour Network	WAN SUL RAL TAV VUL	From: 20th. Nov. 1968 To: 26th. Nov. 1968
Keravat	KRT	From: 20th. Nov. 1968 To: 25th. Nov. 1968
Esa'Ala	ESA	From: 5th. Nov. 1968 To: 11th. Nov. 1968
Tabele	TBL	From: To:
Agenahambo	AGE	From: 9th. Nov. 1968 To: 22nd. Nov. 1968
Waris	WAA	Not operational
Ulamona	ULA	Not operational
Piva	PIV	Not operational
Cape Gloucester	LAG	Not operational

STATION PERSONNEL

RAB Central Observatory, Rabaul.

Volcanologist-in-Charge	G.W. D'Addario
Volcanologist	R.F. Heming
Seismologist	M. Mancini
Seismogram Readers	R.A. Page, L.M. Cartwright
Senior Technical Officer	N.O. Myers
Technical Officer	R.J. Conway
Volcanological Assistants	L. Topue, M. Gaiam, E. Ravian
Technical Assistants	P. Daimbari
Trainee Volcanological Assistants	B. Talai, M. Salaiau, C. Matupit
Clerk	J.A. Alcock

KRT Keravat Outstation.

Observer (part-time)	G.E. Chorick

TBL Tabele Observatory.

Observer	V. Kaita

ESA Esa'Ala Observatory.

Observer	F. Dira

AGE Agenahambo Outstation.

Observer (part-time)	B. Kirke

The Rabaul Preliminary Earthquake Analysis (PEA) is produced by the staff under the direction of the Volcanologist-in-Charge from whom additional information and photocopies of seismogram records from all stations may be obtained on request.

Please address all communications to:-

Volcanologist-in-Charge,
Central Observatory,
P.O. Box 386,
RABAUL.

			T sec	A mm	GM	Dist	H	Remarks
RABAUL. W.W.S.S. & HBR. NETWORK on Secondary time until further notice.								
19th November, 1968.								
RAB	iPZ	234203.3	0.4	3.2	d	2°	234133	M_L=4.5
	iSN	26.1						
20th November, 1968.								
RAB	e(P)Z/	024226						Distant
RAB	iPZ	102247.2	0.5	2.6	u	2¾°	102205	M_L=4.7
	iSN	2319.1						
WAN	iPZ	2247.4			u	2¾°	102205	
	iSZ	2319.4						
TAV	iPZ	2247.6	0.2	2.0	u	2½°	102208	
	iSE w	2317.5						
VUL	iPZ	2247.3	0.5	1.6	u			
KRT	iPZ	48.2	0.3	2.5	u			
RAB	eiPZ	122030½	0.4	2.2	u	4¼°	121927	M_L=5.1
	iZ	31.1						
	iSN	2119.4						
TAV	iPZ	2030.0	0.4	1.4	d	4¼°	121927	
	iSEw	2118.0						
VUL	iPZ	2030.5	0.5	1.0	d			
KRT	iPZ	30.8	0.3	1.4	d			
RAB	iPZ	134722.9	0.3	2.6	d	1½°	134656	M_L=4.2
	iSE	43.1						
WAN	iPZ	22.6	0.2	3.6	u	1¾°	134655	
	iSZ	43.2						
SUL	iPZ	23.0	0.4	1.9	u	1½°	134657	
	iSZ	43.0						
RAL	iPZ	22.8	0.2	1.8	u			
TAV	iPZ	23.6	0.2	3.0	d	1¾°	134656	
	iSEw	44.2						
VUL	iPZ	21.8	0.5	8.0	d	1½°	134655	
	iSZ	41.4						
KRT	iPZ	20.2	0.2	3.6	u	1½°	134656	
	iSE	38.0						
RAB	e(P)Z	2333(18)			u	(1°)	2333(00)	
	iSN	31.4						
21st November, 1968.								
RAB	ePZ/	035450			u			Teleseism
RAB	iPZ	092136.4	0.4	5.0	u	1°	092118	M_L=3.8
	iSN	50.4						
WAN	iPZ	35.6	0.4	0.4	u	1°	092117	
	iSZ	49.8						
SUL	iPZ	36.0			u			
RAL	iPZ	35.8	0.3	1.2	u	1°	092118	
	iSZ	49.0						
TAV	iPZ	35.4			u	1°	092117	
	iSEw	49.0						

			T sec	A mm	GM	Dist	H	Remarks
21st November, 1968.- continued.								
VUL	iPZ	092137.2	0.6	1.2	u	1¼°	092117	
	iSZ	51.8						
KRT	e(P)Z	39			u	1¼°	092119	
	iSE	54.2						
RAB	iPZ	115222.0	0.5	2.0	d			Regional
RAB	iPZ	143654.0	0.5	1.2	u			Regional
VUL	iPZ	54.2		1.8	d			
KRT	iPZ	53.3	0.3	2.0	d			
RAB	iPZ	174326.5	0.5	3.5	u	1½°	174300	M_L=4.0
	iSE	46.5						
WAN	iPZ	26.6			d	1½°	174300	
	iSZ	46.2						
SUL	iPZ	27.0	0.4	1.0	u			
RAL	iPZ	26.6			d	1½°	174301	
	eSZ	45½						
TAV	iPZ	26.0	0.2	1.2	u	1½°	174300	
	iSZ	46.0						
VUL	iPZ	25.2	0.4	0.8	d	1½°	174300	
	iZ	25.6						
	iSZ	44.0						
KRT	iPZ	23.5			d	1½°	174300	
	iSE	41.0						
RAB	iPZ	195743.3	0.3	2.0	d	¾°	195730	M_L=3.4
	iSN	53.6						
WAN	iPZ	43.0			u	¾°	195728	
	iSZ	53.6						
RAL	iPZ	43.0			u	¾°	195731	
	iSZ	52.2						
TAV	iPZ	42.6			d			
VUL	iPZ	43.8	0.3	2.4	u	¾°	195729	
	iSZ	55.2						
KRT	iPZ	44.8	0.2		u	1°	195729	
	iSE	57.1						
RAB	iPZ	210017.0	0.4	16.5	d	1¾°	205949	
	iSE	37.5						
WAN	iPZ	16.8	0.2	6.8	u	1½°	205950	
	iSZ	37.0						
SUL	iPZ	17.2	0.2	2.0	u	1½°	205952	
	iSZ	36.6						
RAL	iPZ	16.8			u	1½°	205950	
	iSZ	37.2						
TAV	iPZ	16.8		4.8	u	1¾°	205948	
	iSZ	39.0						
VUL	iPZ	16.0	0.3	9.0	d	1½°	205951	
	iSZ	35.2						
KRT	iPZ	14.4			d	1½°	205951	
	iSE	31.9						

			T sec	A mm	GM	Dist	H	Remarks
22nd November, 1968.								
RAB	iPZ	090623.0	1.0	4.1	u	37½°		M_B=5.9 M_S=6.4
	eSN/	1200						
	eLrN/	1636						
		LZ	21.0	126.0				
		LN	19.0	78.0				
		LE	22.0	90.0				
RAB	iPZ	103730.8	0.7	5.0	u	27½°		M_B=5.6
	iSE/N/	4202						
	eLqE/	4350						
TAV	iPZ	3729.0	0.5	2.1	u			
KRT	e(P)Z	(31)			u			
RAB	ePZ	114504½			u	36°		
	eSE/	5031						
	eLrZ/	5451						
RAB	iPZ	154957.9	1.0		u			Distant
KRT	iPZ	59.8						
RAB	iPZ	175312.8	0.8	38.6	u	3¾°	175214	M_L=4.9
	iSN	57.8						
SUL	iPZ	13.0	0.2	2.0	d			
KRT	iPZ	10.2	0.3	6.0	u	3¾°	175214	
	iSE	52.8						
RAB	ePZ	183829½			u			
RAB	ePZ	190215½		2.0	u			
KRT	ePZ	16	0.5	0.5	d			
RAB	iPZ	190339.0	0.4	3.0	d	1°	190320	M_L=3.5
	iSE/	53					In coda of preceding shock.	
RAB	iPZ	190534.4	1.0	14.0	u	1°	190518	M_L=3.5
	iSE/	46					In coda of preceding shock	
WAN	iPZ	34.8			d			
RAL	iPZ	34.8			d			
TAV	iPZ	34.3			d			
VUL	iPZ	35.2	0.3	6.0	u			
RAB	iPZ	193854.9	0.6	10.6	u	1°	193839	
	iSN	3906.8						
SUL	iPZ	3855.6			d			
VUL	iPZ	55.2	0.2		u			
KRT	iPZ	55.6	0.5		d	1°	193838	
	iSE	3908.3						
RAB	ePZ	204928½			d	2°	204855	
	iSN	53.8						
RAL	iPZ	28.4	0.6	2.8	u			
TAV	iPZ	27.8			d			
KRT	iPZ	29.3			u	2°	204858	
	iSE	52.9						

			T sec	A mm	GM	Dist	H	Remarks
22nd November, 1968 - continued.								
RAB	ePZ	210430						
WAN	iPZ	30.3	0.2		u			
VUL	iPZ	31.2			d			
KRT	iPZ	30.3	0.5	3.0	u	1°	210414	
	iSE	42.5						
RAB	ePZ	214834		19.0	u	2°	214801	M_L=4.6
	iSN	58.9						
RAB	iPZ	220430.2			d	1°	220413	M_L=3.5
	iSN	42.8						
23rd November, 1968.								
RAB	iPZ	012523.7	0.7	1.6	u	¾°	012509	M_L=3.1
	iSN	35.0						
RAB	eiPZ	024814½	0.5	1.8	d	1¼°	024752	M_L=3.6
	iSN	31.1						
RAL	eiPZ	14			d	1¼°	024753	
	iSZ	30.2						
TAV	iPZ	14.4			d	1¼°	024753	
	iSEw	30.0						
VUL	iPZ	16.5			d	1¼°	024754	
	iSZ	33.5						
RAB	ePZ	110911½	0.4	1.0	d	3°	110827	M_L=4.8
	iZ	16.3						
	iSN	45.5						
TAV	iPZ	12.0		2.8	u	2¾°	110829	
	iSEw	45.0						
VUL	iPZ	13.0	0.5	3.8	u	3°	110828	
	iZ	18.5						
	iSZ	47.4						
KRT	ePZ	14½			u			
RAB	ePZ	112805½	0.4	1.0	u			Regional
RAB	eZ/	162516			+			Traces
RAB	ePZ	180310½	0.4	1.2	u			Regional
SUL	iPZ	09.7			d			
RAL	iPZ	09.4		2.0	d			
TAV	iPZ	09.0	0.2	8.0	u			
VUL	iPZ	10.0			d			
RAB	ePZ	180830½	0.5	1.0	u			Regional
RAB	iPZ	210439.0	0.3	1.5	d	2¾°	210356	M_L=4.6
	iSN	0511.5						
WAN	ePZ	0439	0.3	1.0	u	2¾°	210357	
	eSZ	0511						
TAV	ePZ	0440½	0.4		u	2¾°	210357	
	eSEw	0513						
VUL	ePZ	0438½	0.2	3.0	d	2½°	210358	
	iSZ	0509.0						

			T sec	A mm	GM	Dist	H	Remarks
24th November, 1968.								
RAB	iPZ	122437.7	0.4	3.2	u	1°	122421	M_L=3.8
	eSN/	50						
WAN	iPZ	37.2	0.2	1.4	u	1°	122420	
	iSZ	49.7						
TAV	iPZ	38.0			u	1°	122422	
	iSEw	50.0						
VUL	iPZ	38.6	0.5	2.0	u	(1°)	1224(22)	
	i(S)Z	51.0						
KRT	iPZ	38.0	0.3	2.8	u	¾°	122423	
	iSE	49.4						
RAB	ePZ	171017			d			Distant
RAL	iPZ	18.0	1.0	0.7	d			
TAV	iPZ	16.4	0.4	0.6	d			
VUL	iPZ	18.6	0.4	1.4	d			
KRT	ePZ	18½			d			
RAB	ePZ	185724	1.0	2.0	d	8¾°	185516	M_L=5.8 M_B=5.3
	eSN/	5903						
WAN	ePZ	5724	1.0	0.7	u			
TAV	iPZ	22.8	0.2	1.3	u	8¾°	185516	
	iSEw	5901.0						
VUL	ePZ	5722½			d			
KRT	ePZ	23			u			
RAB	ePZ	202956½			d			Distant
RAB	ePZ	211626				60°		M_S=5.4
	iSN/	2412.0						
		LZ	18.0	36.0				
		LN	18.0	46.0				
		LE	18.0	36.0				
RAB	iPZ	212913.6	0.7	1.5	d			Regional
RAB	iPZ	232705.2			d			Regional
25th November, 1968.								
RAB	eZ/	013806			+			Traces
RAB	iPZ	060403.2	0.9	40.0	d	1¼°	060341	
	iSN/	20						
WAN	iPZ	03.2	0.3	11.2	d	1¼°	060342	
	iSZ	19.2						
SUL	iPZ	03.2			d	1¼°	060342	
	iSZ	19.0						
RAL	iPZ	02.8		22.0	d	1¼°	060341	
	iSZ	18.5						
TAV	iPZ	02.5			d	1¼°	060340	
	iSZ	19.2						
VUL	iPZ	03.2	0.8	46.8	d	1¼°	060342	
	iSZ	19.6						

			T sec	A mm	GM	Dist	H	Remarks
25th November, 1968.								
RAB	iPZ	081310.9	0.5	2.0	u	1¼°	081248	
	iSN	27.4						
RAL	iPZ	10.4	0.2	1.2	u	1¼°	081248	
	iSZ	27.4						
TAV	iPZ	10.0			d	1¼°	081247	
	iSZ	26.8						
VUL	iPZ	10.9	0.4	5.4	u	1¼°	081248	
	iSZ	28.2						
RAB	iPZ	122229.0	0.5	2.0	u	¾°	122214	
	iSE	40.1						
RAL	iPZ	28.5			u	¾°	122215	
	iSZ	38.6						
TAV	iPZ	28.3			u	¾°	122215	
	iSZ	38.0						
VUL	iPZ	29.1		1.0	u	1°	122213	
	iSZ	40.8						
KRT	iPZ	30.0			u	1°	122212	
	iSE	42.9						
RAB	ePZ	130147			d	1½°	130121	
	iSN	0207.0						
TAV	iPZ	0145.5	0.3	1.9	u	1½°	130119	
	iSZ	0205.2						
VUL	iPZ	0146.0			u	1½°	130120	
	iSZ	0206.0						
KRT	ePZ	0146½			u	1¾°	130117	
	iSE	0208.5						
RAB	ePZ	184232	1.0	0.8	u	28°		
	iPPZ/	4318						
	iPPPZ/	32						
	iPcPZ/	4540						
	eSN/	4708						
	eLqE/	5456						
	eLrZ/	5540						
26th November, 1968.								
RAB	iPZ	011033.2			d	1¼°	011012	M_L=5.6
	iEo	49.0						Felt Rabaul Int. III-IV 4.2°S 152.2°E Felt Diolene Int. IV 4.2°S 151.6°E Direction 185°S from Rabaul.
WAN	iPZ	33.0			d			
SUL	iPZ	33.2	0.3	5.8	d			
RAL	iPZ	32.8			d			
TAV	iPZ	32.7			d			
VUL	iPZ	32.0	0.2	9.3	d			

			T sec	A mm	GM	Dist	H	Remarks
26th November, 1968.								
RAB	iPZ	023920.8	0.4	2.2	d	1¼°	023859	M_L=4.0
	iSN	37.2						
WAN	iPZ	20.5			u	1¼°	023858	
	iSZ	37.0						
RAL	iPZ	20.8	0.4	2.2	d	1¼°	023859	
	iSZ	37.0						
TAV	iPZ	20.2	0.3	3.0	u	(1½°)	0238(56)	
	i(S)Z	38.0						
VUL	iPZ	20.3	0.3	8.7	u	(1¼°)	0239(00)	
	i(S)Z	35.0						
RAB	ePZ	103004	0.4	3.0	d	2½°	102925	M_L=5.4
	iSE/	34						
RAB	ePZ	142858½	0.3	1.4	u			Regional
RAB	ePZ	190506½						Teleseism

			T sec	A mm	GM	Dist	H	Remarks
AGENAHAMBO.								
9th November - 22nd November, 1968.								
9th November, 1968.								
AGE	ePZ	203558						Distant
10th November, 1968.								
AGE	ePZ	184159½						Regional
AGE	ePZ	203925½	0.2	0.7	d			Distant
11th November, 1968.								
AGE	iPZ iSZ	010148 0218				2½°	010109	C.B.M
12th November, 1968.								
AGE	ePZ	202818	0.3	1.0	d			Regional
13th November, 1968.								
AGE	iPZ iSZ	001308½ 38½				2½°	001229	
AGE	iPZ iSZ	140139½ 09½			d	2½°	140100	
14th November, 1968.								
AGE	ePZ	092514						Distant
AGE	ePZ iSZ	161235 1311	0.5	3.0	d	3°	161148	
AGE	ePZ	231407						Distant
15th November, 1968.								
AGE	iPZ i(S)Z	031819½ 1918½				(5¼°)	0317(03)	
AGE	iP!Z iSZ	234901½ 35½			u	2¾°	234817	
16th November, 1968.								
AGE	ePZ iSZ	202325½ 2410½				3¾°	202227	
17th November, 1968 - Nil recorded.								
18th November, 1968.								
AGE	iPZ iSZ	005047 53	0.3	1.6	d	¼°	005039	
AGE	eiPZ iSZ	034352 4408			u	1¼°	034331	
AGE	iPZ iSZ	125401½ 31	0.2	1.0	d	2½°	125322	
AGE	iPZ iSZ	214344 58	0.3	0.8	d	1°	214325	

		T sec	A mm	GM	Dist	H	Remarks
AGENAHAMBO - continued.							
19th November, 1968.							
AGE	ePZ	094234½			1¼°	094213	
	iZ	42					
	iSZ	50½					
20th November, 1968.							
AGE	ePZ	024215½					Teleseism
21st November, 1968 - Nil recorded.							
22nd November, 1968.							
	Microseismic activity from 221230 - 221439 due to sing sing nearby station Average T=0.1 A=1.5						
AGE	iP!Z	175246					
AGE	ePZ	203729					Teleseism

			T sec	A mm	GM	Dist	H	Remarks
ESA'ALA.								
5th November - 11th November, 1968.								
5th November, 1968.								
ESA	ePZ eSZ/	001138½ 1241	0.5	1.0	u	5½°	001017	
ESA	iPZ eSN/	031124 1211	0.3	2.5	d	4°	031023	
ESA	iPZ/ iSN/	160750 54			d			Local
6th November, 1968.								
ESA	iPZ iSN/	030423 33	0.3	1.0	d	¾°	030409	
ESA	iPZ iSN/	030529½ 41	0.2	1.0	d	1°	030513	
ESA	iPZ iSN/	030959½ 1010	0.2	1.3	d	¾°	030944	
ESA	ePZ/	212102			d			Near
ESA	iPZ/ iSN/	220448 0542			u	4¾°	220338	
7th November, 1968.								
ESA	ePZ	005907	0.4	0.8	u			Regional
ESA	iPZ iSN/	013127 33	0.2	4.0	u	¼°	013119	
ESA	ePZ/ eSN/	033853 4034			d	9°	033643	
ESA	ePZ iSN/	054816½ 4910	0.5	1.0	d	4¾°	054706	
ESA	eZ/	091711			-			Traces
ESA	ePZ/ eSN/	141932 2404			d	26°		
8th November, 1968.								
ESA	iPZ iSN/	015425 5513	0.2	1.2	d	4¼°	015322 Epicentre 5.8°S 150.7°E New Britain Region.	
ESA	iPZ	025647	0.4	1.4	d			Regional
ESA	ePZ/ eSN/	074540 4845			d	16°		
ESA	ePZ/	183052			d			Distant
9th November, 1968.								
ESA	ePZ	022201	0.5	1.0	u			Near
ESA	iPZ	043526½	0.6	1.0	u			Distant
ESA	ePZ eSN/	045358½ 5425	0.3	1.0	d	2¼°	045323	
ESA	iPZ	070715	0.2	9.0	d			Local
ESA	ePZ/ eSN/	203418 3920			u	30°		

			T sec	A mm	GM	Dist	H	Remarks
ESA'ALA - continued.								
10th November, 1968.								
ESA	eZ/	085348			+			Traces
ESA	ePZ/	170743			u			Distant
ESA	eZ/	183947			-			Traces
ESA	ePZ/ iSN/	203730½ 54			u	2°	203659	
11th November, 1968.								
ESA	iPZ iSN/	010001 59	0.3	1.0	d	5°	005846	
ESA	ePZ eSN/	020704½ 32	0.3	0.8	u	2¼°	020628	
ESA	iPZ eSN/	021154 1220	0.4	0.8	d	2¼°	021120	
ESA	iPZ	054241.	0.3	10.0	u			Local
ESA	e(P)Z/ eSN/	0936(07) 3956			d	(20¾°)	0211(20)	
ESA	ePZ/ eSN/	144809 5520			d	49½°		

Rabaul Central Observatory,
29th November, 1968.

(G.W. D'ADDARIO)
VOLCANOLOGIST-IN-CHARGE.

PEA DEC-68 No. 49

TERRITORY OF PAPUA AND NEW GUINEA
GEOLOGICAL AND VOLCANOLOGICAL BRANCH
VOLCANOLOGICAL SECTION

PRELIMINARY EARTHQUAKE ANALYSIS
RABAUL CENTRAL OBSERVATORY
1968

Rabaul	RAB	From: NOV. 27, 1968 To: DEC. 3 1968
Rabaul Harbour Network	WAN SUL RAL TAV VUL	From: NOV. 27, 1968 To: DEC. 3 1968
Keravat	KRT	From: NOV. 26, 1968 To: DEC. 1 - 1968
Esa'Ala	ESA	From: To:
Tabele	TBL	From: To:
Agenahambo	AGE	From: To:
Waris	WAA	Not operational
Ulamona	ULA	Not operational
Piva	PIV	Not operational
Cape Gloucester	LAG	Not operational

STATION PERSONNEL

RAB Central Observatory, Rabaul.

Volcanologist-in-Charge	G.W. D'Addario
Volcanologist	R.F. Heming
Seismologist	M. Mancini
Seismogram Readers	R.A. Page, L.M. Cartwright
Senior Technical Officer	N.O. Myers
Technical Officer	R.J. Conway
Volcanological Assistants	L. Topue, M. Gaiam, E. Ravian,
Technical Assistants	P. Daimbari
Trainee Volcanological Assts.	B. Talai, M. Salaiau, C. Matupit
Clerk	J.A. Alcock

KRT Keravat Outstation.

Observer (part time)	G.E. Chorick

TBL Tabele Observatory.

Observer	V. Kaita

ESA Esa'Ala Observatory.

Observer	F. Dira

AGE Agenahambo Outstation.

Observer (part time)	B. Kirke

The Rabaul Preliminary Earthquake Analysis (PEA) is produced by the staff under the direction of the Volcanologist-in-Charge from whom additional information and photocopies of seismogram records from all stations may be obtained on request.

Please address all communications to:-

Volcanologist-in-Charge,
Central Observatory,
P.O. Box 386,
RABAUL.

SEISMOGRAPH STATIONS

STATION	CODE	SOUTH LATITUDE	EAST LONGITUDE	ELEV. (m)	FOUNDATION
NEW GUINEA					
Rabaul	RAB	04°11'28.6"	152°10'11.4"	183.5	Basalt Flow
Wanliss Street	WAN*	04°11'39.6"	152°10'32.5"	25.0	Basalt Flow
Sulphur Creek	SUL*	04°13'09.8"	152°10'33.3"	8.5	Unconsolidated Volcanic Ash
Rabaulanakaia	RAL*	04°13'13.0"	152°12'07.0"	91.0	Unconsolidated Volcanic Ash
Tavurvur	TAV*	04°13'52.18"	152°13'12.99"	27.0	Andesitic Flow
Taviliu	VUL*	04°16'58.2"	152°08'44.6"	332.2	Unconsolidated Volcanic Ash
Keravat	KRT	04°21'10.5"	152°03'06"	20.0	Alluvium
Tabele	TBL	04°06'04.67"	145°00'41.37"	179.5	Basalt Flow
Waris	WAA	04°07'00"	145°06'00"	48.0	Lapilli Tuff
Piva	PIV	06°12'00"	155°03'30"	60.0	Alluvium
Cape Gloucester	LAG	04°27'20"	148°26'00"	24.0	Lapilli Tuff
Ulamona	ULA	04°59'24.0"	151°16'30.0"	17.0	Lapilli Tuff
PAPUA.					
Agenahambo	AGE	08°48'49"	148°05'56"	303.0	Unconsolidated Volcanic Ash
Esa'Ala	ESA	09°44'18.2"	150°48'50.7"	46.4	Granite Gneiss

RABAUL HARBOUR NETWORK

STATION INSTRUMENTATION

STATION & INSTRUMENTS	COMP.	To.	Tg.	TRACE SPEED mm/min	APPROXIMATE RELATIVE MAGNIFICATION	APPROXIMATE DAMPING
NEW GUINEA.						
Rabaul Central Observatory, Rabaul.						
World Wide Standard	Z	1.0	0.74	60	12,500	Critical
	N.E	1.0	0.74	60	6,250	Critical
	Z/N/E/	15.0	100.0	15	750	Critical
Benioff VR 14.7Kg.	Zh	1.0	0.02	180+	4,000	Critical
Omori 15Kg.	No	3.6	-	24	12	10.1 Air
Omori 15Kg.	Eo	3.8	-	24	10	10.1 Air
Wood Anderson Torsion	Na, Ea	0.8	-	60	2,800	Critical
Rabaul Harbour Network.						
WAN° Benioff VR 14.7Kg.	Z	1.0	0.02	60	5,700	Critical
SUL° Benioff VR 14.7Kg	Z	1.0	0.02	60	1,425	Critical
RAL° Benioff VR 14.7Kg.	Z	1.0	0.02	60	5,700	Critical
TAV° Benioff VR 14.7Kg.	Z	1.0	0.02	60	11,400	Critical
VUL° Benioff VR 14.7Kg.	Z	1.0	0.02	60	5,700	Critical

+ Recording is triggered by the onset of any earthquake with pre-determined minimum amplitude. Recorder is stopped automatically by hour break pulse.

Readings from the Harbour Network are entered in the PEA only for large earthquakes, with impulsive and sharply defined onset of phases.

Determination of Epicentre.

Where no source is cited, the determination of epicentral distance and origin time for local and regional earthquakes is carried out at the Central Observatory, Rabaul, from the S-P travel times, assuming a normal depth of the focus.

Geographical Designation of Epicentre.

The regional names which follow the co-ordinates of epicentres located at the Central Observatory are meant only to supplement the co-ordinates and normally follow well known geographical rather than geological features. Use is made of the full degree blocks according to the method defined by E.A. Flinn and E.R. Engdahl in "A PROPOSED BASIS FOR GEOGRAPHICAL AND SEISMIC REGIONALIZATION", Seismic Data Laboratory Report No. 101, U.I.D. Inc., Alexandria, Virginia, 1964, adopted by the U.S.C.G.S. for computer requirements.

Magnitude Definition and Determination.

M_L - Local Magnitude (Richter, 1935) is calculated from the recorded trace amplitude of the Wood Anderson torsion seismographs of stated physical constants (installed at the Observatory in Nov. 1967).

Maximum trace amplitude (0 to peak) expressed in millimetres and tenths is measured directly on both components. Magnitude is determined independently and the arithmetic mean taken. M_L values are given to the tenth of a unit.

The station correction factor is assumed to be zero until better known.

M_S - Surface Wave Magnitude (Gutemberg & Richter, 1956) is calculated from the amplitude of surface waves of period near 20 seconds for shallow distant earthquakes.

M_B - Body Wave Magnitude is calculated from the ratio of amplitude over period for body waves on S P - Z of World Wide Seismograph System only when depth is known. The magnification factor for the standard seismograph is taken into account.

m - Unified Magnitude (Gutemberg & Richter, 1956) has the following relation to M_L, M_S and M_B.

$m = 1.7 + 0.8\ M_L - 0.01\ M^2_L$

$m = M_L$ (without correction)

$m = 2.5 + 0.63\ M_S$

Local Magnitude of earthquakes recorded at RAB with clear S-P interval is tabulated on a Day-Distance (in Central Angle Degrees) graph which is added to the PEA monthly.

Symbols.

i - impulsive and sharply defined beginning of a phase.

e - emergent and poorly defined beginning of a phase.

T - Period in seconds.

A - Peak to Trough trace amplitude in millimetres.

GM - Ground motion.

Dist - Epicentral distance in central angle degrees.

H - Origin time.

h - Focal depth in kilometres.

CBM - Confused by microseisms.

PRESENTATION OF DATA (CONTINUED)

Remarks

Local - Typical signature of an earthquake with epicentre within 0.9°.

Near - Typical signature of an earthquake with epicentre between 0.9° and 9°.

Distant - Typical signature of an earthquake with epicentre between 9° and 45°.

Teleseism - Typical signature of an earthquake with epicentre more than 45°.

Traces - Any recorded dispersed waves or very weak unknown earthquake phases.

Local and Near earthquakes will be classified Regional, and Distant earthquakes will be grouped with Teleseisms if sheer waves and their reflections are unidentifiable.

G.W. D'ADDARIO

VOLCANOLOGIST-IN-CHARGE.

TOTAL NUMBER OF EARTHQUAKES AS RECORDED AND CLASSIFIED AT EACH STATION FOR THE MONTH OF NOVEMBER 1968

LOCAL -0 -.9°					NEAR 0.9°-9°					REGIONAL					DISTANT 9°-45°					TELESEISM 45°- -					TRACES				
21	17	12	18	14	109	63	39	54	69	23	4	5	8	8	36	5	1	6	7	6	1			1	24				
17	6	3	7	14	74	14	3	20	51	8	2	3	2	6	7	6	1	4	8	1	1		3	1		3			

RAB	WAN	SUL	RAL	TAV
VUL	ESA	TBL	AGE	KRT

OBSERVATORIES

RABAUL CENTRAL (W.W.S.S.) - RAB.
ESA'ALA - ESA.
TABELE - TBL.

RABAUL OUTER NETWORK

KERAVAT - KRT.

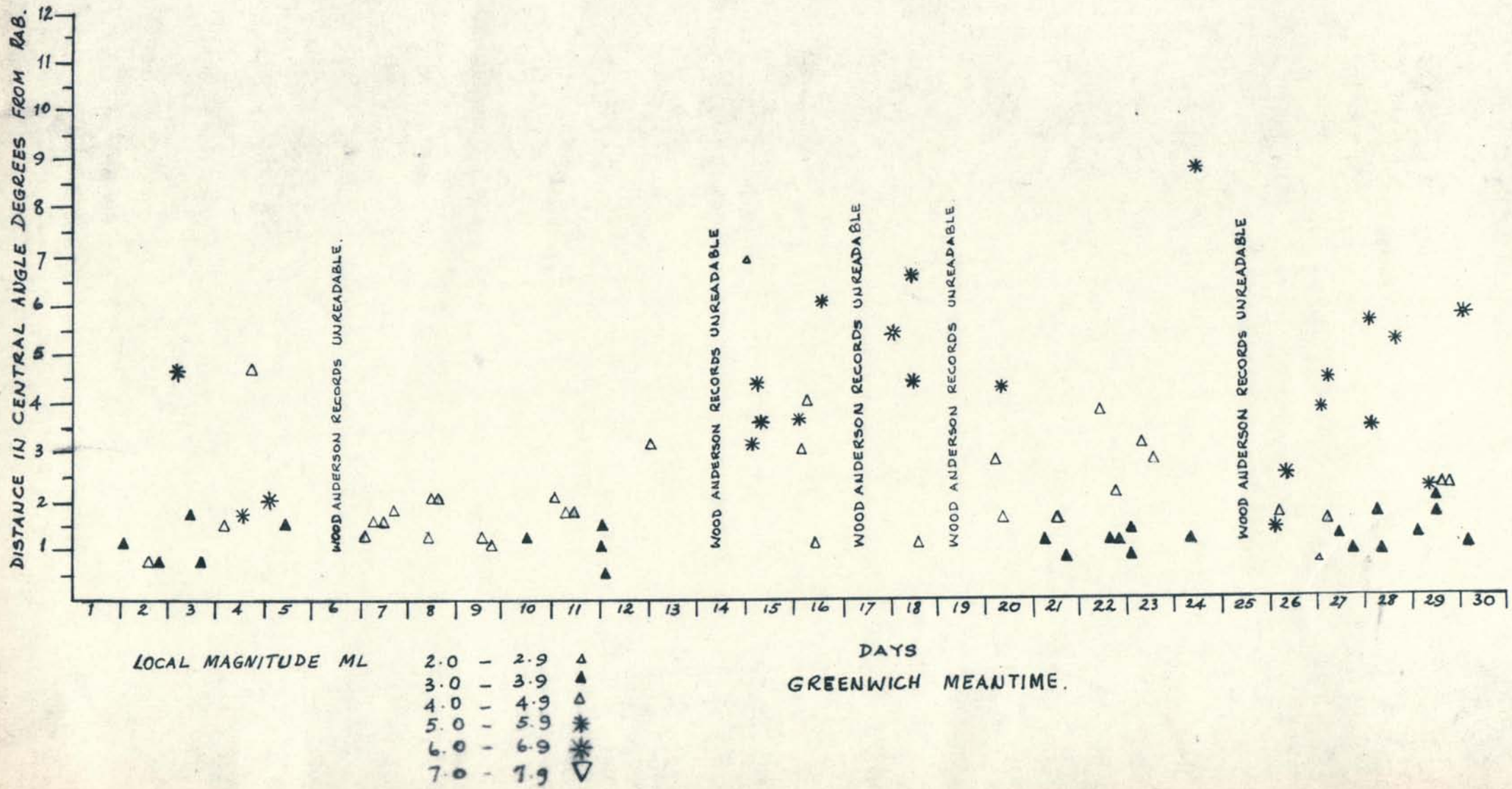
RABAUL INNER NETWORK

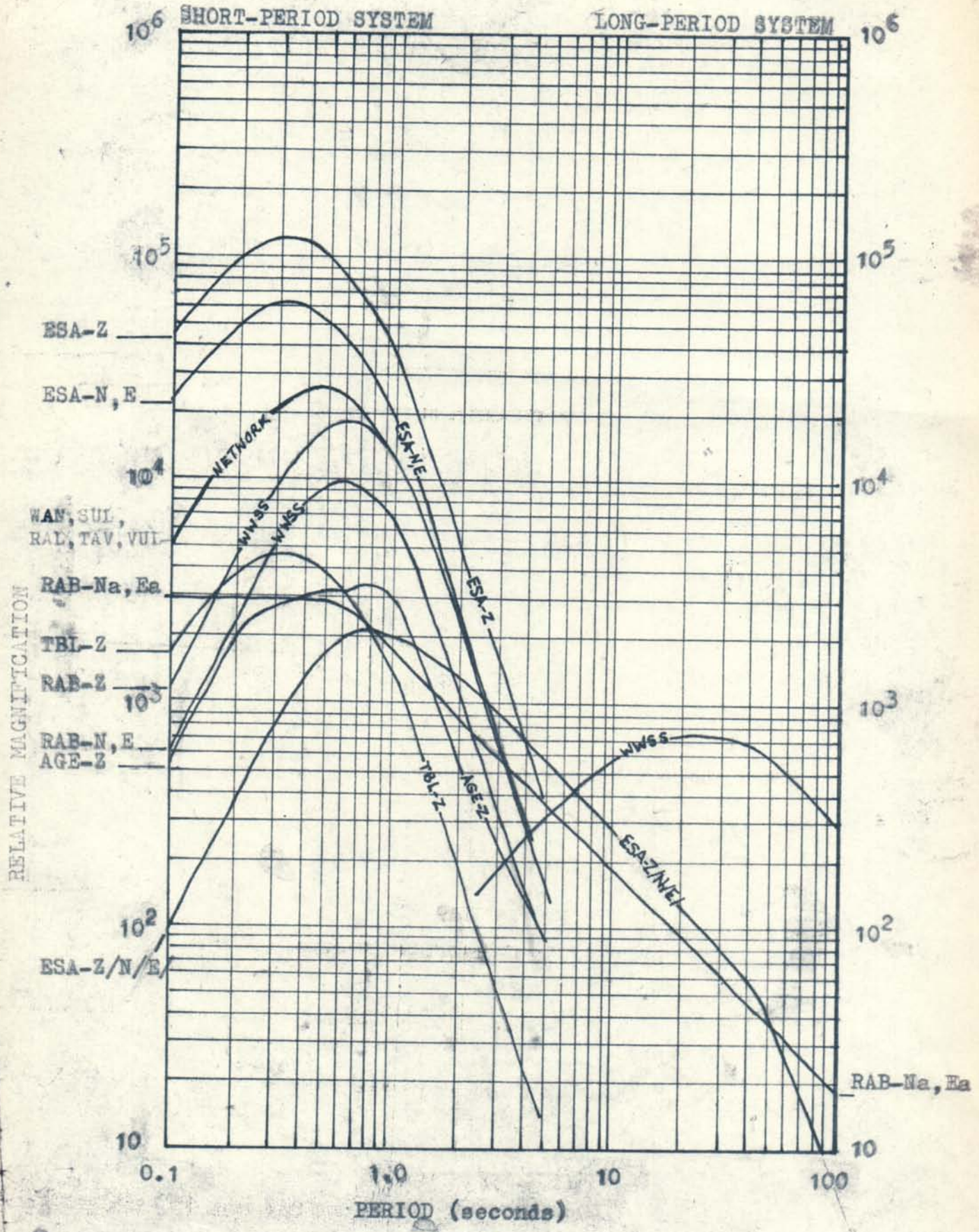
WANLISS STREET - WAN.
SULPHUR CREEK - SUL.
RABALANAKAIA - RAL.
TAVURVUR - TAV.
TAVILIU - VUL.

STATION

AGENAHAMBO - AGE.

Magnitude Of Regional Earthquakes With A Clear S_P Interval
November, 1968.





FREQUENCY RESPONSE CURVES OF THE INSTRUMENTS

GWDA Nov.67

			T sec	A mm	GM	Dist	H	Remarks
KERAVAT.								
26th November, 1968.								
KRT	iPZ	011032.2			d			
KRT	iPZ	023919.4			u	1°	023901	
	iSE	33.0						
RABAUL.								
27th November, 1968.		KRT - Records not available for study.						
		KRT - The records from 270143 - 272226 are not available for study.						
RAB	iPZ	030902.4	0.8	2.4	u	½°	030853	M_L=2.7
	iSE	09.6						
RAB	iPZ	040206.6			d	3¾°	040108	M_L=5.6
	iPg	13.8						
	iSN/E/	52						
	iLqE/	59						
WAN	iPZ	07.0			d	3¾°	040108	
	iSN	52.2						
RAL	ePZ	06			d	4°	040106	
	iSZ	52.4						
TAV	iPZ	05.6			d			
VUL	iPZ	05.2			u	4°	040104	
	iSZ	52.4						
RAB	iPZ	081554.2	0.5	3.4	u	1½°	081529	M_L=4.0
	iSE	1612.8						
RAB	iPZ	090837.4	0.8	1.5	u	4¼°	090735	M_L=5.7
	iSE	0925.4						
WAN	ePZ	0837			u	4¼°	090733	
	iSZ	0926.0						
RAL	ePZ	0838				4¼°	090735	
	iSZ	0926.0						
VUL	ePZ	0838½			u	4°	090737	
	iSZ	0925.4						
RAB	iPZ	091353.6				½°	091344	
	iSE	1400.6						
RAB	iPZ	105806.8	0.6	6.8	d			Local
	iSN	08.4						
WAN	iPZ	05.6	0.2	3.0	d			
	iSZ	08.8						
SUL	iPZ	06.2	0.4	3.2	d			
RAL	iPZ	06.0			d			
TAV	iPZ	05.2			u			
	iSE	07.0						
VUL	iPZ	05.6						

			T sec	A mm	GM	Dist	H	Remarks
27th November, 1968 - continued.								
RAB	iPZ	151640.4	0.6	3.8	u	¼°	151634	M_L=1.8
	iSN	45.8						
WAN	iPZ	40.6		2.0	u			
SUL	iPZ	39.0			u			
RAL	iPZ	39.8			u			
TAV	iPZ	40.0			u			
VUL	iPZ	41.0		1.0	u			
RAB	iPZ	174802.0	0.6	3.4	u	1°	174743	M_L=3.5
	iSN	15.8						
WAN	iPZ	01.9		2.0	u			
SUL	iPZ	02.0			u			
RAL	iPZ	01.8			u			
TAV	iPZ	01.4			u			
VUL	iPZ	00.8		4.2	u	1°	174745	
	iSZ	13.0						
RAB	iPZ	210124.0	0.4	2.0	u	¾°	210110	M_L=3.8
	iSN	33.8						
RAB	eZ/	224616			-			Traces
28th November, 1968. KRT - Strong microseismic activity from 2235-1100, 1956-2218.								
RAB	ePZ	055408	1.4	6.0	d	5½°	055245	M_L=5.9 M_B=5.6
	iSN	5512.0						
RAB	iPZ	062756.0			d	3¼°	062706	M_L=5.2
	iPg	2803.2						
	iSN/	34						
RAB	eZ/	081604			-			Traces
RAB	iPZ	085717.0	0.4	2.0	d	1½°	085652	M_L=3.9
	iSE	36.0						
RAB	iPZ	105605.8	0.5	2.0	u			Local
WAN	iPZ	05.6			u			
SUL	iPZ	05.5	0.3	4.0	u			
RAL	iPZ	04.4	0.4	4.2	d			
VUL	iPZ	04.0			u			
RAB	iPZ	105700.0	0.3	7.2	d			Local
WAN	iPZ	5659.8			d			
SUL	iPZ	59.9		2.9	d			
RAL	iPZ	59.6	0.3	2.9	u			
VUL	iPZ	58.9			u			
RAB	ePZ/	105516			d	38°		M_S=6.0
	eSE/	110106						
		LZ	20.0	69.0				
		LN	20.0	22.0				
		LE	20.0	56.0				

			T sec	A mm	GM	Dist	H	Remarks
28th November, 1968 - continued.								
RAB	iPZ	114436.5	0.4	7.0	d	¾°	114423	M_L=3.8
	iSE	46.5						
WAN	ePZ	36½			d			
RAL	ePZ	37½			d			
VUL	iPZ	37.5	0.4	3.0	d			
KRT	iPZ	37.6		4.0	d	¾°	114424	
	iSE	47.8						
RAB	iP!Z	163144.4	0.8	33.0	u			
WAN	iP!Z	44.3	1.0	8.0	u			
SUL	iP!Z	44.0	0.4	7.0				
RAL	iP!Z	43.8	0.7	12.4	u			
VUL	iP!Z	44.2			u			
KRT	iP!Z	44.6			u			
RAB	iPZ	202747.6	0.7	4.0	u	5°	202634	M_L=5.8 M_B=5.2
	iSE	2845.0						
29th November, 1968.								
RAB	eZ/	043330			-			Traces
RAB	iPZ	070316.0	0.3	3.0	u	1°	070300	M_L=3.8
	iSN	28.4						
WAN	iPZ	15.6	0.3	1.8	u	1°	070258	
	iSZ	28.2						
TAV	iPZ	15.5	0.2	2.0	u	1°	070258	
	eSZ	28						
VUL	iPZ	15.2			u	1°	070259	
	eSZ	27						
KRT	iPZ	13.6						
	iSE	25.0						
RAB	ePZ	125120	1.0	2.8	u	20°		M_S=5.7
	eSN/	5506						
		LZ	20.0	8.0				
		LN	18.0	7.0				
KRT	ePZ	5119			u			
RAB	iPZ	150517.4	0.5	8.0	u	2°	150446	M_L=5.0
	iSN	41.0						
WAN	iPZ	17.0	0.5	3.4	u	2°	150445	
	iSZ	40.6						
RAL	iPZ	16.8	0.5	2.0	u	2°	150446	
	iSZ	40.0						
TAV	iPZ	16.4	0.2	4.6	u	2°	150445	
	iSZ	40.2						
VUL	iPZ	17.2			u			
KRT	iPZ	17.8			u	1¾°	150449	
	iSE	39.6						
RAB	iPZ	160443.4			u	2°	160413	M_L=3.8
	iSE	0506.8						
TAV	iPZ	0442.8			u			
KRT	iPZ	42½				1¾°	160413	
	iSE	0504.0						

			T sec	A mm	GM	Dist	H	Remarks
29th November, 1968 - continued.								
RAB	iPZ	172255.8	0.5	2.0	d	1½°	172231	M_L=3.7
	iSN	2314.8						
KRT	iPZ	2253.4			u	1½°	172228	
	iSZ	2312.4						
RAB	iPZ	175849.4	0.4	2.0	d	2°	175818	M_L=4.0
	iSN	5913.0						
WAN	ePZ	5848½			d			
RAL	ePZ	49	0.4	1.0	d	2°	175819	
	iSZ	5911.5						
TAV	iPZ	5848.0	0.4	1.0	d	2°	175818	
	iSZ	5911.4						
KRT	iPZ	5850.0			u	1¾°	175822	
	iSE	5910.6						
RAB	ePZ	191321½	0.5	1.5	u	2°	191251	M_L=4.1
	iSN	44.8						
30th November, 1968.								
RAB	iPZ	000132.6	0.5	2.0	u	5¾°	000008	M_L=6.1 M_B=5.0
	iSE	0237.2						
RAB	iPZ	010701.6	0.4	2.3	d	1°	010645	M_L=3.7
	iSE	13.8						
WAN	iPZ	01.8			d	1°	010644	
	iSZ	14.4						
RAL	iPZ	01.8						
	iSZ	13.4						
TAV	iPZ	01.3		2.5	u	1°	010645	
	iSEw	13.0						
VUL	iPZ	01.4		6.0	d			
RAB	eZ/	032132			-			Traces
RAB	eZ/	043847			+			Traces
RAB	eZ/	062442			-			Traces
RAB	eiPZ	075545	1.0	3.0	u	25°		
	iZ	46.0						
	eSE/	5945						
KRT	ePZ	5545			d			
1st December, 1968.								
RAB	iPZ	001913.4	0.4	6.0	d	1½°	001850	M_L=3.6
	iSE	31.2						
WAN	iPZ	13.3			d	1½°	001849	
	iSZ	31.0						
SUL	iPZ	13.8			d			
RAL	iPZ	13.2			d			
TAV	iPZ	14.0	0.5	1.4	d			
VUL	iPZ	12.2		2.4	u	1¼°	001850	
	iSZ	29.4						
KRT	iPZ	10.2			d	1¼°	001850	
	iSE	25.6						
RAB	iPZ	005957.0			d	¾°	005943	
	iSN	010006.8						

			T sec	A mm	GM	Dist	H	Remarks
1st December, 1968 - continued.								
RAB	iPZ	013245.2	0.4	1.8	u	¾°	013230	M_L=3.1
	iSE	55.8						
RAB	iPZ	030426.6	0.4	6.0	d	1¼°	030405	
	iSN	42.8						
WAN	iPZ	27.0			u			
SUL	iPZ	27.0			d			
RAL	iPZ	26.6	0.7	3.0	d	1¼°	030407	
	iSZ	42.0						
TAV	iPZ	26.0			d	1¼°	030406	
	iSZ	41.2						
VUL	iPZ	25.8			d	1¼°	030406	
	iSZ	40.8						
KRT	iPZ	25.6	0.4	5.4	d	1¼°	030403	
	iSE	42.6						
RAB	ePZ/	054636			+			Traces
RAB	iPZ	075810.0	0.2	1.0	u			
SUL	iPZ	10.8			u			
RAL	iPZ	09.8			u			
TAV	iPZ	09.4	0.3	2.0	u			
VUL	iPZ	08.8			u			
RAB	iPZ	084349.2	0.4	1.0	u	½°	084338	M_L=3.0
	iSE	57.2						
RAB	iPZ	104221.0	0.3	3.0	d	1°	104203	M_L=3.7
	iSN	34.4						
WAN	iPZ	20.9			d	1°	104203	
	iSZ	34.0						
RAL	iPZ	20.6			d	1°	104204	
	iSZ	32.8						
TAV	iPZ	20.4			d	1°	104203	
	iSZ	33.4						
VUL	iPZ	21.8		2.4	d			
KRT	iPZ	22.8			d	1¼°	104203	
	iSE	38.2						
RAB	iPZ	133407.2	1.0	1.0	u	17°		M_B=4.0
	iZ/	3725						
RAB	iPZ	164726.8	0.4	2.0	u	¾°	164712	M_L=3.6
	iSN	37.4						
WAN	iPZ	26.8			u	¾°	164713	
	iSZ	37.0						
SUL	iPZ	26.8			u	1°	164711	
	iSZ	38.4						
RAL	iPZ	27.0			u	¾°	164712	
	iSZ	38.0						
TAV	iPZ	27.4	0.4		d	¾°	164712	
	iSZ	38.6						
VUL	iPZ	25.7			u	¾°	164712	
	iSZ	35.8						
KRT	iPZ	23.2			u	¾°	164711	
	iSE	32.4						

			T sec	A mm	GM	Dist	H	Remarks
1st December, 1968 - continued.								
RAB	iPZ	180428.0	0.4	1.0	d	3°	180341	M_L=4.8
	iSE	0504.2						
WAN	iPZ	0427.8			d			
SUL	iPZ	27.9			d			
RAL	iPZ	28.6	0.7		d			
TAV	iPZ	28.6	0.7		d			
VUL	iPZ	27.0			d			
KRT	iPZ	25.0	0.4	3.2	d	3°	180339	
	iSE	0500.2						
RAB	iPZ	215610.2	0.4	3.0	d			
WAN	iPZ	10.4			d			
RAL	ePZ	10	0.6		d			
TAV	iPZ	10.6			d			
VUL	iPZ	12.2	0.5	2.4	d			
2nd December, 1968.								
RAB	iPZ	033602.4	0.5	3.8	u			Distant
WAN	iPZ	02.8	0.4	2.0	u			
RAL	iPZ	02.8	0.5	2.0	u			
TAV	iPZ	03.0	0.5	1.7	u			
VUL	iPZ	01.8	0.5	4.0	u			
RAB	eZ/	134335			+			Traces
RAB	iPZ	133409.4			d	1½°	133346	M_L=3.5
	iSN	27.0						
RAB	eZ/	151546			+			Traces
RAB	ePZ	152648			u	3¾°	152552	M_L=4.7
	iSN	2730.8						
RAB	iPZ	154812.6	0.5	2.6	u	1°	154754	
	iSN	27.0						
WAN	iPZ	12.2			u	1°	154753	
	iSZ	26.5						
RAL	iPZ	12.0	0.2	2.4	u	1°	154754	
	iSZ	25.2						
TAV	iPZ	12.0		5.0	u	1°	154754	
	iSEw	25.2						
VUL	iPZ	13.2			d	1¼°	154753	
	iSZ	28.0						
3rd December, 1968.								
RAB	iPZ	001051.2	0.5	24.2	u	1¼°	001029	M_L=4.3
	iSE	1108.6						
WAN	iPZ	1050.9	0.4	10.8	u			
RAL	iPZ	51.0		8.2	u			
TAV	eiPZ	50½			u			
VUL	iPZ	51.0	0.2	24.6	u			

			T sec	A mm	GM	Dist	H	Remarks
3rd December, 1968 - continued.								
RAB	iP!Z	073917.4			u	¼°	073909	M_L=4.2
	iSE/	23.0						Approx. direction from Rabaul N30°E. Felt Rabaul Int. II 4.2°S 152.2°E
WAN	iP!Z	17.1		107.0	u			
SUL	iP!Z	17.6			u			
RAL	iP!Z	17.4			u			
TAV	iP!Z	17.6			u			
VUL	iP!Z	19.0			u			
RAB	iPZ	121009.8	0.5	1.9	d	¾°	120956	M_L=3.4
	iSE	19.4						
WAN	iPZ	10.0				¾°	120958	
	iSZ	19.4						
RAL	iPZ	09.6		2.0	d			
TAV	iPZ	09.0			u	¾°	120955	
	iSZ	18.5						
VUL	iPZ	11.0			d			
RAB	eZ/	121021			-			Traces
RAB	eiPZ	155421½	0.8	3.8	d			Distant
	iZ	22.4						
RAB	iPZ	161028.5	0.5	1.8	d	4¼°	160923	M_L=5.0
	iSE	1118.8						
RAB	eZ/	193458			+			Traces

RABAUL CENTRAL OBSERVATORY,
6TH DECEMBER, 1968.

G.W. D'ADDARIO

VOLCANOLOGIST-IN-CHARGE.

PEA DEC-68 No. 50.

TERRITORY OF PAPUA AND NEW GUINEA
GEOLOGICAL AND VOLCANOLOGICAL BRANCH
VOLCANOLOGICAL SECTION

PRELIMINARY EARTHQUAKE ANALYSIS
RABAUL CENTRAL OBSERVATORY
1968

Rabaul	RAB	From: DEC. 4. 1968 To: DEC. 10. 1968
Rabaul Harbour Network	WAN SUL RAL TAV VUL	From: DEC. 4. 1968 To: DEC. 10. 1968
Keravat	KRT	From: DEC. 3. 1968 To: DEC. 9. 1968
Esa'Ala	ESA	From: OCT. 28. 1968 To: NOV. 18. 1968
Tabele	TBL	From: To:
Agenahambo	AGE	From: NOV. 23. 1968 To: DEC. 7. 1968
Waris	WAA	Not operational
Ulamona	ULA	Not operational
Piva	PIV	Not operational
Cape Gloucester	LAG	Not operational

STATION PERSONNEL

RAB Central Observatory, Rabaul.

Volcanologist-in-Charge	G.W. D'Addario
Volcanologist	R.F. Heming
Seismologist	M. Mancini
Seismogram Readers	R.A. Page, L.M. Cartwright
Senior Technical Officer	N.O. Myers
Technical Officer	R.J. Conway
Volcanological Assistants	L. Topue, M. Gaiam, E. Ravian,
Technical Assistants	P. Daimbari
Trainee Volcanological Assts.	B. Talai, M. Salaiau, C. Matupit
Clerk	J.A. Alcock

KRT Keravat Outstation.

Observer (part time)	G.E. Chorick

TBL Tabele Observatory.

Observer	V. Kaita

ESA Esa'Ala Observatory.

Observer	F. Dira

AGE Agenahambo Outstation.

Observer (part time)	B. Kirke

The Rabaul Preliminary Earthquake Analysis (PEA) is produced by the staff under the direction of the Volcanologist-in-Charge from whom additional information and photocopies of seismogram records from all stations may be obtained on request.

Please address all communications to:-

Volcanologist-in-Charge,
Central Observatory,
P.O. Box 386,
RABAUL.

			T sec	A mm	GM	Dist	H	Remarks
KERAVAT.								
3rd December, 1968.								
KRT	iEN FEN	0707 0713	0.4	4.0-5.0				Harmonic tremor
KRT	iPZ	073920.6			d			
KRT	iEN FEN	1207 1214	0.3	3.0				Harmonic tremor
KRT	iPZ	155420.5	0.7	2.0	u			
KRT	iPZ iSE	161025.8 1113.3	0.4	0.4	u	4¼°	160923	
RABAUL.								
4th December, 1968.								
RAB	iPZ	102503.8	0.8	2.6	u			Regional
RAB	iPZ iSN	130902.2 03.9	0.4	5.4	u			Local
WAN	iPZ	02.2	0.2	9.0	u			
SUL	iPZ	02.0			u			
RAL	iP!Z	02.0			u			
TAV	iPZ iSEw	02.0 03.6			u			
VUL	iP!Z	02.2			u			
KRT	iPZ iSNE	04.3 07.8	0.2	3.0	u			
RAB	iPZ iSZ	133939.6 4018.2	0.8	3.2	u	3¼°	133849	
RAB	iPZ iSE	172427.6 36.0	0.3	1.4	u	½°	172417	
WAN	iPZ	28.2			d			
SUL	iPZ	28.0	0.4	1.2	u			
RAL	iPZ	27.4			u			
TAV	iPZ iSEw	27.2 36.0	0.3	3.2	u	¾°	172415	
VUL	iPZ iSZ	26.2 34.2			u	½°	172415	
KRT	iPZ iSE	25.4 32.5		3.0	u	½°	172416	
RAB	ePZ	204814			u			Distant
5th December, 1968.								
RAB	eZ/	085936			-			Traces
RAB	eZ/	102104			-			Traces
RAB	iPZ	122952.4	0.5	1.7	u			Regional
RAB	iPZ	143452.0			u			Regional

			T sec	A mm	GM	Dist	H	Remarks
5th December, 1968 - continued.								
RAB	iPZ	151054.0	0.5	1.7	d	2°	151021	M_L=4.3
	iSN	1118.7						
VUL	iPZ	1053.1	0.3	5.0	d	2¼°	151019	
	iSZ	1118.6						
KRT	iPZ	1052.5	0.2	1.0	d	2°	151022	
	iSE	1115.5						
RAB	iPZ	215035.8	0.5	1.6	u	¾°	215024	M_L=3.1
	iSN	45.2						
6th December, 1968.								
RAB	eZ/	001702			+			Traces
RAB	iPZ	031954.8	0.5	12.0	d	1°	031936	M_L=4.6
	iSE	2008.5						
WAN	iPZ	1954.6	0.4	3.8	d	1°	031937	
	iSZ	2008.0						
RAL	iPZ	1954.4	0.4	6.0	d	1°	031936	
	iSZ	2008.0						
TAV	iPZ	1954.4			d	1°	031937	
	iSZ	2007.8						
VUL	iPZ	1955.0	0.4	4.0	d			
KRT	iPZ	56.0		2.4	d	1¼°	031936	
	iSE	2011.0						
RAB	iPZ	033833.8	0.4	2.0	u	4°	033734	M_L=5.6
	iZ	40.5						
	iSE/	3920						
WAN	iPZ	3834.0	0.4	1.6	d			
SUL	iPZ	34.2			d			
RAL	iPZ	33.8	0.5	4.0	d			
TAV	iPZ	33.4			d			
VUL	iPZ	33.2			u			
KRT	iPZ	37.5	0.5	5.2	d	3¾°	033739	
	iSE	3922.2						
RAB	iPZ	052547.4	0.4	2.8	u	¾°	052532	M_L=3.6
	iSN	58.0						
WAN	iPZ	47.2	0.3	1.0	u	¾°	052533	
	iSZ	57.0						
RAL	iPZ	47.0			u	¾°	052533	
	iSZ	56.5						
TAV	iPZ	46.6			d	¾°	052534	
	iSZ	56.0						
VUL	iPZ	48.0	0.3	2.8	u			
RAB	iPZ	135352.4	0.4	1.0	d	1¼°	135332	M_L=3.6
	iSN	5407.6						

			T sec	A mm	GM	Dist	H	Remarks
6th December, 1968 - continued.								
RAB	iPZ	142548.4	0.4	4.5	d	1¼°	142527	M_L=3.5
	iSN	2604.0						
WAN	iPZ	2548.4	0.4	1.0	d	1¼°	142527	
	iSZ	2604.0						
SUL	iPZ	2548.4			d	1¼°	142527	
	iSZ	2604.0						
RAL	iPZ	2548.0	0.4	1.0	d	1¼°	142527	
	iSZ	2604.0						
TAV	iPZ	2547.6	0.4	7.0	d	1¼°	142526	
	iSZ	2603.5						
VUL	iPZ	2547.4	0.5	3.0	d	1°	142529	
	iSZ	2601.4						
KRT	iPZ	2547.0		2.4	d	1¼°	142527	
	iSE	2601.8						
RAB	iZ	202446	0.4	3.4				Ship moving in Simpson Harbour, Rabaul.
	FZ	5036						
7th December, 1968.								
		W.W.S.S. L.P. N galvonometer jammed 060459 - out of order until 080655.						
		HBR. NETWORK - VUL Pen broken 062244. Not replaced until 082300.						
RAB	iPZ	025227.8	0.2	2.9	d	2°	025155	M_L=4.6
	eSEa	52½						
WAN	iPZ	27.1			u	2¼°	025153	
	iSZ	53.0						
TAV	iPZ	27.0	0.4	1.5	u	2¼°	025153	
	iSNw	52.5						
KRT	iPZ	25.7			d	2°	025154	
	iSE	49.3						
RAB	ePZ	045310	1.0	7.0	u	6°	045142	
	iSE/	5418						
RAB	ePZ	045614	0.6	22.2	u	7°	045433	
	iSE/	5732						
RAB	ePZ	045920	3.0	17.0	d	6¾°	045742	M_L=7.2 M_B=7.1
	iSE/	050036						
WAN	ePZ	045919½			d			
TAV	ePZ	18½			u			
KRT	iPZ	19.9			u			
RAB	ePZ	091452			u			Regional
RAB	ePZ/	155044			u	64°	154045	
	eSE/	5900						
RAL	iZ	1745	0.8	1.4				Harmonic tremor
	FZ	1807						

			T sec	A mm	GM	Dist	H	Remarks
7th December, 1968 - continued.								
RAB	ePZ	171354½	1.0	2.0	u	18°	170900	M_B=4.6
	eSZ	1706						
WAN	ePZ	1354			u			
RAL	ePZ	53			u			
TAV	ePZ	53½			u			
KRT	ePZ	54			u			
RAB	iPZ	173726.8	0.4	3.0	d	1½°	173703	M_L=3.6
	iSE/	45						
WAN	iPZ	26.4	0.6	3.7	u			
TAV	iPZ	26.0		14.2	d	1½°	173702	
	iSNw	43.8						
KRT	iPZ	27.7	0.3	2.0	u			
RAB	iPZ	192543.7	0.2	18.0	d			Regional
WAN	iPZ	43.5	0.3	2.4	d			
SUL	iPZ	43.5	0.2	1.8	d			
RAL	iPZ	43.2		9.5	d			
TAV	iPZ	43.2		7.9	d			
KRT	iPZ	45.2	0.3	7.4	d			
RAB	iPZ	214050.5	1.0	1.9	u	20°	213635	
	iSE/	4424						
WAN	ePZ	4050½			u			
SUL	ePZ	50			u			
RAL	ePZ	50			u			
TAV	ePZ	50	0.8	2.1	u			
KRT	iPZ	48.1	0.4	2.4	u			
RAB	eZ/	234818			-			Traces
8th December, 1968.								
RAB	iPZ	010202.6	0.2	26.0	d	½°	010153	M_L=3.8
	iSE	10.0						
WAN	iPZ	02.4			d	½°	010153	
	iSZ	09.5						
SUL	iPZ	03.1	0.3	5.4	d	½°	010152	
	iSZ	11.5						
RAL	iP!Z	03.2			d	½°	010152	
	iSZ	11.5						
TAV	iPZ	03.4			d	¾°	010150	
	iSNw	13.0						
KRT	iPZ	02.9	0.2	1.0	d	½°	010152	
	iSE	10.5						
RAB	iPZ	040758.4	0.4	1.4	u	2¼°	040723	M_L=4.3
	iSE	0825.0						
WAN	iPZ	0758.2			u	2¼°	040722	
	eSZ	0825½						
RAL	iPZ	0758.8			u	2¼°	040723	
	iSZ	0826.0						

			T sec	A mm	GM	Dist	H	Remarks
8th December, 1968 - continued.								
RAB	eZ/	075146			+			Traces
RAB	iPZ	091556.0	0.7	1.0	d			Distant
RAB	iPZ	100040.8	0.4	2.4	d	3¼°	095952	M_L=4.7
	iSE	0118.0						
RAB	eZ/	103538			+			Traces
RAB	eZ/	111402½			-			Traces
RAB	eZ/	125252			+			Traces
RAB	iPZ	131637.0	0.5	4.3	u			Regional
WAN	iPZ	36.7	0.8	1.3	u			
RAL	iPZ	37.0	0.8	2.8	u			
TAV	ePZ	37	0.8	5.3	u			
KRT	ePZ	35½	0.6	7.0	u			
RAB	iPZ	145640.3	0.6	1.5	d			Regional
WAN	iPZ	40.2			u			
SUL	iPZ	39.8			u			
RAL	iPZ	39.6			u			
TAV	iPZ	40.2	0.8	5.3	u			
RAB	ePZ	145748	0.4	1.0	u			Regional
WAN	iPZ	47.5			u			
SUL	iPZ	47.2			d			
RAL	iPZ	47.0			u			
TAV	iPZ	47.6			u			
RAB	iPZ	190800.6	0.4	2.4	d	½°	190751	M_L=2.7
	iSE	07.1						
WAN	iPZ	00.4			d			
RAL	iPZ	01.2	0.5	2.0	d			
TAV	iPZ	01.2	0.6	1.0	d	½°	190752	
	iSNw	07.8						
KRT	iPZ	03.8	0.5	3.0	u	¾°	190752	
	iSE	12.8						
RAB	eZ/	200535			-			Traces
9th December, 1968.								
RAB	iP!Z	094549.8			d	1½°	094523	M_L=5.2
	iSNo	4610						Felt Rabaul Int.I II
								4.2°S 152.2°E
WAN	iPZ	4549.8			d			
SUL	iPZ	49.6		29.5	d			
RAL	iPZ	49.6			d			
TAV	iPZ	49.6			d			
VUL	iPZ	48.6			d			
KRT	iPZ	47.5			d			

			T sec	A mm	GM	Dist	H	Remarks
9th December, 1968 - continued.								
RAB	iPZ	095828.8	0.4	2.0	d	3¼°	095739	
	iSN	5906.4						
RAB	iPZ	105742.4	0.4	2.8	u	1½°	105716	
	iSE	5802.5						
WAN	iPZ	5742.6	0.2	2.8		1½°	105716	
	iSZ	5802.8						
RAL	iPZ	5742.4			u			
TAV	iPZ	42.6			d			
VUL	iPZ	41.6			d			
RAB	iPZ	115811.8	0.4	18.8	d	1½°	115745	M_L=4.8
	iSE	31.5						
WAN	iPZ	11.8		7.0	d	1½°	115745	
	iSZ	31.8						
SUL	iPZ	11.8	0.3	5.9	u			
RAL	iPZ	11.8		9.0	d			
TAV	iPZ	11.6	0.3	4.6	d	1¾°	115744	
	iSNw	33.0						
VUL	iPZ	10.8			d			
KRT	iPZ	09.5			d			
RAB	iPZ	131440.4	0.4	10.0	u	1½°	131414	M_L=4.5
	iSN	1500.0						
WAN	iPZ	1440.2				1½°	131414	
	iSZ	1500.0						
SUL	iPZ	1440.2	0.3		u	1½°	131414	
	iSZ	1500.3						
RAL	iPZ	1440.2		3.0	u			
TAV	iPZ	40.0	0.3	2.5	u	1¾°	131411	
	iSZ	1501.8						
VUL	iPZ	1439.2			d			
KRT	iPZ	38.0			d	1¾°	131409	
	iSE	59.6						
RAB	iPZ	192712.6	0.5	3.5	d	1¼°	192653	M_L=4.2
	iSN	28.0						
WAN	iPZ	12.5			u			
SUL	ePZ	12½		1.0	u			
RAL	ePZ	12			d			
TAV	iPZ	11.5			d			
VUL	iPZ	12.0			d			
KRT	iPZ	12.1	0.3	2.8	d	1°	192653	
	iSE	26.4						
RAB	iPZ	231435.6	0.2	11.0	d	¼°	231429	M_L=2.8
	iSN	41.0						
WAN	iPZ	35.8			d			
SUL	iPZ	35.4			d			
RAL	iPZ	34.8			d			
TAV	iPZ	34.6						
VUL	iPZ	35.2			d			

			T sec	A mm	GM	Dist	H	Remarks
10th December, 1968.								
RAB	iPZ	020740.4	0.5	4.0	d	1½°	020715	M_L=5.0
	iSN	59.8						
WAN	iPZ	40.2	0.4	11.0	d	1½°	020715	
	iSZ	59.8						
SUL	iPZ	40.0	0.4	1.2	d			
RAL	iPZ	40.4	0.2	15.6	d			
TAV	iPZ	40.0			d			
VUL	iPZ	39.4			d			
RAB	iPZ	043009.8	0.8	6.0	d			Regional
RAB	eZ/	080112			-			Traces
RAB	iPZ	131247.2	0.2	2.0	d	¾°	131232	M_L=3.8
	iSN	58.2						
WAN	iPZ	47.0			d	¾°	131233	
	iSZ	57.0						
RAL	iPZ	46.6			d	¾°	131234	
	iSZ	56.0						
TAV	iPZ	46.4			d	¾°	131233	
	iSZ	56.0						
VUL	iPZ	47.6			d	¾°	131233	
	iSZ	59.0						
RAB	iPZ	153843.4	0.6	3.0	d			Regional
RAB	iPZ	183658.2	0.5	2.0	d	1¼°	183637	M_L=3.8
	iSN	3714.4						
WAN	iPZ	3658.6	0.2	1.0	d	1¼°	183637	
	iSZ	3714.5						
RAL	iPZ	3658.8						
VUL	iPZ	57.6	0.4	7.0	u	1°	183639	
	iSZ	3712.0						

			T sec	A mm	GM	Dist	H	Remarks
AGENAHAMBO.								
23rd November, 1968 - 7th December, 1968.								
23rd November, 1968 - Nil recorded.								
24th November, 1968 - Nil recorded.								
25th November, 1968 - Nil recorded.								
26th November, 1968.								
AGE	iPZ	011031½			u			Regional
27th November, 1968 - Nil recorded.								
28th November, 1968.								
AGE	eiPZ	163130½			u			Regional
	iZ	34						
AGE	iPZ	202604			d			Regional
29th November, 1968.								
AGE	iPZ	150630½	0.4	1.5	d	½°	150620	
	iZ	35½						
	iSZ	38½						
30th November, 1968.								
AGE	iPZ	080023			d			Regional
1st December, 1968 - Nil recorded.								
2nd December, 1968.								
AGE	iPZ	033438½			u			Regional
3rd December, 1968.								
AGE	iPZ	155302½			u			Regional
AGE	iPZ	160215½			u			Regional
4th December, 1968 - Nil recorded.								
5th December, 1968.								
AGE	eiPZ	033826			u			Regional
	iZ	26½						
6th December, 1968 - Nil recorded.								
7th December, 1968.								
AGE	ePZ	045813						Teleseism

			T sec	A mm	GM	Dist	H	Remarks
ESA'ALA.								
28th October, 1968 - 4th November, 1968. 12th November, 1968 - 18th November, 1968.								
28th October, 1968.								
ESA	ePZ iSN/	233507½ 3803			d	17°	233113	
29th October, 1968.								
ESA	iPZ iSZ	022618 22½	0.3	10.0	u	¼°	022612	
ESA	iPZ iSZ	041246 53	0.2	1.4	d	½°	041236	
ESA	iPZ iSZ	065802 26½	0.1	1.2	d	2°	065729	
ESA	eZ/	114321			+			Traces
ESA	iPZ/ iSN/	170510 0603			u	4½°	170401	
ESA	iPZ/	222801			u			
30th October, 1968.								
ESA	iPZ iSZ	001157½ 1205			u	½°	001147	
ESA	iPZ iSZ	041511½ 26			u	1¼°	041451	
31st October, 1968.								
ESA	iPZ/ iSN/ eLqN/ eLrN/	091114½ 1301 1553½ 1700			u	9½°	090857	
1st November, 1968.								
ESA	eZ/	014744			-			Traces
ESA	iPZ/ iSN/	132319 2759			d	27°	131741	
2nd November, 1968.								
ESA	iPZ iSZ	113452 3506	0.2	9.8	u	1°	113433	
ESA	iPZ	114221	0.4	0.8	d			Regional
ESA	ePZ	223659½	0.6	1.2	d			Distant
3rd November, 1968.								
ESA	iPZ/ iSN/	031128½ 1227	0.2	10.0	d	5¼°	031012	
4th November, 1968.								
ESA	ePZ	013142½	0.2	1.2	u			Regional
ESA	iPZ/ iSN/	042046 2109	0.1	13.0	u	2°	042016	
ESA	iPZ/ iSN/ eLqN/	091046 1423 1955	0.2	42.0	u	18°	090639	

			T sec	A mm	GM	Dist	H	Remarks
ESA'ALA - continued.								
12th November, 1968.								
ESA	iPZ i(sP)Z/ i(S)N/	005007 20 5631	0.3	1.0	u	(42°)		
ESA	eZ/	095947			-			Traces
ESA	eZ/	202616			-			Traces
13th November, 1968.								
ESA	iPZ	001105	0.3	5.0	u			Regional
ESA	ePZ	025105½	0.5	1.0	u			Regional
ESA	iPZ/ iSN/	135940 140012	0.9	3.2	u	2¾°	135858	
ESA	iPZ/ i(S)N/	184842 5554	1.5	1.0	u	(48°)		
14th November, 1968.								
ESA	iPZ iN/ iSN/	231141 1203 1539	0.3	1.9	d	22¾°		
15th November, 1968.								
ESA	iP!Z	022938			u			Local
ESA	ePZ	033707½	0.2	0.3	d			Regional
ESA	iPZ/ iSN/	075447 5541	0.5	2.0	d	4¾°	075337	
16th November, 1968.								
ESA	iPZ/	075114	3.5	16.0	u			Teleseism
17th November, 1968.								
ESA	iPZ/ iZ/	052357 2810	1.0	2.0	d			
18th November, 1968.								
ESA	eiPZ iZ iSZ/	024320½ 21 4422	0.3	7.0	d	5¼°	024200	Felt Kieta Int. IV 6.2°S 155.6°E Epicentre 7.5°S 155.7°E Solomon Islands.
ESA	iP!Z/	075223½			u			Regional

PEA DEC-68 No.5.1

TERRITORY OF PAPUA AND NEW GUINEA
GEOLOGICAL AND VOLCANOLOGICAL BRANCH
VOLCANOLOGICAL SECTION

PRELIMINARY EARTHQUAKE ANALYSIS
RABAUL CENTRAL OBSERVATORY
1968

Rabaul	RAB	From: DEC. 12. 1968 To: DEC. 17. 1968
Rabaul Harbour Network	WAN SUL RAL TAV VUL	From: DEC. 12. 1968 To: DEC. 17. 1968
Keravat	KRT	From: DEC. 12. 1968 To: DEC. 16. 1968
Esa'Ala	ESA	From: NOV. 19. 1968 To: DEC. 9. 1968
Tabele	TBL	From: NOV. 6. 1968 To: DEC. 3. 1968
Agenahambo	AGE	From: To:
Waris	WAA	Not operational
Ulamona	UL	Not operational
Piva	PIV	Not operational
Cape Gloucester	LAG	Not operational

STATION PERSONNEL.

RAB Central Observatory, Rabaul.

Volcanologist-in-Charge	G.W. D'Addario
Volcanologist	R.F. Heming
Seismologist	M. Mancini
Seismogram Readers	R.A. Page, L.M. Cartwright
Senior Technical Officer	N.O. Myers
Technical Officer	R.J. Conway
Volcanological Assistants	L. Topue, M.Gaiam, E. Ravian
Technical Assistants	P. Daimbari
Trainee Volcanological Assistants	B. Talai, M. Salaiau, C.Matupit
Clerk	J.A. Alcock

KRT Keravat Outstation.

Observer (part-time)	G.E. Chorick

TBL Tabele Observatory.

Observer	V. Kaita

ESA Esa'Ala Observatory.

Observer	F. Dira

AGE Agenahambo Outstation.

Observer (part-time)	B. Kirke

The Rabaul Preliminary Earthquake Analysis (PEA) is produced by the Staff. under the direction of the Volcanologist-in-Charge from whom additional information and photocopies of seismogram records from all stations may be obtained on request.

Please address all communications to:-

Volcanologist-in-Charge,
Central Observatory,
P.O. Box 386,
RABAUL.

			T sec	A mm	GM	Dist	H	Remarks
KERAVAT. W.W.S.S. Secondary time switched off at 101604, Primary time switched on at 101605.								
10th December, 1968.								
KRT	iPZ	020737.5			d	1¾°	020710	
	iSE	58.8						
KRT	iPZ	131249.4	0.2		d			
KRT	iPZ	153840.9	0.2	1.8	d			
KRT	iPZ	183656.1		9.0	u	1°	183637	
	iSE	3710.2						
RABAUL.								
11th December, 1968.								
Record from Wood Anderson seismograph not available for study from 121007 - 121233.								
RAB	iZ	0029	0.4	4.2				Harmonic tremor
	FZ	34						
RAB	eZ/	030408						Traces
RAB	iZ	0433	0.4	4.2				Harmonic tremor
	FZ							
RAB	iZ	0704	0.4	4.0				Harmonic tremor
	FZ	19						
RAB	iPZ	104848.4	0.5	2.0	d	2°	104818	
	iSN	4911.8						
WAN	iPZ	4848.6			d	1¾°	104820	
	iSZ	4910.4						
RAL	iPZ	4848.0		3.0	d	2°	104818	
	iSZ	4910.5						
TAV	iPZ	4846.6		2.0	u	2°	104816	
	iSZ	4910.0						
VUL	iPZ	4847.2		2.5	d	2°	104817	
	iSZ	4910.3						
RAB	eZ/	120232						Traces
RAB	iPZ	125314.8	0.4	6.5	u	1½°	125248	
	iSN	35.0						
WAN	iPZ	14.8	0.2	2.4	u	1½°	125248	
	iSZ	35.0						
RAL	iPZ	14.6	0.5	2.9	u	1½°	125248	
	iSZ	35.0						
TAV	iPZ	14.6	0.3	2.5	u	1¾°	125247	
	iSZ	35.4						
VUL	iPZ	13.6		10.0	d	1½°	125248	
	iSZ	33.0						
KRT	iPZ	12.3		10.2	d	1¾°	125245	
	iSE	33.5						
RAB	iPZ	193020.0	0.5	5.0	u			Regional
WAN	iPZ	20.5		3.6	d			
RAL	iPZ	20.4	0.5	2.9	u			
TAV	iPZ	20.6	0.5	2.5	u			
VUL	iPZ	19.5	0.5	5.5	u			
KRT	ePZ	21	0.3	3.0	u			

			T sec	A mm	GM	Dist	H	Remarks
11th December, 1968 - continued.								
RAB	ePZ/	214102			u			Distant
12th December, 1968.								
		W.W.S.S. - Records not available for study from 112234 - 120541 due to calibration tests and adjustments.						
		L.P. Z - Record not available for study from 112234 - 122321 due to calibration tests.						
		S.P. N.S. & E.W. Records not available for study due to faulty development. S phase read from Wood Anderson seismogram.						
		RAB SP Z - P phase read from HBR. NETWORK WAN seismogram after 121810.						
RAB	iPZ	072533.5	0.5	4.0	u	30°	071930	M_B=5.8
	eSE/	3009						
WAN	iPZ	2533.0	0.5	1.0	u			
RAL	iPZ	32.8			u			
TAV	iPZ	33.0	0.6	2.2	u			
VUL	iPZ	33.4	0.6	6.2	u			
KRT	iPZ	34.0	0.5		u			
RAB	iPZ	121035.6			d	¾°	121023	M_L=3.1
	iSEa	44.4						
RAB	ePZ	160727			d			Distant
WAN	ePZ	27½			d			
RAL	ePZ	27½			d			
TAV	ePZ	28			u			
VUL	iPZ	26.8			d			
KRT	ePZ	27½			u			
RAB	iPZ	163716.2			d	2½°	163635	M_L=4.2
	iSEa	47.4						
VUL	iPZ	15.6	0.4		d			
KRT	iPZ	16.6	0.3	1.8	d			
RAB	iPZ	163856.2			d	2½°	163815	M_L=4.3
	iSEa	3927.2						
WAN	iPZ	3856.2			d			
RAL	iPZ	56.6			u			
TAV	iPZ	56.8			d			
VUL	iPZ	55.2	0.2		d	2¾°	163812	
	iSZ	3928.0						

			T sec	A mm	GM	Dist	H	Remarks
12th December, 1968 - continued.								
RAB	iPZ	175908.2	0.4		d	¾°	175854	M_L=4.0
	iSEa	18.4						
WAN	iPZ	08.0	0.4		d	¾°	175854	
	iSZ	18.4						
SUL	iPZ	08.2	0.3	9.0	d	¾°	175854	
	iSZ	18.0						
RAL	iPZ	08.0			d			
TAV	iPZ	08.0			d			
VUL	iPZ	09.4			d			
KRT	iPZ	11.2			d	¾°	175856	
	iSE	22.5						
RAB	iSEa	210117.2				¾°	210056	M_L=4.5
WAN	iPZ	08.4			u	¾°	210055	
	iSZ	18.0						
SUL	iPZ	08.0			d	¾°	210054	
	iSZ	18.0						
RAL	iPZ	07.6			u			
TAV	iPZ	07.6			u	¾°	210055	
	iSEw	16.6						
VUL	iPZ	09.0			u			
KRT	iPZ	10.6			u	¾°	210058	
	iSE	19.7						
13th December, 1968.								
		W.W.S.S. Records not available for study between 130401 - 130414 due to changing of seismogram.						
		S.P. E.W. Record not available for study due to faulty developing.						
RAB	iPZ	010323.5	0.5	1.0	u	6½°	010146	M_L=5.7 M_B=5.3
	iSN	0438.2						
WAN	iPZ	0323.4			u			
RAL	iPZ	22.6	0.6		u			
TAV	ePZ	22½			u			
VUL	iPZ	24.4			u	6½°	010147	
	iSZ	0439.4						
RAB	iZ	0317	0.4	4.0				Harmonic tremor
	FZ	26						
WAN	iZ	0317	0.4	2.6				Harmonic tremor
	FZ	26						
RAB	iP!Z	033524.4			d	1°	033506	M_L=5.1
	iSE/	38.0					Felt Rabaul Int. I-II 4.2°S 152.2°E	
WAN	iP!Z	24.2			d			
SUL	iP!Z	24.0			d			
RAL	iP!Z	23.8			d			
TAV	iP!Z	23.6			d			
VUL	iPZ	23.4			d			
KRT	iPZ	23.3			d			

			T sec	A mm	GM	Dist	H	Remarks
13th December, 1968 - continued.								
RAB	iPZ	093241.8	0.4	2.0	d	3°	093157	M_L=5.0
	iZ	44.2						
	iSN	3316.0						
WAN	ePZ	3241½			d			
RAL	iPZ	40.8	0.7	6.0	d			
TAV	ePZ	40½	0.3	2.8	d			
VUL	iPZ	39.9	0.3	5.0	d	3°	093154	
	iZ	43.2						
	iSZ	3314.6						
KRT	ePZ	3239				2¾°	093157	
	eSE	3310½						
RAB	iPZ	135658.4	0.5	2.3	d	3°	135611	M_L=4.5
	iSN	5734.8						
WAN	iPZ	5658.6	0.3	1.4	u	3°	135611	
	iSZ	5735.0						
TAV	iPZ	5657.8			d			
VUL	iPZ	58.6	0.2	13.9	d	3°	135611	
	iSZ	5735.0						
KRT	iPZ	5658.9		2.0	u	3¼°	135609	
	eSE	5736½						
RAB	ePZ	173153	0.2	2.1	d	2°	173120	M_L=4.0
	iSN	3218.0						
RAL	iPZ	3153.2	0.5	4.0	d			
TAV	iPZ	52.6	0.2	2.1	u			
VUL	iPZ	52.4			u	2¼°	173118	
	iSZ	3218.4						
KRT	iPZ	3151.6		3.0	u	2°	173121	
	iSE	3214.2						
RAB	iPZ	192758.8	0.3	7.0	d	6½°	192623	M_L=6.3 M_B=5.8
	iSN	2912.8						
RAL	iPZ	2758.2	0.3		d	6¾°	192620	
	iSZ	2914.0						
TAV	iPZ	2758.6	0.4		d			
VUL	iPZ	56.8	0.3		d	6½°	192621	
	iSZ	2911.0						
KRT	iPZ	2801.1			u			
14th December, 1968.								
RAB	iZ	0042	0.4	4.0				Harmonic tremor
	FZ	46						
RAB	iZ	0105	0.4	4.0				Harmonic tremor
	FZ	15						
RAB	iPZ	012155.0	0.5	2.0	d	10½°	011923	
	eSE/	2353						
RAB	iZ	0448	0.4	4.2				Harmonic tremor
	FZ	0505						

			T sec	A mm	GM	Dist	H	Remarks
14th December, 1968 - continued.								
RAB	iPZ	073909.6	0.5	6.0	u	1¾°	073842	M_L=4.3
	iZ	13.0						
	iSN	30.8						
WAN	iPZ	09.6	0.2	2.0	u	1¾°	073842	
	eSZ	31						
SUL	iPZ	09.6	0.3	1.4	u	1¾°	073842	
	eSZ	31						
RAL	iPZ	09.4	0.4	1.4	d	1¾°	073842	
	iSZ	30.8						
TAV	iPZ	08.8	0.3	2.5	u			
VUL	iPZ	08.2	0.3	13.0	u			
KRT	iPZ	07.3	0.4		u	2°	073837	
	iSE	29.9						
RAB	iPZ	081350.4	0.4	3.0	d	1¾°	081321	M_L=4.1
	iSN	1412.0						
WAN	iPZ	1350.4	0.2	1.0	d			
RAL	iPZ	50.0			d			
TAV	iPZ	49.6			d			
VUL	iPZ	48.8	0.2	9.0	u			
KRT	iPZ	48.5	0.5		u			
RAB	ePZ	100903½	0.8	1.0	d	62°		
	eSN/	1720						
RAB	iPZ	112831.2	0.4	10.0	d	1¼°	112810	M_L=4.2
	iSN	47.0						
WAN	iPZ	31.2	0.4	7.0	d	1¼°	112810	
	eSZ	47						
SUL	iPZ	30.8	0.2	5.0	d	1¼°	112809	
	iSZ	46.8						
RAL	iPZ	30.6			d	1¼°	112811	
	iSZ	45.4						
TAV	iPZ	30.4			d	1¼°	112810	
	eSZ	45						
VUL	iPZ	30.0	0.2	12.0	d			
KRT	iPZ	29.8			d	1¼°	112810	
	iSE	44.3						
RAB	ePZ	142455½	0.6	1.0	u	7°	142314	M_L=5.9
	eSN	2613						
WAN	ePZ	2455½			u	7°	142314	
	eSZ	2613						
RAL	ePZ	2455	0.8		u			
TAV	ePZ	55			u			
VUL	ePZ	57	0.8		d			
KRT	ePZ	57½			u			

			T sec	A mm	GM	Dist	H	Remarks.
14th December, 1968 - continued.								
RAB	ePZ iSN	143325 3441.0	0.5	1.0	d	6¾°	143147	M_L=5.8
WAN	ePZ eSZ	3325 3440½			d	6¾°	143147	
TAV	iPZ iSZ	3325.2 3441.2			u	6¾°	143147	
VUL	iPZ	3326.2			u			
KRT	ePZ	27	[illegible]	[illegible].0	u			
RAB	iPZ iSN	163033.[illegible] 44.2	0.4	[illegible].0	u	¾°	163020	M_L=4.4
WAN	iPZ iSZ	33.4 43.0	0.4	15.[illegible]	u	¾°	163020	
SUL	iPZ iSZ	33.4 43.0	0.4	7.[illegible]	u	¾°	163020	
RAL	iPZ iSZ	33.2 43.4			u	¾°	163019	
TAV	iPZ eSZ	33.0 43			u	¾°	163019	
VUL	iPZ	34.0			u			
KRT	iPZ iSE	35.0 46.4	0.4	11.0	u	¾°	163020	
15th December, 1968.								
HBR. NETWORK - VUL Strong microseismic activity from 142234 - 152232.								
RAB	ePZ iSN/	010156 0529	1.0	2.0	d	37°		
WAN	ePZ	0156			d			
RAL	ePZ	56			d			
TAV	ePZ	56			d			
VUL	ePZ	58½			u			
RAB	ePZ/ eSN/	022415 3230			d	61½°		
		LZ LE LN	20.0 19.0 20.0	53.0 25.0 38.0				
TAV	ePZ	2415½			d			
RAB	iPZ iSEa	061204.0 25.0			u	1¾°	061136	M_L=3.8
RAL	iPZ	03.6			u			
TAV	iPZ	03.4	0.4	1.8	u			
VUL	iPZ iSZ	02.8 21.4	0.3	13.0	u	1½°	061138	
KRT	iPZ iSE	02.0 20.7		4.8	u	1½°	061137	

			T sec	A mm	GM	Dist	H	Remarks
15th December, 1968 - continued.								
RAB	iPZ	150517.4	0.4	6.6	d	2½°	150437	M_L=4.5
	iSE	48.8						
WAN	iPZ	17.4	0.3	8.0	d			
SUL	iPZ	17.4	0.4	4.0	d			
RAL	iPZ	17.4		20.0	d			
TAV	iPZ	17.2	0.3	17.0	d	2¾°	150435	
	iSNw	49.0						
VUL	iPZ	17.4	0.3	31.0	d			
KRT	iPZ	17.6		4.6	d			
16th December, 1968.								
		W.W.S. Record from Wood Anderson seismograph not available for study.						
		KRT - Station closed 162251 (temporarily).						
RAB	iZ	0318	0.4	3.0				Harmonic tremor
	FZ	32						
RAB	iPZ	065305.8	0.5	7.0	u	1°	065248	
	iSN	18.6						
WAN	iPZ	05.8	0.2	1.0	u			
RAL	iPZ	05.0		2.2	u			
TAV	iPZ	04.8		4.8	d			
VUL	iPZ	05.4	0.5	23.0	d	1°	065249	
	iSZ	17.6						
KRT	iPZ	06.4	0.5	4.0	u	1°	065250	
	iSE	17.9						
RAB	iPZ	105126.4	1.0	1.8	u	20°		
	eSN/	5516						
WAN	iPZ	5126.2			u			
RAL	iPZ	25.6	0.8	1.1	u			
TAV	ePZ	26½			u			
VUL	ePZ	26½		1.4	u			
KRT	iPZ	27.4	1.0	4.4	u			
RAB	iPZ	105743.3	0.5	4.0	u	1½°	105717	
	iSN	5803.1						
WAN	iPZ	5743.0			u	1½°	105718	
	iSZ	5802.0						
RAL	iPZ	5742.6	0.4	3.8	d	1½°	105719	
	iSZ	5801.0						
TAV	iPZ	5742.4	0.4	8.0	d	1½°	105717	
	iSZ	5801.2						
VUL	iPZ	5743.6	0.3	4.0	u	1½°	105717	
	iSZ	5803.6						
KRT	iPZ	5744.2	0.1	2.8	u			

			T sec	A mm	GM	Dist	H	Remarks
16th December, 1968 - continued.								
RAB	iPZ	163011.4	0.4	11.0	u	2°	162940	
	iSN	35.2						
SUL	iPZ	11.4	0.4	1.8	u			
RAL	iPZ	11.4		3.8	u			
TAV	iPZ	11.3	0.3	1.3	u			
VUL	iPZ	10.0	0.6	16.4	d	2°	162938	
	iSZ	34.4						
KRT	iPZ	08.3		5.6	d	1¾°	162941	
	iSE	29.2						
RAB	iPZ	211047.4	0.5	9.3	d	1°	211031	
	iSN	59.8						
WAN	iPZ	47.6	0.2	5.4	d	1°	211031	
	iSZ	59.8						
SUL	iPZ	47.4		2.8	d	1°	211031	
	iSZ	59.3						
RAL	iPZ	47.0			d	1°	211031	
	iSZ	58.8						
TAV	iPZ	46.8	0.2	49.0	d	1°	211031	
	iSZ	58.4						
VUL	iPZ	47.8	0.3	11.8	d	¾°	211033	
	iSZ	59.0						
RAB	ePZ	213107½			u			Distant
17th December, 1968.								
RAB	iZ	0319	0.4	4.0				Harmonic tremor
	FZ	32						
RAB	iPZ	045503.8	0.5	39.0	u	2½°	045424	M_L=5.0
	iSN	33.8						
WAN	iPZ	03.8	0.4	3.8	u	2½°	045426	
	iSZ	33.0						
SUL	iPZ	04.2		5.0	u	2½°	045425	
	iSZ	34.0						
RAL	iPZ	03.8			u	2½°	045426	
	iSZ	33.0						
TAV	iPZ	03.6			u	2½°	045425	
	iSZ	32.4						
VUL	iPZ	02.8		9.6	u	2½°	045425	
	iSZ	32.0						
RAB	iPZ	051854.6	0.5	2.7	u	2¼°	051818	M_L=4.0
	iSN	1923.0						
RAL	iPZ	1854.8	0.7	3.6	d	2¼°	051818	
	iSZ	1922.8						
TAV	iPZ	1854.0	0.4	3.0	u	2½°	051816	
	iSZ	1923.0						
VUL	iPZ	1853.4	0.4	2.8	u	2¼°	051816	
	iSZ	1921.2						

			T sec	A mm	GM	Dist	H	Remarks
17th December, 1968 - continued.								
RAB	iPZ	104139.3	0.4	5.0	u	1¼°	104118	M_L=3.8
	iSN	55.5						
WAN	iPZ	39.5	0.2	2.4	d	1¼°	104118	
	iSZ	55.6						
RAL	iPZ	39.6	0.2	1.6	d			
TAV	iPZ	39.6	0.4	1.6	d			
VUL	iPZ	38.0			u	1¼°	104117	
	iSZ	53.8						
RAB	iPZ	121359.5	0.5	2.0	u	76°		M_B=6.4 M_S=6.6
	iZ	1400.2						
	ePPZ/	1652						
	ePPPZ/	1825						
	iSN/	2341						
	eSSN/	2804						
		LN	20.0	40.0				
		LE	22.0	50.0				
WAN	ePZ	1359			u			
SUL	ePZ	59			u			
RAL	iPZ	59.4	0.8	15.4	u			
TAV	iPZ	59.6	0.6	7.4	d			
VUL	iPZ	59.8	0.5	4.8	u			
RAB	ePZ	163830				7¼°	163645	M_L=5.5
	iSN	3951.4						

			T sec	A mm	GM	Dist	H	Remarks
TABELE.								
6th November, 1968 - 4th December, 1968.								
6th November, 1968 - Nil recorded.								
7th November, 1968.								
TBL	iPZ iSZ	192322½ 56	0.3	1.8	d	3°	192238	
8th November, 1968. - Nil recorded.								
9th November, 1968.								
		Strong microseismic activity associated with heavy rain between 2021 - 2100 hours. T= 0.3 A=7.0						
TBL	iPZ eSZ	141035 1115	0.4	1.0	u	3½°	140943	
TBL	ePZ	155936	0.4	2.0	u			Regional
10th November, 1968.								
TBL	ePZ	164425	0.4	1.5	d			Distant
11th November, 1968.								
TBL	ePZ eSZ	100136 0220	0.3	1.2	d	3¼°	100039	
12th November, 1968.								
TBL	iPZ iSZ	201114 29	0.3	9.0	d	1¼°	201054	
13th November, 1968 - Nil recorded.								
14th November, 1968.								
TBL	iPZ iZ iSZ	092718 20 41	0.4	1.0	d	2°	092648	
TBL	iPZ e(S)Z	230454 0521	0.4	1.5	d	(2¼°)	2304(18)	
15th November, 1968 - Nil record due to faulty developing.								
16th November, 1968.								
TBL	iPZ eSZ	211905 22½	0.5	5.5	u	1½°	211841	
17th November, 1968 - 25th November, 1968 - Nil recorded.								
		From 21.11.68 - 4.12.68 No hour breaks on seismograms.						
26th November, 1968.								
TBL	ePZ eSZ	111210½ 23	0.7	1.0	u	1°	111153	
27th November, 1968.								
TBL	iPZ	005911½	0.4	3.0	u			Local
		Microseismic activity from 0546 - 0620						

			T sec	A mm	GM	Dist	H	Remarks
TABELE - continued.								
28th November, 1968.								
TBL	iPZ	023324½	0.7	8.2	d			Regional
TBL	iPZ	062821½	0.4	4.0	u			Local
TBL	iPZ	073832			u			Local
29th November, 1968 & 30th November, 1968 - Nil recorded.								
1st December, 1968.								
TBL	iPZ iSZ	224924 35½	0.3	4.0	d	1°	224908	
2nd December, 1968.								
TBL	iPZ iSZ	171657 1718	0.3	2.0	d	1¾°	171629	
3rd December, 1968 & 4th December, 1968 - Nil recorded.								

		T sec	A mm	GM	Dist	H	Remarks
ESA'ALA.							
19th November, 1968 - 9th December, 1968.							
19th November, 1968.							
ESA	iPZ/	094149		u			Epicentre 9.7°S 151.0E East New Guinea Region Felt Esa'Ala Int. III 9.7°S 150.8°E Felt Salamo Int. V 9.7°S 150.8°E Felt Dobu Int. IV 9.8°S 150.9°E
		22 tremors recorded in 24 hours.					
ESA	iPZ/ iSN/	095235 45		d	¾°	095221	
ESA	iPZ/	095508		d			Local
ESA	iPZ/	095752		u			"
ESA	iPZ/	104943		u			"
ESA	iPZ/	112631		u			"
ESA	iPZ/	115808		u			"
ESA	iPZ/	121455½		u			"
ESA	iPZ/	122908		u			"
ESA	iPZ	134324		u			"
ESA	iPZ/	135007		u			"
ESA	iPZ	142753		u			"
ESA	iPZ/	152742		u			"
ESA	iPZ	155132		u			"
ESA	iPZ/	162020½		u			"
ESA	ePZ/	182440½		d			"
ESA	iPZ/	192401		u			"
ESA	iPZ/	194701½		u			"
ESA	iPZ/	194833		u			"
20th November, 1968.							
ESA	iPZ/	024125½		u			Felt Salamo Int IV 9.7°S 150.8°E
ESA	iPZ/	051858½		d			Local
ESA	iPZ/	085446½		u			"
ESA	iPZ/	110004		d			"
ESA	iPZ/	110201		d			"
ESA	iPZ/	124106		u			"
ESA	iPZ	235645		u			"
ESA	iPZ	235904		u			"
21st November, 1968.							
ESA	iPZ	012004½		u			"
ESA	iPZ	023728½		u			"
ESA	iPZ/	104001½		u			"
ESA	iPZ/	195642		u			"
ESA	ePZ	211837		d			"

			T sec	A mm	GM	Dist	H	Remarks
ESA'ALA - continued.								
21st November, 1968 - continued.								
ESA	iPZ/	222442			u			Local
ESA	iPZ	230548	0.5	7.0	u			"
ESA	iPZ	231614½	0.5	5.0	u			"
22nd November, 1968.								
ESA	iPZ	024850½			u			"
ESA	iPZ	034415½			u			"
ESA	ePZ/ eSN/	090642½ 1234½			d	37°		
ESA	iPZ/ iSN/	103733½ 4212½			d	26°		
ESA	iPZ/	114520			u			Distant
ESA	iPZ/	115122			u			Local
ESA	iPZ/	141811			u			"
ESA	iPZ/	154942			d			Distant
ESA	iPZ/	175253			u			Near
23rd November, 1968.								
ESA	iPZ	002855½			u			Local
ESA	iPZ	004945½			u			"
ESA	iPZ/	103125½			u			"
ESA	ePZ/	170205½			u			"
24th November, 1968.								
ESA	iPZ	005542½			u			"
ESA	iPZ/	181918½			d			"
ESA	iPZ/	192414½			u			"
ESA	ePZ/	211619½			d			Teleseism
25th November, 1968.								
ESA	ePZ/	184242			u			Distant
26th November, 1968.								
ESA	iPZ iSN/	011116½ 1207	0.2	1.8	u	4½°	011010	
ESA	iPZ/	063810			u			Regional
27th November, 1968.								
ESA	iPZ	003051			u			Regional
ESA	eiPZ iZ	011357 57½	0.8	1.6	d			Teleseism
ESA	iPZ iSN/	040237½ 0329	0.6	1.0	u	4½°	040130	
ESA	iPZ	071838			u			Regional
ESA	iPZ	232138	0.3	7.9	u			Local

			T sec	A mm	GM	Dist	H	Remarks
ESA'ALA - continued.								
28th November, 1968.								
ESA	iPZ	002756		7.0	d			Regional
ESA	iPZ	003332	0.2	3.4	u			Local
ESA	iPZ	051203½	0.2	9.6	u			Regional
ESA	ePZ/ iSN/	062828 2921			d	4½°	062719	
ESA	iPZ	100720½	0.3	2.0	d			Regional
ESA	iPZ	110432	0.2	6.0	u			Regional
ESA	iPZ	121854	0.4	5.0	d			Regional
ESA	iPZ	143114½	0.5	1.6	d			Regional
ESA	iPZ iSN/	163207 3316½			d	6¼°	163036	
ESA	iPZ/ iSN/	202706½ 27			d	1¾°	202639	
29th November, 1968.								
ESA	iPZ/	093455½			u			Regional
ESA	iPZ	100514	0.4	6.2	u			Regional
ESA	ePZ/	125128			u			Distant
30th November, 1968.								
ESA	iPZ iSN/	000145 0248½	0.5	1.5	d	5½°	000022	
ESA	iPZ	000321			d			Regional
ESA	iPZ	110255	0.3	2.6	d			Regional
ESA	iPZ	165525	0.2	3.2	u			Regional
ESA	iPZ	220438½			u			Regional
1st December, 1968.								
ESA	iPZ	015349	0.2	0.8	u			Local
ESA	iPZ	033051½	0.3	3.0	u			Local
ESA	iPZ	220814½	0.4	2.6	u			Local
2nd December, 1968.								
ESA	iPZ	011119	0.2	3.2	d			Local
ESA	iPZ iSE/	033602 47	0.4	3.4	u	3¾°	033503	
ESA	iPZ/	083343			u			Regional
ESA	iPZ	200025½	0.3	3.0	u			Regional
ESA	iPZ	230517			d			Local
ESA	iPZ	234927	0.2	3.0	u			Local
3rd December, 1968.								
ESA	iPZ	033803.3			u			Local
ESA	iPZ	070316½	0.2	1.0	u			Local
ESA	ePZ	074042			d			Traces
ESA	ePZ	155419	0.2	0.3	u	Epicentre 6.5°S 149.2°E New Britain Region		

			T sec	A mm	GM	Dist	H	Remarks
ESA'ALA - continued.								
3rd December, 1968 - continued.								
ESA	eiPZ iZ iSN/	160951½ 52 1015	0.4	0.2	u	2°	160920	Epicentre 8.2°S 151.0°E East New Guinea Region.
ESA	iPZ	173018	0.1	3.0	u			
ESA	eZ/	193449			-			Traces
4th December, 1968.								
ESA	iPZ	013937			u			Local
ESA	iPZ iSN/	035018 24	0.2	1.7	u	¼°	035010	
ESA	iP!Z	090940½			u			Regional
5th December, 1968.								
ESA	iPZ	034002	0.2	1.4	u			Regional
6th December, 1968.								
ESA	e(P)Z	001610			d			Teleseism
ESA	iPZ	105222½			u			Local
ESA	iPZ	121141½			d			Local
ESA	iPZ	172819			d			Local
7th December, 1968.								
ESA	iPZ	045842	0.5	0.7	u			Regional
ESA	iPZ	050310	0.5	0.4	u		Regional -	In coda of previous shock.
ESA	ePZ iSN/	171239 1549	0.5	0.4	d	18°	170832	
ESA	iP!Z iSN/	173225 4320			u	94½°	171914	
8th December, 1968.								
ESA	iPZ	131625½	0.5	2.2	u			Teleseism
9th December, 1968.								
ESA	iPZ iZ iSZ/	094624½ 26½ 5101½	0.8	1.6	d	27½°	094037	

Rabaul Central Observatory,

19th December, 1968.

G.W. D'ADDARIO

VOLCANOLOGIST-IN-CHARGE.

A MERRY CHRISTMAS AND A HAPPY NEW YEAR TO ALL.

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27 JAN 1969

PEA DEC-68 No. 52453

TERRITORY OF PAPUA AND NEW GUINEA
GEOLOGICAL AND VOLCANOLOGICAL BRANCH
VOLCANOLOGICAL SECTION

PRELIMINARY EARTHQUAKE ANALYSIS
RABAUL CENTRAL OBSERVATORY
1968

Rabaul	RAB	From: DEC. 18. To: DEC. 31.
Rabaul Harbour Network	WAN SUL RAL TAV VUL	From: DEC. 18. To: DEC. 31.
Keravat	KRT	From: NOT OPERATIONAL To:
Esa'Ala	ESA	From: To:
Tabele	TBL	From: To:
Agenahambo	AGE	From: To:
Waris	WAA	Not operational
Ulamona	ULA	Not operational
Piva	PIV	Not operational
Cape Gloucester	LAG	Not operational

STATION PERSONNEL

RAB Central Observatory, Rabaul.

Volcanologist-in-Charge	G.W.D'Addario
Volcanologist	R.F.Heming
Seismologist	M.Mancini
Seismogram	D.J.Cook, R.A.Page
Senior Technical Officer	N.O.Myers
Technical Officer	R.J.Conway
Volcanological Assistants	L.Topue, M.Gaiam, E.Ravian.
Technical Assistant	P.Daimbari
Trainee Volcanological Assistants	B.Talai, M.Salaiau, C.Matupit
Secretary	H.James

KRT Keravat Outstation.

Observer (part-time)	G.E.Chorick

TBL Tabele Observatory.

Observer	V.Kaita

ESA Esa'ala Observatory.

Observer	F.Dira

AGE Agenahambo Outstation.

Observer (part-time)	B.Kirke

The Rabaul Preliminary Earthquake Analysis (PEA) is produced by the staff under the direction of the Volcanologist-in-Charge from whom additional information and photocopies of seismogram records from all stations may be obtained on request.

Please address all communications to:-

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P.O. Box 386,
RABAUL. T.N.G.

SEISMOGRAPH STATIONS

STATION	CODE	SOUTH LATITUDE	EAST LONGITUDE	ELEV. (m)	FOUNDATION
NEW GUINEA					
Rabaul	RAB	04°11'28.6"	152°10'11.4"	183.5	Basalt Flow
Wanliss Street	WAN*	04°11'39.6"	152°10'32.5"	25.0	Basalt Flow
Sulphur Creek	SUL*	04°13'09.8"	152°10'33.3"	8.5	Unconsolidated Volcanic Ash
Rabaulanakaia	RAL*	04°13'13.0"	152°12'07.0"	91.0	Unconsolidated Volcanic Ash
Tavurvur	TAV*	04°13'52.18"	152°13'12.99"	27.0	Andesitic Flow
Taviliu	VUL*	04°16'58.2"	152°08'44.6"	332.2	Unconsolidated Volcanic Ash
Keravat	KRT	04°21'10.5"	152°03'06"	20.0	Alluvium
Tabele	TBL	04°06'04.67"	145°00'41.37"	179.5	Basalt Flow
Waris	WAA	04°07'00"	145°06'00"	48.0	Lapilli Tuff
Piva	PIV	06°12'00"	155°03'30"	60.0	Alluvium
Cape Gloucester	LAG	04°27'20"	148°26'00"	24.0	Lapilli Tuff
Ulamona	ULA	04°59'24.0"	151°16'30.0"	17.0	Lapilli Tuff
PAPUA.					
Agenahambo	AGE	08°48'49"	148°05'56"	303.0	Unconsolidated Volcanic Ash
Esa'Ala	ESA	09°44'18.2"	150°48'50.7"	46.4	Granite Gneiss

* RABAUL HARBOUR NETWORK

STATION INSTRUMENTATION

STATION & INSTRUMENTS	COMP.	To.	Tg.	TRACE SPEED mm/min	APPROXIMATE RELATIVE MAGNIFICATION	APPROXIMATE DAMPING
NEW GUINEA.						
Rabaul Central Observatory, Rabaul.						
World Wide Standard	Z	1.0	0.74	60	12,500	Critical
	N.E	1.0	0.74	60	6,250	Critical
	Z/N/E/	15.0	100.0	15	750	Critical
Benioff VR 14.7Kg.	Zh	1.0	0.02	180+	4,000	Critical
+ Recording is triggered by the onset of any earthquake with pre-determined minimum amplitude. Recorder is stopped automatically by hour break pulse.						
Omori 15Kg.	No	3.6	-	24	12	10.1 Air
Omori 15Kg.	Eo	3.8	-	24	10	10.1 Air
Wood Anderson Torsion	Na, Ea	0.8	-	60	2,800	Critical
Rabaul Harbour Network.						
Readings from the Harbour Network are entered in the PEA only for large earthquakes, with impulsive and sharply defined onset of phases.						
WAN° Benioff VR 14.7Kg.Z		1.0	0.02	60	5,700	Critical
SUL° Benioff VR 14.7Kg Z		1.0	0.02	60	1,425	Critical
RAL° Benioff VR 14.7Kg.Z		1.0	0.02	60	5,700	Critical
TAV° Benioff VR 14.7Kg.Z		1.0	0.02	60	11,400	Critical
VUL° Benioff VR 14.7Kg.Z		1.0	0.02	60	5,700	Critical

Station & Instruments	Comp	To	Tg	Trace Speed mm/min	Approximate Relative Magnification	Approximate Damping
Rabaul Harbour Network (continued)						
° Signals from these stations are telemetered by land line to Helicorders (Geotech Mod. 2484) at the Central Observatory.						
°° Signals from this station are telemetered via VHF to its Helicorder at the Central Observatory.						
KRT Keravat Out-station						
Benioff MC 50Kg	Z	1.2	0.2	15	20% sensitivity	critical
Benioff MC 50Kg	N,E	1.2	0.2	15	10% sensitivity	critical
ULA Ulamona Field Station						
Willmore portable	Z	0.6	0.25	60	3000	underdamped
PIV Piva Field Station						
Willmore portable	Z	0.6	0.25	60	3000	underdamped
WAA Waris Field Station						
Willmore portable	Z	0.6	0.25	60	3000	underdamped
LAG Cape Gloucester						
Willmore portable	Z	0.6	0.25	60	3000	underdamped
N.B. These field stations consist of a permanent building in which instruments are installed when necessary. Details of emergency field stations within the Territory will be listed when in operation.						
TBL Tabele Observatory						
Benioff VR 107.5Kg	Z	1.0	0.2	60	1350	critical
(PAPUA)						
ESA Esa'Ala Observatory						
Benioff VR 107.5Kg	Z	1.0	0.2	15	36000	critical
Benioff VR 107.5Kg	N,E	1.0	0.2	15	18000	critical
Benioff VR 107.5Kg	Z/N/E/	1.0	60.0	30	50% sensitivity	critical
AGE Agenahambo Station						
Willmore portable	Z	0.6	0.25	60	3000	underdamped

VR Variable Reluctance

MC Moving-coil

Relative magnification curves of seismograph systems installed in the stations controlled by the Rabaul Central Observatory are listed once a month in the PEA.

PRESENTATION OF DATA

(reviewed in November, 1967)

All times are reduced to Greenwich Mean Time (GMT), which is 10 hours behind Eastern Standard Time.

At RAB and Harbour Network, the time signal is marked every minute on each seismogram record from the Observatory crystal chronometer. Second marks from radio signal VNG (Australia) are recorded on World-Wide Standard System S.P.=N component only according to the W.W.S.S. programme, at six hour intervals. Primary time is provided by W.W.S.S. equipment and secondary time by a Labtronic crystal chronometer with the accuracy of $\pm$ 5ms per day compared with VNG (Australia) with the aid of a chronoscope.

At TBL and AGE, the time signal is derived from a spring driven chronometer (Mercer) and marked each minute on records. Time accuracy is determined by comparison with signals from WWVH daily. Linear correction is applied to the daily drift.

On all seismogram records time increases from left to right and time break is upward.

At RAB* and Harbour Network the recording drum of each seismograph is driven by a 110VAC 60Hz synchronous motor. The 110VAC is frequency regulated by a crystal chronometer.

* The Omori recording drum is driven by a nonregulated 50Hz frequency supply.

At ESA and KRT power for recorder motors is frequency regulated by a crystal chronometer at 50Hz. Power for AGE and TBL and field stations is supplied by a 50Hz free running oscillator.

Direction of Motion

Upward direction of ground motion corresponds to upward trace motion on vertical seismogram records. Direction of component of ground motion to North or East corresponds to upward trace motion on horizontal seismogram records.

Vertical trace motion from impulsive onset of longitudinal waves of compressional or dilational ground movement is indicated by "u" or "d" accompanied by N,S,E, or W as per trace motion amplitude on horizontal seismogram records, to represent vectorially the direction of ground motion. "+" or "-" indicates upward or downward motion of the ground respectively, from a wave not known to be of the longitudinal type.

Accuracy of Readings

When readings are given with a decimal figure, they are to 1/10 of a second, other readings have been made to the nearest half second.

Crustal Phases

Px, Sx, Crustal phases, other than Pn and Sn for local and near earthquakes.

Felt Intensity

Information on maximum intensities of shocks reported felt is included. Intensities are given in Roman numerals based on the Modified Mercalli scale, of 1931.

Determination of Epicentre.

Where no source is cited, the determination of epicentral distance and origin time for local and regional earthquakes is carried out at the Central Observatory, Rabaul, from the S-P travel times, assuming a normal depth of the focus.

Geographical Designation of Epicentre.

The regional names which follow the co-ordinates of epicentres located at the Central Observatory are meant only to supplement the co-ordinates and normally follow well known geographical rather than geological features. Use is made of the full degree blocks according to the method defined by E.A. Flinn and E.R. Engdahl in "A PROPOSED BASIS FOR GEOGRAPHICAL AND SEISMIC REGIONALIZATION", Seismic Data Laboratory Report No. 101, U.I.D. Inc., Alexandria, Virginia, 1964, adopted by the U.S.C.G.S. for computer requirements.

Magnitude Definition and Determination.

M_L - Local Magnitude (Richter, 1935) is calculated from the recorded trace amplitude of the Wood Anderson torsion seismographs of stated physical constants (installed at the Observatory in Nov. 1967).

Maximum trace amplitude (0 to peak) expressed in millimetres and tenths is measured directly on both components. Magnitude is determined independently and the arithmetic mean taken. M_L values are given to the tenth of a unit.

The station correction factor is assumed to be zero until better known.

M_S - Surface Wave Magnitude (Gutemberg & Richter, 1956) is calculated from the amplitude of surface waves of period near 20 seconds for shallow distant earthquakes.

M_B - Body Wave Magnitude is calculated from the ratio of amplitude over period for body waves on P - Z of World Wide Seismograph System only when depth is known. The magnification factor for the standard seismograph is taken into account.

m - Unified Magnitude (Gutemberg & Richter, 1956) has the following relation to M_L, M_S and M_B.

$$m = 1.7 + 0.8\ M_L - 0.01\ M^2_L$$

$$m = M_B \text{ (without correction)}$$

$$m = 2.5 + 0.63\ M_S$$

Local Magnitude of earthquakes recorded at RAB with clear S-P interval is tabulated on a Day-Distance (in Central Angle Degrees) graph which is added to the PEA monthly.

Symbols.

i - impulsive and sharply defined beginning of a phase.

e - emergent and poorly defined beginning of a phase.

T - Period in seconds.

A - Peak to Trough trace amplitude in millimetres.

GM - Ground motion.

Dist - Epicentral distance in central angle degrees.

H - Origin time.

h - Focal depth in kilometres.

CBM - Confused by microseisms.

PRESENTATION OF DATA (CONTINUED)

Remarks

Local - Typical signature of an earthquake with epicentre within 0.9°.

Near - Typical signature of an earthquake with epicentre between 0.9° and 9°.

Distant - Typical signature of an earthquake with epicentre between 9° and 45°.

Teleseism - Typical signature of an earthquake with epicentre more than 45°.

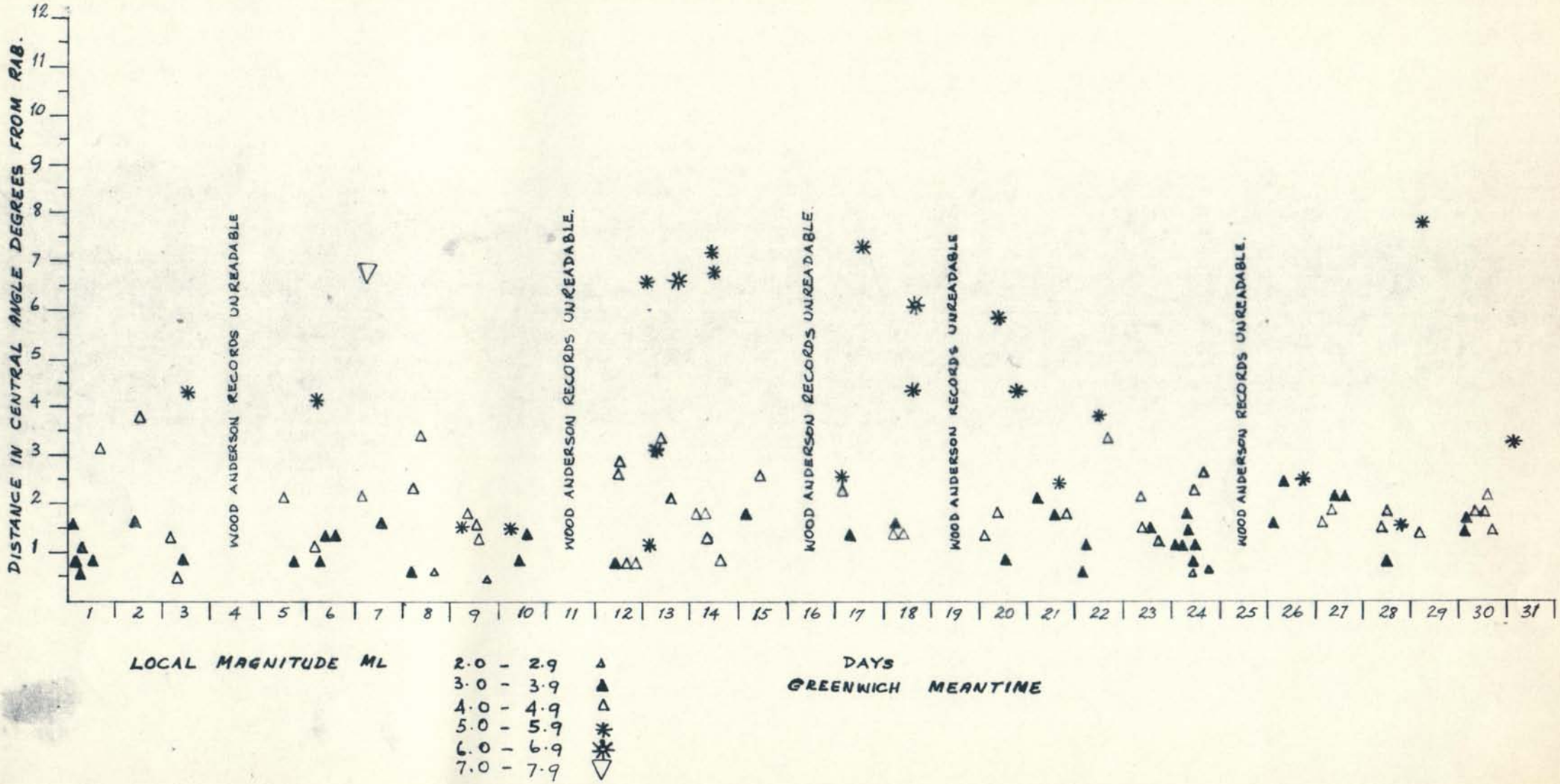
Traces - Any recorded disperse waves or very weak unknown earthquake phases.

Local and Near earthquakes will be classified Regional, and Distant earthquakes will be grouped with Teleseisms if sheer waves and their reflections are unidentifiable.

G.W. D'ADDARIO

VOLCANOLOGIST-IN-CHARGE.

Magnitude Of Regional Earthquakes With A Clear S_P Interval
December, 1968.



TOTAL NUMBER OF EARTHQUAKES AS RECORDED AND CLASSIFIED AT EACH STATION FOR THE MONTH OF DECEMBER 1968

LOCAL -0 -.9°					NEAR 0.9°- 9°					REGIONAL					DISTANT 9° - 45°					TELESEISM 45°- -					TRACES				
24	16	11	17	17	108	74	40	82	87	36	12	3	17	18	29	6	2	8	10	5	2	2	2	3	26				
15					86					18					9					2									

RAB	WAN	SUL	RAL	TAV
VUL	ESA	TBL	AGE	KRT

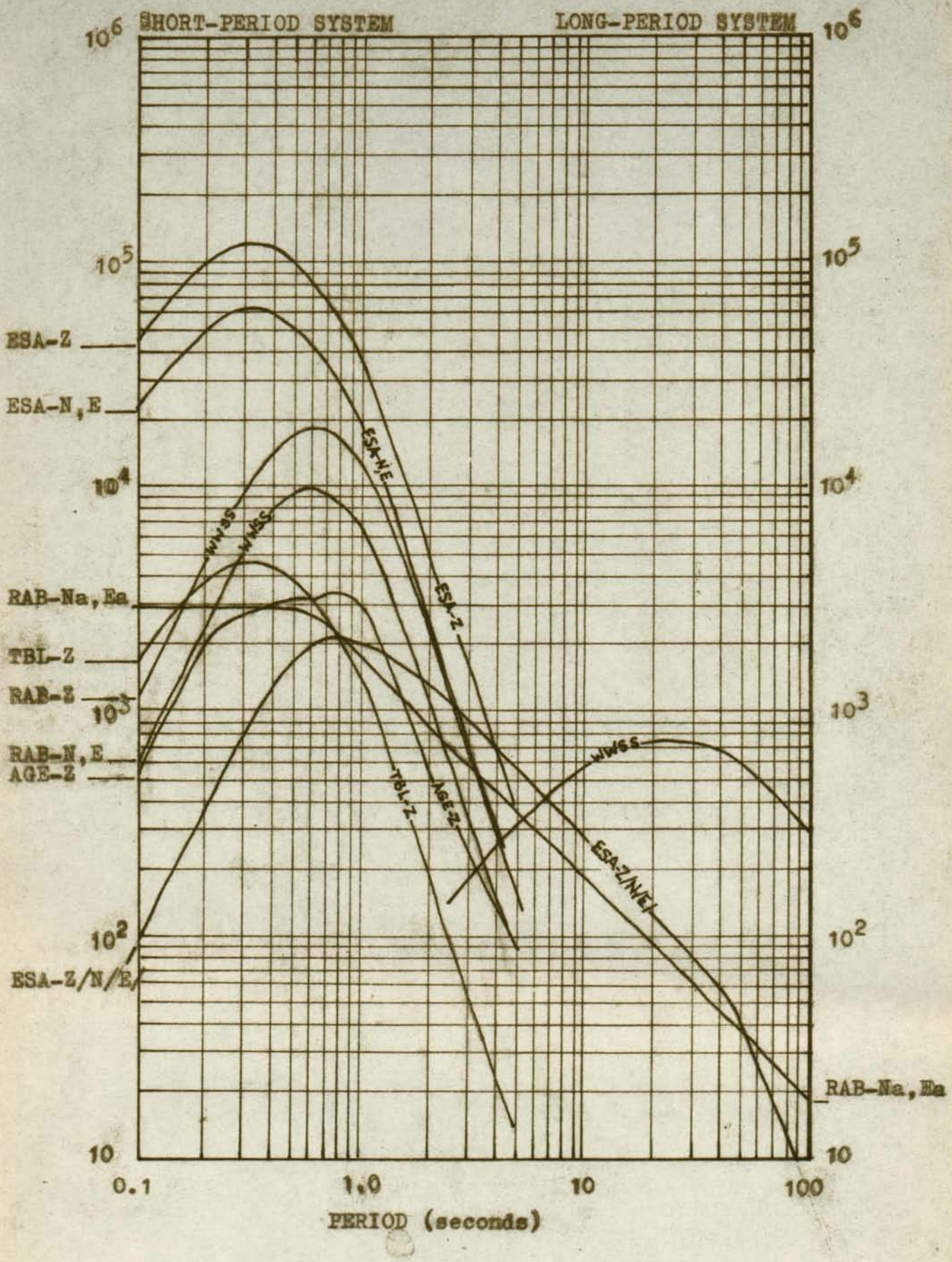
OBSERVATORIES
RABAUL CENTRAL (W.W.S.S.) - RAB
ESA'ALA - ESA
TABELE - TBL

RABAUL OUTER NETWORK
KEREVAT - KRT

RABAUL INNER NETWORK
WANLISS STREET - WAN
SULPHUR CREEK - SUL
RABALANAKAIA - RAL
TAVURVUR - TAV
TAVILIU - VUL

STATION
AGENAHAMBO - AGE

HES A 32/1/69



FREQUENCY RESPONSE CURVES OF THE INSTRUMENTS

GWDA Nov.67

			T sec	A mm	GM	Dist	H	Remarks
RABAUL.								
18th December, 1968.								
		W.W.S.S. LP Z record not available for study due to faulty developing.						
		Microseismic activity from 17th 2256 - 18th 0700.						
RAB	iZ	2318	0.4	3.6				Harmonic disturbance
	FZ	43						
RAB	iZ	0557	0.4	3.4				Harmonic disturbance
	FZ	0613						
RAB	iPZ	071737.6	0.4	11.6	d	1¼°	071716	M_L=4.3
	iSN	53.4						
WAN	iPZ	38.4			u	1¼°	071718	
	iSZ	53.6						
SUL	iPZ	38.2	0.6	4.0	d	1°	071719	
	iSZ	52.0						
RAL	iPZ	38.6	0.6	4.6	d			
TAV	iPZ	37.6			d	1°	071719	
	iSN	52.0						
VUL	iPZ	36.8			d	1¼°	071717	
	iSZ	51.4						
RAB	iPZ	091212.2	0.3	1.4	u	1½°	091147	M_L=3.9
	iSN	30.8						
SUL	iPZ	12.2			d	1½°	091147	
	iSZ	30.8						
RAL	iPZ	11.6			u	1¼°	091150	
	iSZ	28.0						
TAV	iPZ	11.4			d	1¼°	091149	
	iSNw	28.0						
VUL	iPZ	11.8	0.4		d	1½°	091147	
	iSZ	30.8						
RAB	ePZ	111245½			d	2½°	111205	M_L=4.3
	iSN	1316.0						
RAL	iPZ	1245.2			d	2½°	111204	
	iSZ	1315.8						
TAV	iPZ	1244.6	0.4	1.7	u	2½°	111206	
	iSNw	1314.0						
VUL	iPZ	1244.8		1.4	d	2½°	111205	
	iSZ	1315.2						
RAB	iPZ	111642.2	0.5	10.2	d			Regional
WAN	iPZ	42.4			d			
SUL	iPZ	42.6	0.3	3.0	d			
RAL	iPZ	42.6			d			
TAV	iPZ	43.0	0.3	2.6	d			
VUL	iPZ	42.0			d			

			T sec	A mm	GM	Dist	H	Remarks
18th December, 1968 - continued.								
RAB	iPZ	123402.0	1.0	4.2	u			Regional
WAN	iPZ	02.2	1.0	1.0	d			
RAL	iPZ	02.5	0.8	3.4	d			
TAV	iPZ	02.4	1.0	2.4	u			
VUL	ePZ	01½	0.8	9.0	u			
RAB	iPZ	165800.2			d			Regional
RAL	iPZ	5759.9			d			
TAV	iPZ	59.6			d			
VUL	iPZ	59.4	0.4	3.0	d			
RAB	iPZ	185017.6	0.5	4.0	u			Regional
WAN	iPZ	17.4	0.5	1.0	d			
RAL	iPZ	18.0	0.5	2.2	u			
TAV	iPZ	18.0	0.6	1.4	u			
VUL	iPZ	17.0	0.6	2.4	u			
RAB	iPZ iSN	201553.4 1702.8	0.8	69.6	d	6°	201424	M_L=6.2 M_B=6.4 Felt Kilenge Int. BII 7.4°S 144.2°E
WAN	iPZ	1553.6	0.8	17.4	d			
SUL	iPZ	54.2			u			
RAL	iPZ	53.8		45.4	d			
TAV	iPZ	54.0		35.0	d			
VUL	iPZ	53.2	0.8	13.8	u			
RAB	iPZ iSN	205605.2 53.2	0.6	3.0	u	4¼°	205503	M_L=5.2
WAN	iPZ	05.2			d			
RAL	iPZ	04.8		9.0	d			
TAV	iPZ iSNw	04.6 51.5			u	4°	205503	
VUL	iPZ	04.8	0.4	7.0	u			
RAB	iZ FZ	2304 11	0.4	3.8				Man-made disturbance, pile driver working on new wharf area, Simpson Harbour, Rabaul.

19th December, 1968.

W.W.S. Record from Wood Anderson Seismograph not available for study.

RAB	iPZ	003127.4			u			Distant
TAV	ePZ	27½			d			
VUL	ePZ	27			d			
RAB	iZ FZ	0136 49	0.4	4.2				Man-made disturbance, pile driver working on new wharf area, Simpson Harbour, Rabaul.

			T sec	A mm	GM	Dist	H	Remarks
19th December, 1968 - continued.								
RAB	iZ	0429	0.4	4.0				Man-made disturbance,
	FZ	50						pile driver working on
								new wharf area, Simpson
								Harbour, Rabaul.
RAB	iZ	0543	0.4	4.0				"
	FZ	58						
RAB	iZ	0700	0.4	3.8				"
	FZ	10						
RAB	iZ	0714	0.6	3.0				"
	FZ	32						
RAB	iPZ	102147.4	0.5	2.0	d	2°	102117	
	iZ	48.8						
	iSN	2210.0						
WAN	iPZ	2147.3	0.2	2.7	d	2°	102117	
	iZ	48.4						
	iSZ	2210.0						
SUL	ePZ	2147½	0.2	1.2	d	1¾°	102118	
	iZ	48.4						
	iSZ	2209.0						
RAL	iPZ	2146.9		1.2	d	2°	102117	
	iZ	48.0						
	iSZ	2209.4						
TAV	iPZ	2146.8			d	1¾°	102119	
	iSNw	2208.0						
VUL	iPZ	2147.4	0.3	5.0	d	2°	102116	
	iSZ	2211.0						
RAB	ePZ/	113018			u	43½°		
	eSN/	3646						
RAB	ePZ	144842½			d			Distant
RAB	iPZ	152446.0	1.6	7.2	u	58°		M_B=6.5
	iSN/	3244						
WAN	ePZ	2446		1.0	u			
SUL	ePZ	46			u			
RAL	ePZ	45½		3.2	u			
TAV	ePZ	46	1.0	2.0	u			
VUL	iPZ	46.5		1.8	u			
RAB	ePZ	164217	1.2	5.6	u			Regional
WAN	ePZ	17	1.0	0.8	u			
SUL	ePZ	17						
RAL	iPZ	16.4	1.0	5.6	u			
TAV	ePZ	16½	1.0	1.5	u			
VUL	iPZ	17.4	1.0	1.8	d			

			T sec	A mm	GM	Dist	H	Remarks
19th December, 1968 - continued.								
RAB	iPZ	170143.8	0.5	1.9	u	3¼°	170053	
	iSN	0223.0						
WAN	ePZ	0144			d			
SUL	iPZ	43.8			u			
RAL	iPZ	43.8	0.2	2.6	u	3¼°	170053	
	iSZ	0223.0						
TAV	iPZ	0143.0		5.5	u	3¼°	170052	
	iSNw	0222.0						
VUL	iPZ	0143.0	0.2	2.8	d	3¼°	170052	
	iSZ	0222.1						
RAB	iPZ	170450.8	0.4	1.9	u	2½°	170411	
	iSN	0520.5						
WAN	ePZ	0450½			u			
SUL	iPZ	50.6			u			
RAL	iPZ	49.3	0.5	4.0	d	2½°	170411	
	iSZ	0518.4						
TAV	iPZ	0448.5	0.5	4.2	u	2½°	170410	
	iSNw	0517.2						
VUL	iPZ	0449.0	0.5	7.0	d	2½°	170411	
	iSZ	0518.0						
RAB	iPZ	205318.7	0.4	4.0	d	1½°	205252	
	iSN	38.2						
WAN	iPZ	18.6		4.8	d	1½°	205253	
	iSZ	37.6						
SUL	iPZ	18.8	0.2	1.8	u			
RAL	iPZ	18.4		3.5	d	1½°	205253	
	iSZ	37.0						
TAV	iPZ	19.0	0.2	2.2	d			
VUL	iPZ	18.0	0.4	22.2	d	1½°	205254	
	iSZ	36.2						
RAB	iZ	2242	0.4	3.2				Man-made disturbance, pile driver working on new wharf area, Simpson Harbour, Rabaul.
	FZ	50						
RAB	iZ	2354	0.4	3.1				"
	FZ	0021						
WAN	iZ	2354	0.4	2.0				"
	FZ	0021						
20th December, 1968.								
RAB	iZ	0336	0.4	3.8				"
	FZ	49						
WAN	iZ	36	0.4	2.0				"
	FZ	49						

			T sec	A mm	GM	Dist	H	Remarks
20th December, 1968 - continued.								
RAB	iPZ iSE/	035149.4 5206	0.5	10.0	u	1¼°	035127	M_L=4.5
WAN	iPZ	5149.6	0.3	5.4	u			
SUL	iPZ	50.4	0.5	3.0	u			
RAL	eiPZ iZ	50 50.4	0.6	4.2	u			
TAV	eiPZ	50½			u			
VUL	iPZ	50.4	0.5	8.2	u			
RAB	iZ FZ	0519 43	0.4	4.3				Man-made disturbance, pile driver working on new wharf area, Simpson Harbour, Rabaul.
WAN	iZ FZ	19 43	0.3	2.0				"
RAB	iPZ iSN	120133.2 54.0	0.4	3.5	d	1¾°	120105	M_L=4.5
WAN	iPZ iSZ	33.4 53.0	0.3	1.9	d	1½°	120107	
SUL	ePZ iSZ	33½ 53.0			d	1½°	120107	
RAL	iPZ iSZ	33.4 53.0		5.0	d	1½°	120107	
TAV	iPZ iSZ	32.4 53.0			d	1¾°	120105	
VUL	iPZ iSZ	33.2 53.0	0.3	7.0	d	1½°	120107	
RAB	iPZ eSE/	133004.1 3109	0.8	2.4	d	5¾°	132840	M_L=5.2
WAN	ePZ	3005			d			
RAL	ePZ	04½			d			
TAV	ePZ	04			d			
VUL	ePZ	03½						
RAB	iPZ iSN	153432.8 44.0	0.5	10.1	d	¾°	153418	M_L=3.6
WAN	iPZ	32.6			d			
SUL	iPZ	32.6			d			
RAL	iPZ	32.4	0.6	26.0	d			
TAV	iPZ	31.9			d			
VUL	iPZ iSZ	32.4 45.0	0.8	16.4	d	1°	153415	
RAB	iPZ	200214.9	0.8	2.0	u			Distant
RAB	iPZ e(S)N/	214802.5 53(09)		1.4	u	(33°)		
RAB	iZ FZ	2151 2233	0.4	3.4				Man-made disturbance, pile driver working on new wharf area, Simpson Harbour, Rabaul.
WAN	iZ FZ	2152 2214		1.0				"

			T sec	A mm	GM	Dist	H	Remarks
20th December, 1968 - continued.								
RAB	iPZ iSN	234844.6 4932.6			u	4¼°	234742	M_L=5.9
WAN	iP!Z	4844.6		45.0	u			
SUL	iP!Z	45.0		52.0	u			
RAL	iPZ	44.8			u			
TAV	iPZ	44.8			u			
VUL	iP!Z	43.4	0.3	56.0	u			
RAB	iZ FZ	2355 0008	0.4	4.0				Man-made disturbance, pile driver working on new wharf area, Simpson Harbour, Rabaul.
WAN	iZ FZ	2355 0008	0.2	2.6				"
21st December, 1968.								
RAB	iZ FZ	0345 53	0.4	3.1				"
WAN	iZ FZ	45 53	0.4	1.4				"
RAB	iPZ iSN	060138.9 0201.4	0.6	3.0	d	2°	060109	M_L=3.9
RAB	iPZ iSN	182148.2 2210.0	0.5	2.8	d	1¾°	182119	M_L=3.9
RAB	eiPZ iZ iSN	204841½ 42.0 4908.0	0.4	2.4	d	2¼°	204806	M_L=5.0
WAN	ePZ	4841½			d			
RAL	iPZ iSZ	41.2 4908.0			d	2¼°	204806	
TAV	ePZ	4840						
VUL	iPZ	39.0	0.5	3.0	d			
RAB	iPZ iSE	213931.4 53.8	0.6	5.4	d	1¾°	213902	M_L=4.4
WAN	ePZ iSZ	31 53.6			d	2°	213901	
SUL	ePZ	31			d			
RAL	iPZ iSZ	30.8 51.6	0.8	10.8	d	1¾°	213903	
TAV	iPZ iSNw	30.2 50.8			d	1¾°	213902	
VUL	iPZ iSZ	30.4 53.0	0.8	3.0	d	2°	213900	
22nd December, 1968.								
RAB	ePZ	043904½	0.5	2.0	d			Regional
RAB	ePZ eSE	054959 5007	0.5	1.0	d	½°	054948	M_L=3.0
RAB	iPZ iSN	075527.5 41.0	0.5	2.0	u	1°	075509	M_L=3.4

			T sec	A mm	GM	Dist	H	Remarks
22nd December, 1968 - continued.								
RAB	iPZ	091656.0	1.0	4.0	d			Regional
TAV	iPZ	56.2	1.0	2.0	d			
VUL	iPZ	56.5	1.0	3.0	d			
RAB	ePZ	152810	0.8	3.0	u	(3¼°)	1527(13)	M_L=5.5
	i(S)E/	54						
WAN	iPZ	10.8	0.6	2.5	u			
SUL	iPZ	11.0	0.5	1.6	d			
RAL	ePZ	11	1.0	7.0	d			
TAV	ePZ	11½	0.5	1.0	d			
RAB	ePZ	172342	0.4	1.0	d	3¼°	172252	M_L=4.6
	iSN	2420.0						
TAV	iPZ	2341.6	0.2	1.2	d	3¼°	172251	
	iSZ	2421.0						
VUL	iPZ	2341.4	2.0	1.0	d	3¼°	172252	
	iSZ	2419.0						
RAB	ePZ	174326	1.0	3.5	d	19°		M_B=5.2
	iSE/	4704						
TAV	iPZ	4326.5	1.0	2.5	d			
VUL	iPZ	26.0	1.0	3.5	d			
23rd December, 1968.								
RAB	iZ	0147	0.4	3.0				Man-made disturbance, pile driver working on new wharf area, Simpson Harbour, Rabaul.
	FZ	59						
RAB	iPZ	055826.4	0.5	3.5	u	27°		M_B=5.7
	eSN/	060304						
VUL	iPZ	26.3	0.6	2.1	u			
RAB	iPZ	093628.1	0.4	2.5	u	2°	093555	M_L=4.0
	iSN	53.4						
RAB	iPZ	114635.4	0.3	3.5	d	1½°	114610	M_L=4.4
	iSN	54.4						
WAN	iPZ	35.5	0.4	0.6	u	1½°	114610	
	iSZ	54.5						
RAL	iPZ	35.0			d	1½°	114611	
	iSZ	53.0						
TAV	iPZ	34.8			d	1½°	114610	
	eSZ	54						
VUL	iPZ	35.7	0.5	7.0	d	1¼°	114613	
	eSZ	53						
RAB	iPZ	134058.0	0.4	1.2	u	1½°	134033	M_L=3.7
	iSN	4117.0						
WAN	ePZ	4058			u			
RAL	ePZ	58			d			
VUL	iPZ	57.3		4.7	u			

			T sec	A mm	GM	Dist	H	Remarks
23rd December, 1968 - continued.								
RAB	iPZ	160305.8	0.4	4.0	d			Regional
WAN	ePZ	06	0.4	1.4	u			
TAV	ePZ	05½	0.4	1.9	d			
VUL	iPZ	05.0	0.4	3.0	u			
RAB	iPZ	173820.1	0.4	6.0	d	1¼°	173800	M_L=3.8
	iSN	35.0						
WAN	iPZ	20.0	0.2	1.5	d	1¼°	173759	
	iSZ	35.5						
SUL	iPZ	20.0	0.4	2.0	d	1¼°	173800	
	iSZ	34.5						
RAL	ePZ	19½	0.5	20.0	d	1¼°	173759	
	eSZ	34						
TAV	iPZ	19.2			d	1°	173800	
	iSZ	33.5						
VUL	iPZ	19.0	0.2	5.0	d	1°	173800	
	iSZ	33.2						
RAB	ePZ	201615	0.6	1.0	u			Distant Felt Telefomin Int. II 5.2°S 141.6°E
RAB	iPZ	234554.4	0.5	3.0	u			Regional
RAL	iPZ	53.8			u			
TAV	ePZ	51			u			
VUL	iPZ	51.4			u			
24th December, 1968.								
RAB	iPZ	002413.9	0.7	8.0	d	1°	002356	M_L=3.6
	iSN	27.0						
WAN	iPZ	13.9	0.2	2.0	u	1°	002356	
	iSZ	27.2						
SUL	iPZ	14.0	0.3	2.0	u			
RAL	iPZ	13.6			d			
TAV	iPZ	13.0			d	1°	002355	
	iSZ	26.0						
VUL	iPZ	12.8	0.1	21.0	u	1°	002355	
	iSZ	26.0						
RAB	iPZ	011604.1	0.5	4.0	u			Regional
WAN	iPZ	04.0			u			
RAL	ePZ	04½			u			
TAV	iPZ	03.8			u			
VUL	ePZ	03½	0.4	0.6	u			
RAB	iPZ	060805.0	0.6	2.0	u	1°	060749	M_L=3.1
	iSE	16.8						
RAL	iPZ	05.4	0.5	1.8	d			
VUL	iPZ	07.4			d			

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			T sec	A mm	GM	Dist	H	Rmearks
24th December, 1968 - continued.								
RAB	iPZ iSE	084455.7 4516.8	0.4	3.5	d	1¾°	084428	M_L=3.8
WAN	iPZ iSZ	4455.8 4516.5		1.2	u	1¾°	084428	
RAL	iPZ	4455.9	0.2	0.5	d			
TAV	ePZ	56			d			
VUL	iPZ iSZ	54.4 4516.0	0.4	4.8	d	1¾°	084425	
RAB	iPZ iSE	103252.4 3311.0	0.5	3.6	u	1½°	103227	M_L=3.6
WAN	iPZ	3253.0			d			
RAL	iPZ iSZ	54.5 3314.0	0.6	3.0	u	1½°	103228	
TAV	iPZ iSNw	3255.0 3315.0	0.5	1.0	d	1½°	103229	
VUL	iPZ	3255.2	0.6	0.8	d			
RAB	iPZ	113041.4	0.4	2.4	u			
WAN	iPZ	40.8			d			
SUL	iPZ	41.0			u			
RAL	iPZ	40.4	0.3	5.0	u			
TAV	iPZ iSNw	40.2 56.0	0.4	4.0	u	1¼°	113019	
VUL	iPZ	40.2	0.2	7.0	u			
RAB	iPZ	115951.3	0.5	2.2	u			Regional
RAL	iPZ	51.4			u			
TAV	iPZ	54.0	0.5	1.0	u			
VUL	iPZ	51.2			u			
RAB	iPZ eSN/ eZ/	130659.5 1604 1816	0.7	2.4	d	72°		M_B=4.8
RAL	iPZ	0659.0	0.4	0.6	d			
TAV	iPZ	58.5	0.7	0.6	u			
VUL	iPZ	59.0	0.6	1.0	d			
RAB	iPZ iSE	144307.5 34.0	0.4	4.0	u	2¼°	144232	M_L=4.6
WAN	iPZ iSZ	07.2 33.5	0.2	2.0	d	2¼°	144233	
SUL	iPZ	07.5	0.2	0.4	u			
RAL	iPZ	07.6	0.2	2.0	u			
TAV	iPZ	08.0	0.3	1.8	u			
VUL	iPZ iSZ	04.6 31.5		4.0	u	2¼°	144229	
RAB	iPZ iSN	145924.4 34.0	0.5	1.4	u	¾°	145911	M_L=3.0
TAV	iPZ	24.0			u			
VUL	iPZ iSZ	26.0 38.6	0.5	1.0	d	1°	145908	

			T sec	A mm	GM	Dist	H	Remarks
24th December, 1968 - continued.								
RAB	iPZ	151526.0	0.5	2.0	d	¼°	151518	
	iSN	31.5						
WAN	iPZ	25.5			d			
SUL	iPZ	25.8			u			
RAL	iPZ	25.5	0.6	1.5	d			
TAV	iPZ	25.6	0.3	3.0	u	¼°	151519	
	iSNw	30.5						
VUL	iPZ	25.4	0.4	3.0	d			
RAB	iPZ	153149.5	0.4	1.0	u	½°	153140	M_L=2.1
	iSE	56.6						
RAB	iPZ	163334.0			d	1°	163318	M_L=3.1
	iSE	45.6						
RAB	eZ/	170508			+			Traces
RAB	iPZ	195258.2	0.5	1.0	d	2½°	195219	M_L=4.0
	iSN	5327.8						
RAL	iPZ	5257.2	0.5	0.6	d	2½°	195219	
	iSZ	5326.0						
TAV	iPZ	5257.2	0.2	3.0	d	2½°	195216	
	iSNw	5328.6						
VUL	iPZ	5257.8	0.2	2.8	d			
RAB	iPZ	200157.2	0.5	0.5	d	½°	200146	M_L=2.9
	iSE	0205.5						
25th December, 1968.								
RAB	iPZ	040505.0			d			Regional
WAN	iPZ	05.5	0.9	1.6	u			
RAL	iPZ	05.1	0.9	3.0	d			
TAV	iPZ	05.0	1.0	2.1	u			
VUL	iPZ	05.4	0.3		d			
RAB	iPZ	101351.2		25.5	d			Regional
WAN	iPZ	51.2		11.9	d			
RAL	iPZ	51.1		22.0	d			
TAV	iPZ	51.0			d			
VUL	iPZ	52.0	0.2		d			
RAB	iPZ	152843.1	0.6	3.5	u			Regional
WAN	ePZ	42			u			
RAL	iPZ	40.5	0.5	4.0	u			
TAV	ePZ	41		3.0	u			
VUL	iPZ	42.3	0.5	2.1	u			
RAB	iPZ	172621.6	0.3	2.0	d			Regional
WAN	ePZ	21			d			
RAL	iPZ	21.5	0.4	6.2	d			
TAV	iPZ	21.1	0.2		d			
VUL	iPZ	20.9	0.3	2.0	u			

			T sec	A mm	GM	Dist	H	Remarks
25th December, 1968 - continued.								
RAB	iPZ	201036.4	0.6	3.4	d	1¾°	201007	
	iSN	58.0						
WAN	ePZ	36½		2.1	d			
RAL	iPZ	36.3	0.3		d	1¾°	201007	
	iSZ	58.2						
TAV	iPZ	36.1			d	1¾°	201008	
	iSZ	57.5						
VUL	iPZ	36.5	0.2	3.4	d	1¾°	201007	
	iSZ	58.4						
26th December, 1968.								
RAB	iPZ	022936.4	0.3	3.0	u	1½°	022913	M_L=3.2
	iSE	53.0						
RAL	iPZ	36.0	0.6	8.3	u			
TAV	iPZ	35.7			d	1¼°	022916	
	iSZ	51.1						
VUL	iPZ	35.4		2.8	d	1½°	022912	
	iSZ	52.9						
RAB	eZ/	031118			-			Traces
RAB	iPZ	041929.4	0.4	2.6	u			Regional
RAL	iPZ	28.2			d			
TAV	iPZ	28.1			d			
VUL	iPZ	29.5	0.4	4.8	d			
RAB	eZ/	090802			-			Traces
RAB	iPZ	113941.2	0.5	1.4	u	2¼°	113907	M_L=3.8
	iSN	4007.4						
WAN	ePZ	3941			u			
RAL	iPZ	40.8	0.5		u	2¼°	113906	
	iSZ	4006.4						
TAV	iPZ	3938.1	0.2	1.4	d			
VUL	iPZ	38.2	0.4	2.4	d	2¼°	113903	
	iSZ	4005.3						
RAB	iPZ	202531.8	0.4	3.4	u	2½°	202454	M_L=5.1
	iSEa	2601.2						
WAN	iPZ	2531.5		5.9	u	2½°	202452	
	iSZ	2601.0						
SUL	iPZ	2532.5	0.3	2.6	d	2½°	202454	
	iSZ	2601.0						
RAL	iPZ	2531.4			d	2½°	202452	
	iSZ	2601.0						
TAV	iPZ	2531.2		1.0	u	2½°	202453	
	iSZ	59.9						
VUL	iPZ	30.6	0.3	3.0	u	2¼°	202454	
	iSZ	58.5						
RAB	eZ/	211606			+			Traces

			T sec	A mm	GM	Dist	H	Remarks
26th December, 1968 - continued.								
RAB	iPZ	234437.1	0.5	1.9	u			Regional
WAN	iPZ	38.0			u			
RAL	iPZ	36.4		3.1	u			
TAV	iPZ	36.0			u			
VUL	iPZ	37.0	0.5	8.0	u			
27th December, 1968.								
RAB	iPZ	030410.4	0.5	2.6	u	2°	030340	
	iSN	33.1						
RAL	iPZ	09.2	0.5	9.3	d			
TAV	iPZ	09.0			d			
VUL	iPZ	08.8	0.4	6.8	u			
RAB	iPZ	051007.6	0.3	5.9	d	1½°	050942	M_L=4.3
	iSE	26.2						
WAN	iPZ	07.2		2.2	d	1½°	050941	
	iSZ	26.8						
RAL	iPZ	07.1	0.4	5.0	d			
TAV	iPZ	07.0	0.3	2.4	d			
VUL	iPZ	06.5	0.2	12.0	d	1½°	050943	
	iSZ	24.2						
RAB	iPZ	135213.1	0.6	4.0	u	1¾°	135145	M_L=4.0
	iSE	34.5						
SUL	iPZ	13.1	0.4	3.3	u			
RAL	iPZ	12.8	0.5	11.0	u			
TAV	iPZ	12.2	0.2	7.5	d			
VUL	iPZ	11.8	0.3	5.8	d	1½°	135147	
	iSZ	31.0						
RAB	eiPZ	141322½	0.4	3.0	u	2°	141252	M_L=3.8
	iZ	23.0						
	iSN	45.5						
WAN	eiPZ	22½	0.2	1.4	u			
	iZ	23.6						
SUL	iPZ	23.6	0.5	3.0	u			
RAL	iPZ	22.9	0.5	3.8	d			
TAV	iPZ	22.8	0.2	5.0	d			
VUL	eiPZ	21½	0.4	12.9	u			
	iZ	22.0						
RAB	iPZ	160102.0	0.4	2.1	d	2°	160032	M_L=3.9
	iSN	25.2						
WAN	ePZ	00½						
SUL	iPZ	00.8			u			
RAL	iPZ	00.1	0.4	6.0	d			
TAV	iPZ	0059.9		4.1	u			
VUL	iPZ	59.8			u	2°	160029	
	iSZ	0123.0						

			T sec	A mm	GM	Dist	H	Remarks
28th December, 1968.								
RAB	iPZ iSN/ eLrZ/	063018.1 3243 3342	1.0	5.0	u	13°	062718	M_B=5.6
WAN	ePZ	3018			u			
RAL	ePZ	19			d			
TAV	ePZ	20			u			
VUL	ePZ	20	0.6	2.1	u			
RAB	iPZ iSN	123416.0 35.0	0.4	5.0	d	1½°	123351	M_L=4.1
WAN	iPZ iSZ	15.9 35.2	0.9	1.3	d	1½°	123350	
RAL	iPZ	15.4	0.6	4.3	d			
TAV	iPZ iSN	15.1 34.0		6.0	d	1½°	123350	
VUL	iPZ iSZ	15.0 33.4	0.3	14.2	d	1½°	123351	
RAB	iPZ iSN	152604.8 26.8	0.6	8.2	u	1¾°	152536	M_L=4.7
WAN	ePZ iSZ	04½ 27.2	0.2	1.9	u	2°	152534	
SUL	iPZ iZ	04.4 05.2	0.2	9.1	u			
RAL	iPZ iSZ	04.0 25.5		10.9	u	1¾°	152535	
TAV	iPZ	03.8		8.0	u			
VUL	iPZ iSZ	04.0 25.1	0.3	10.5	u	1¾°	152536	
RAB	iPZ iSN	165102.0 12.0	0.3	3.0	u	¾°	165048	M_L=3.5
WAN	iPZ iSZ	02.5 11.6			u	¾°	165050	
SUL	iPZ	02.4	0.2	2.3	u			
RAL	iPZ iSZ	02.1 11.0	0.2	4.2	d	¾°	165050	
TAV	iPZ iSNw	02.0 11.5		14.0	d	¾°	165048	
VUL	iPZ iSZ	03.0 13.0	0.3	5.9	d	¾°	165049	
RAB	iPZ eSNo	214000.4 20			u	1½°	213934	M_L=5.5
WAN	iPZ	00.1			u			
SUL	iPZ	00.0			u			
RAL	iPZ	3959.9			u			
TAV	iPZ	59.8			u			
VUL	iPZ	59.6			u			

			T sec	A mm	GM	Dist	H	Remarks
29th December, 1968.								
RAB	eZ/	021431			-			Traces
RAB	iPZ iSN	063747.1 3803.6	0.2	4.0	u	1¼°	063724	M_L=4.1
WAN	iPZ	3746.8	0.2	3.1	u			
RAL	iPZ	47.0		1.3	u			
TAV	iPZ	47.0	0.2		u			
VUL	iPZ iSZ	46.2 3802.4	0.4	4.8	d	1¼°	063725	
RAB	ePZ	065853	1.0	1.0	u			Distant
WAN	ePZ	53½			u			
RAL	ePZ	53½		1.0	u			
TAV	ePZ	53			d			
RAB	ePZ eSE/ eSSN/	072250½ 2842 3133		0.9	d	40°		
RAB	iPZ iSEo	083900.0 4017.0			d	6¾°	083720 M_L=5.4 Felt Rabaul Int. I 4.2°S 152.2°E Felt Pomio Int V 5.5°S 150.5°E	X
WAN	iPZ	3900.0			d			
SUL	iPZ	00.0			d			
RAL	iPZ	00.0			d			
TAV	iPZ	3859.7			d			
VUL	iPZ	59.2			d			
RAB	eZ/	140628			-			Traces
RAB	eZ/	183007			+			Traces
30th December, 1968.								
RAB	iZ FZ	0012 22	0.4	4.0				Man-made disturbance, pile driver working on new wharf area, Simpson Harbour, Rabaul.
RAB	iPZ e(S)N	005017.6 34	0.3	5.0	u	(1¼°)	0049(56)	M_L=3.5
RAL	iPZ	17.5	0.3	8.4	u			
TAV	iPZ	17.2	0.6		d			
VUL	iPZ	19.5	0.2	4.2	d			
RAB * See page 15.	iPZ iSE	063225.8 45.2	0.4	6.0	u	1½°	063201	M_L=3.7
RAL	iPZ iSZ	25.2 43.5			d	1½°	063201	
TAV	iPZ	24.1	0.2		u			
VUL	iPZ	24.0	0.3	3.0	u			
RAB * See page 15	eZ/	045714			-			Traces
RAB	eZ/	072446			+			Traces

			T sec	A mm	GM	Dist	H	Remarks
30th December, 1968 - continued.								
RAB	iPZ	142825.8	0.4	27.0	u	1¾°	142758	M_L=4.7
	iZ	29.0						
	iSN	46.8						
WAN	iPZ	25.8	0.2	7.5	d	1¾°	142758	
	iSZ	46.6						
SUL	iPZ	25.8	0.2	10.0	u			
RAL	iPZ	25.5	0.3	2.0	u	1¾°	142758	
	iSZ	46.8						
TAV	iPZ	25.5	0.3		d			
VUL	iPZ	24.8	0.2	6.3	u	1½°	142800	
	iSZ	44.0						
RAB	eZ/	151714			-			Traces
RAB	iPZ	184548.5	0.4	2.4	u	1¾°	184521	M_L=4.6
	iS!N	4609.4						
SUL	iPZ	4548.6	0.3	1.1	u			
RAL	iPZ	48.8	0.4	2.6	u	1½°	184522	
	iSZ	4609.0						
TAV	iPZ	4548.8		2.0	u			
VUL	iPZ	47.2	0.2	9.0	u	1½°	184521	
	iSZ	4607.1						
RAB	iPZ	201844.5	0.5	3.0	u	2°	201813	M_L=4.1
	iSN	1908.1						
WAN	iPZ	1844.7	0.6	2.1	d			
RAL	iPZ	45.0	0.3	4.0	d			
TAV	iPZ	44.3	0.2	3.9	d			
VUL	iPZ	44.2	0.3	11.0	d	1¾°	201816	
	iSZ	1905.0						
RAB	iPZ	205918.6	0.5	2.0	d	1¼°	205856	M_L=4.0
	iSN	35.8						
WAN	iPZ	19.0			u	1¼°	205858	
	iSZ	35.3						
RAL	iPZ	18.5		9.8	u			
TAV	iPZ	18.0		12.0	d	1¼°	205858	
	iSZ	32.5						
VUL	iPZ	18.6				1¼°	205856	
	iSZ	36.0						
RAB	ePZ	221830½	0.5	1.2	u			Distant
*RAB	iZ	0628	0.4	4.0				Man-made disturbance, pile driver working on new wharf area, Simpson Harbour, Rabaul.
	FZ	37						
*RAB	iZ	0721	0.4	4.0				"
	FZ	29						

			T sec	A mm	GM	Dist	H	Remarks
31st December, 1968.								
RAB	iPZ	002214.0		3.0	d	3°	002129	M_L=5.8
	iSN/	48.0						
WAN	iPZ	14.4	0.4	2.0	d	3°	002130	
	iSZ	48.8						
SUL	iPZ	13.8			d	3°	002127	
	iSZ	49.5						
RAL	iPZ	14.0			d			
TAV	iPZ	13.6			u			
VUL	iPZ	13.7	0.4	8.0	u			
WAN	iZ	0051		1.0				Man-made disturbance, pile driver working on new wharf area, Simpson Harbour, Rabaul.
	FZ	0100						
WAN	iZ	0104		1.0				"
	FZ	0110						
WAN	iZ	0514 .		1.0				"
	FZ	0520						
RAB	iPZ	084858.7			d			
RAL	iPZ	58.0			u			
TAV	iPZ	57.6	0.2	1.6	d	5½°	084737	
	iSNw	4959.2						
VUL	iPZ	4857.4	0.5	1.3	u	5½°	084737	
	iSZ	4959.8						
RAB	iPZ	094347.0	0.5	1.6	d			
RAL	iPZ	48.2			d	4¼°	094244	
	iSZ	4437.0						
TAV	iPZ	4346.0			d	4¼°	094242	
	iSNw	4434.8						
VUL	iPZ	4349.2			d			
RAB	iPZ	134231.4	0.5	1.1	d	15°		
	iSN/	4506						
	iSSN/	26						
	eLqN/	4832						
RAL	ePZ	4228½			u			
TAV	iPZ	28.0			u			
VUL	iPZ	29.4	0.5	1.0	u			

Rabaul Central Observatory,

9th January, 1968.

G.W. D'ADDARIO

VOLCANOLOGIST-IN-CHARGE.