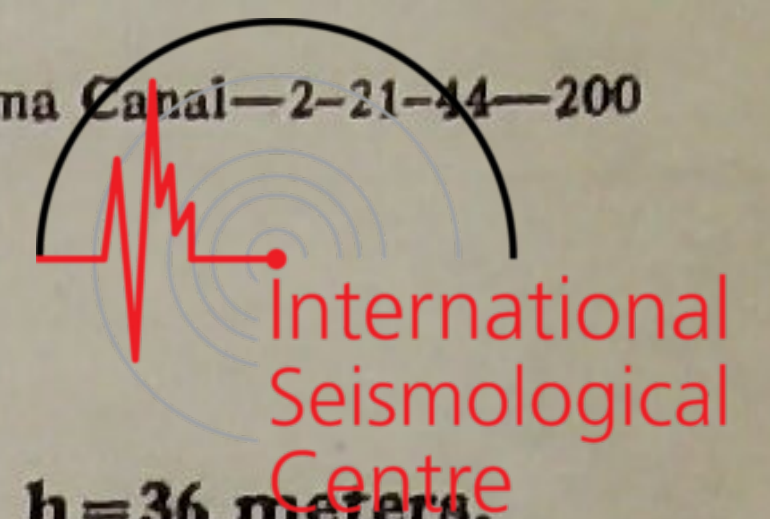


**THE PANAMA CANAL**  
DEPARTMENT OF OPERATION AND MAINTENANCE  
SECTION OF METEOROLOGY AND HYDROGRAPHY



**SEISMOLOGICAL RECORD AT BALBOA HEIGHTS, CANAL ZONE**

Lat. 8° 57' 39" N.

Long. 79° 33' 29" W.

h=36 meters.

Lithologic foundation: Basalt.

Time Correction: Within 1.0 sec.

**INSTRUMENTS—FIXED CONSTANTS**

INSTRUMENTS	SYMBOL	REGISTRATION	DAMPING	PAPER SPEED	MASS
Wood-Anderson	I	Photographic	Magnetic	60 mm. per min.	1.3 gr.
Bosch-Omori	II	Smoked Sheet	Air	15 mm. per min.	100 kg.

**INSTRUMENTS—DETERMINED CONSTANTS**

INSTRUMENTS	COMPONENT	T <sub>0</sub>	V	Q	DETERMINED
Wood-Anderson	N-S	1.0	1370		June 30, 1947
Wood-Anderson	E-W	1.0	1370		June 30, 1947
Bosch-Omori	} Not in operation.				
Bosch-Omori					

Month January, 1948Page No. 1

No. and Date	Phase	Time G. M. T.			Period	AMPLI- TUDE mm	REMARKS
		h	m	s			
<p>Maximum trace amplitudes are tabulated for each phase whenever the maximum amplitude for either component exceeds 3.0 millimeters. No entry in the amplitude column indicates an amplitude of less than 3.0 millimeters.</p> <p>Approximate distances are given whenever the P and S phases seem clear and distinct. For earthquakes distant less than 300 statute miles, local tables are used. For earthquakes distant more than 300 statute miles the 1932 Edition of Jeffrey's Tables is used. Whenever the beginning of the P and S phases are indistinct, earthquakes are roughly classified as NEARBY or DISTANT depending upon whether the character of the record indicates an epicenter distant less or more respectively than 300 statute miles.</p> <p>All earthquakes felt in any degree by residents of the Canal Zone are rated on the modified Mercalli Scale, with quakes reliably reported as felt by any one rated at Intensity I.</p>							
#1	e	17	28	00			Distant
Jan. 6	i	17	30	32			U.S.C. & G.S. reports quake in Mexico, 16.5° N., 98° W.
#2	e	18	04	49			Distant
Jan. 6	F	18	15				
#3	e	05	20	09			Nearby
Jan. 7	i	05	20	22			
	F	05	22				



## SEISMOLOGICAL RECORD AT BALBOA HEIGHTS, CANAL ZONE

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Month January, 1948

Page No. \_\_\_\_\_

No. and Date	Phase	Time G. M. T.			Period s	AMPLI- TUDE mm	REMARKS
		h	m	s			
#4 Jan. 8	e i F	03:16:54					Nearby
#5 Jan. 14	e F	02:37 02:52					Distant Very faint record
#6 Jan. 14	eP IS F	08:07:40 08:08:10 08:12			10.0N 10.0E		Approximate distance 145 miles
#7 Jan. 16	eP IS F	23:09:27 23:09:55 23:12					Approximate distance 135 miles
#8 Jan. 18	eP IS F	08:38:45 08:39:12 08:41					Approximate distance 130 miles
#9 Jan. 21	eP IS F	18:21:37 18:23:16 18:30					Approximate distance 600 miles





SEISMOLOGICAL RECORD AT BALBOA HEIGHTS, CANAL ZONE

Month January, 1948

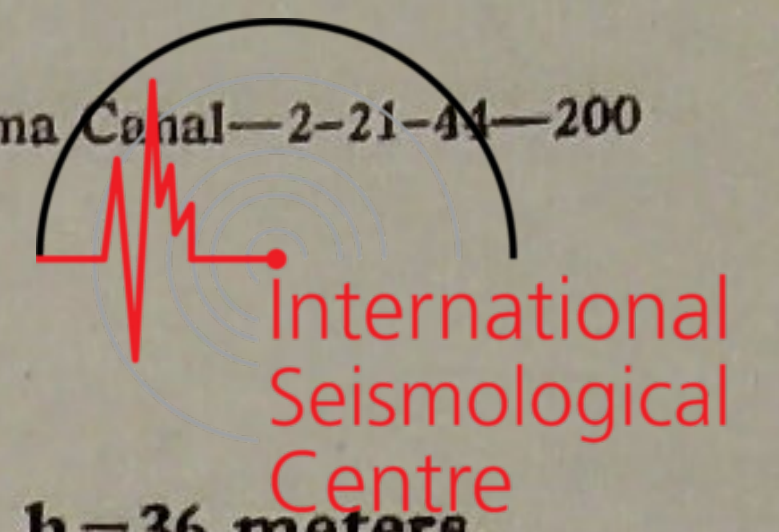
Page No. 3

No. and Date	Phase	Time G. M. T.			Period s	AMPLI- TUDE mm	REMARKS
		h	m	s			
#10  Jan. 24	•	18	06	35		Distant	
	•L	19	00				
	F	20	01				
#11  Jan. 30	•	16	24	38		Distant	
	•	16	25	39			
	F	16	30				

G. E. MATTHEW  
Chief Hydrographer



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SECTION OF METEOROLOGY AND HYDROGRAPHY



**SEISMOLOGICAL RECORD AT BALBOA HEIGHTS, CANAL ZONE**

Lat. 8° 57' 39" N.

Long. 79° 33' 29" W.

h = 36 meters.

Lithologic foundation: Basalt.

Time Correction: Within 1.0 sec.

**INSTRUMENTS—FIXED CONSTANTS**

INSTRUMENTS	SYMBOL	REGISTRATION	DAMPING	PAPER SPEED	MASS
Wood-Anderson	I	Photographic	Magnetic	60 mm. per min.	1.3 gr.
Bosch-Omori	II	Smoked Sheet	Air	15 mm. per min.	100 kg.

**INSTRUMENTS—DETERMINED CONSTANTS**

INSTRUMENTS	COMPONENT	T <sub>0</sub>	V	U	DETERMINED
Wood-Anderson	N-S	1.0	1370		June 30, 1947
Wood-Anderson	E-W	1.0	1370		" " "
Bosch-Omori					
Bosch-Omori		NOT	IN	OPERATION	

Month FEBRUARY 1948

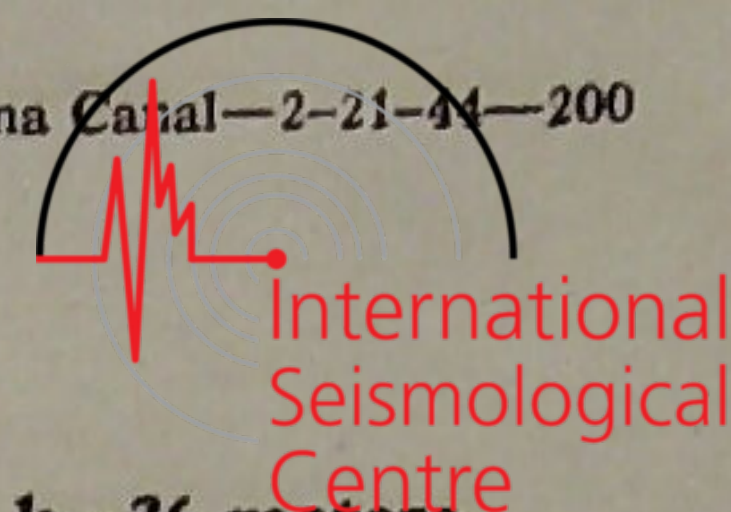
Page No. 4

No. and Date	Phase	Time G. M. T.			Period	AMPLITUDE mm	REMARKS
		h	m	s			
No. 12 Feb. 4	eP 1S F	12:51:02					Approximate distance, 135 miles.
No. 13 Feb. 8	e F	19:32:50					Nearby
No. 14 Feb. 8	e F	23:36					Nearby
No. 15 Feb. 9	e F	13:11					Distant Very faint trace
No. 16 Feb. 9	e F	15:14					Nearby Very faint trace
No. 17 Feb. 14	e F	22:04:36					Distant
No. 18 Feb. 15	e F	00:53:55					Nearby

G. E. MATHEN,  
Chief Hydrographer.



**THE PANAMA CANAL**  
DEPARTMENT OF OPERATION AND MAINTENANCE  
SECTION OF METEOROLOGY AND HYDROGRAPHY



**SEISMOLOGICAL RECORD AT BALBOA HEIGHTS, CANAL ZONE**

Lat. 8° 57' 39" N.

Long. 79° 33' 29" W.

h = 36 meters.

Lithologic foundation: Basalt.

Time Correction: Within 1.0 sec.

**INSTRUMENTS—FIXED CONSTANTS**

INSTRUMENTS	SYMBOL	REGISTRATION	DAMPING	PAPER SPEED	MASS
Wood-Anderson	I	Photographic	Magnetic	60 mm. per min.	1.3 gr.
Bosch-Omori	II	Smoked Sheet	Air	15 mm. per min.	100 kg.

**INSTRUMENTS—DETERMINED CONSTANTS**

INSTRUMENTS	COMPONENT	T.	V	C	DETERMINED
Wood-Anderson	N-S	1.0	1370	14 to 1	June 30, 1947
Wood-Anderson	E-W	1.0	1370	18 to 1	June 30, 1947
Bosch-Omori	Not	in	operation		
Bosch-Omori					

Month MARCH 1948Page No. 5

No. and Date	Phase	Time G. M. T.			Period	AMPLI- TUDE mm	REMARKS
		h	m	s			
#19 March 1	e F	01:32:28					Distant
		01:47					
#20 March 3	e F	9:29:38					Nearby
		9:35					
#21 March 4	1P eS F	01:57:41					Preliminary determination of epicenter by U.S. C. & G.S. in Central Peru, Lat. 10S., Long. 75W., distant about 1,400 miles.
		02:01:34					
		92:19					
#22 March 9	1P 1S F	17:41:54					Approximate distance 70 miles
		17:42:08			7.5N		
		17:44			6.8E		
#23 March 10	e e F	10:30:41					Nearby. Faint trace.
		10:31:36					
		10:35					
#24 March 20	e e F	17:43:00					Nearby
		17:43:51					
		17:46					
#25 March 22	e F	00:11:25					Distant
		00:22					
#26 March 22	eP e F	21:36:15					Distant
		21:38:22					
		21:48					





SEISMOLOGICAL RECORD AT BALBOA HEIGHTS, CANAL ZONE

Month MARCH, 1948

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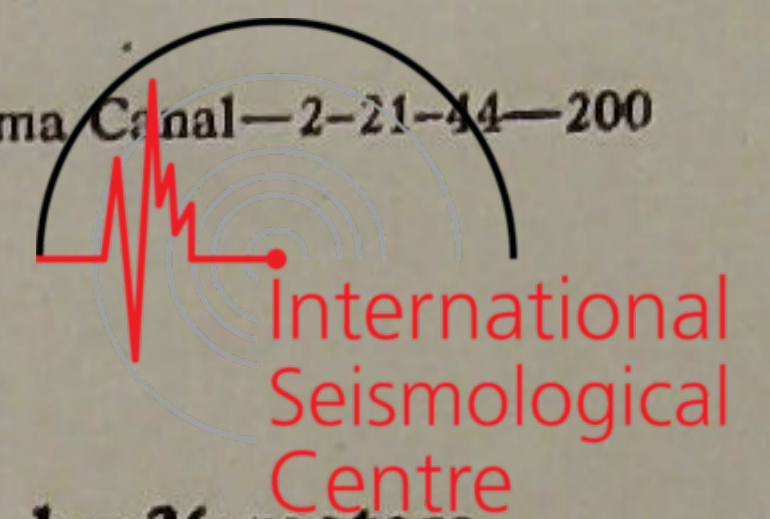
No. and Date	Phase	Time G. M. T.	Period	AMPLI- TUDE	REMARKS
		h m s	s	mm	
#27 March 22	eP IS F	22:29:56 22:30:37 22:34			Approximate distance, 200 miles.
#28 March 22	e F	23:43:04 23:52			Distant
#29 March 24	e F	03:26:07 03:39			Distant

G. E. MATTHEW,  
Chief Hydrographer



**THE PANAMA CANAL**  
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SECTION OF METEOROLOGY AND HYDROGRAPHY

MR 1433—Panama Canal—2-21-44—200



**SEISMOLOGICAL RECORD AT BALBOA HEIGHTS, CANAL ZONE**

Lat. 8° 57' 39" N.

Long. 79° 33' 29" W.

h=36 meters.

Lithologic foundation: Basalt.

Time Correction: Within 1.0 sec.

**INSTRUMENTS—FIXED CONSTANTS**

INSTRUMENTS	SYMBOL	REGISTRATION	DAMPING	PAPER SPEED	MASS
Wood-Anderson	I	Photographic	Magnetic	60 mm. per min.	1.3 gr.
Bosch-Omori	II	Smoked Sheet	Air	15 mm. per min.	100 kg.

**INSTRUMENTS—DETERMINED CONSTANTS**

INSTRUMENTS	COMPONENT	T <sub>0</sub>	V	C	DETERMINED
Wood-Anderson	N-S	1.0	1370	14 to 1	June 30, 1947
Wood-Anderson	E-W	1.0	1370	18 to 1	" " "
Bosch-Omori	Not in operation				
Bosch-Omori					

Month April, 1948Page No. 7

No. and Date	Phase	Time G. M. T.			Period	AMPLI- TUDE mm	REMARKS
		h	m	s			
#30 April 7	e P e S F	5:50:58 5:51:36 5:54					Approximate distance 180 miles
#31 April 12	e F	6:18:05 6:25					Distant. U.S.C. & G.S. reports quake in Lat. 14° N., Long. 90-1/2° W. at 6:15.3 G.C.T.
#32 April 14	e P e S F	21:30:28 21:31:06 21:34					Approximate distance 180 miles
#33 April 21	i P i S e L e L F	20:25:27 20:28:01 20:29:27 20:31:25 21:02:33	20.0 15.0		5.5N 5.5E 6.7N 4.8E 3.0N 3.0E		Approximate distance 950 miles. Press reports indicate earthquake near Dominican Republic Lost in aftershock.
#34 April 21	i P i S F	21:02:34 21:05:09 21:45					Approximate distance 950 miles. Aftershock of #33.
#35 April 22	i P e S F	00:31:45 00:34:22 01:02					Approximate distance 950 miles. Aftershock of #33.



## SEISMOLOGICAL RECORD AT BALBOA HEIGHTS, CANAL ZONE

Month April, 1948Page No. 8

No. and Date	Phase	Time G. M. T.			Period s	AMPLI- TUDE mm	REMARKS
		h	m	s			
#36 April 23	1 P	11	53	45		Approximate distance 950 miles. Aftershock of #33.	
	• S	11	56	20			
	F	12	15				
#37 April 28	• P	12	05	37		Distant.	
	•	12	08	33			
	F	12	15				
#38 April 29	• P	03	11	06		Approximate distance 120 miles.	
	1 S	03	11	31			
	F	03	13				

G. E. MATTHEW  
Chief Hydrographer



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**SEISMOLOGICAL RECORD AT BALBOA HEIGHTS, CANAL ZONE**

Lat. 8° 57' 39" N.

Long. 79° 33' 29" W.

h = 36 meters.

Lithologic foundation: Basalt.

Time Correction: Within 1.0 sec.

**INSTRUMENTS—FIXED CONSTANTS**

INSTRUMENTS	SYMBOL	REGISTRATION	DAMPING	PAPER SPEED	MASS
Wood-Anderson	I	Photographic	Magnetic	60 mm. per min.	1.3 gr.
Bosch-Omori	II	Smoked Sheet	Air	15 mm. per min.	100 kg.

**INSTRUMENTS—DETERMINED CONSTANTS**

INSTRUMENTS	COMPONENT	T.	V	C	DETERMINED
Wood-Anderson	H-S	1.0	1370	14 to 1	June 30, 1947
Wood-Anderson	H-W	1.0	1370	18 to 1	
Bosch-Omori	Not in operation				
Bosch-Omori					

Month MAY 1948

Page No. 9

No. and Date	Phase	Time G. M. T.			Period	AMPLI- TUDE mm	REMARKS
		h	m	s			
# 39 May 2	eP	10:32:18					Approximate distance 95 miles
	LS	10:32:38					
	F	10:35					
# 40 May 3	eP	18:44:26					Nearby
	eS	18:45:06					
	F	18:47					
# 41 May 7	1P	16:00:44			3.0H 4.8E 12.0H 10.6E		Approximate distance 120 miles
	LS	16:01:09					
	F	16:04					
# 42 May 11	1P	9:01:30					Approximate distance 1,580 miles Provisional epicenter by U.S.C. & G.S. Lat. 17° S. Long. 71° W., in Southern Peru.
	LS	9:06:10					
	F	9:21					
# 43 May 13	e	3:38:14					Nearby
	F	3:40					
# 44 May 14	eP	22:43:46					Distant
	F	22:49					
# 45 May 15	1P	03:19:49					Approximate distance 140 miles
	LS	03:20:18					
	F	03:23					



SEISMOLOGICAL RECORD AT BALBOA HEIGHTS, CANAL ZONE

Month MAY 1948

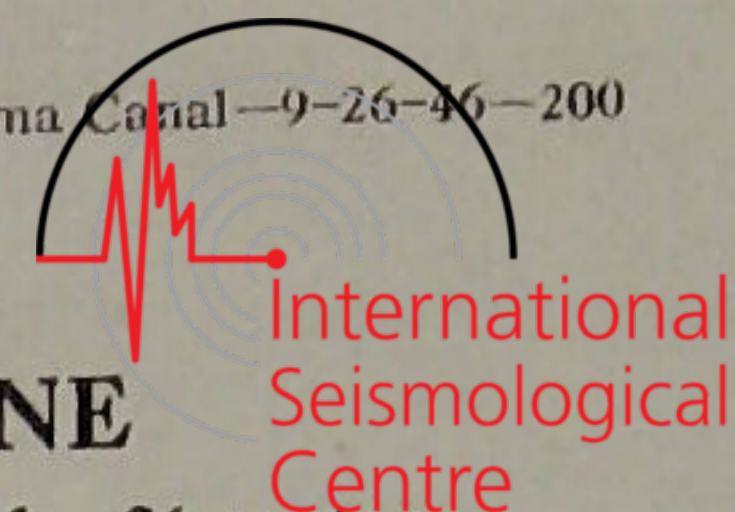
Page No. 10

No. and Date	Phase	Time G. M. T.			Period s	AMPLI- TUDE mm	REMARKS
		h	m	s			
# 46 May 23	• I F	19:48:18 19:48:34 19:51					Nearby
# 47 May 24	• F	13:16:02 13:18					Nearby
# 48 May 28	I F	5:41:05 5:50					Distant
# 49 May 28	• I F	17:02:23 17:03:09 17:05					Nearby

G. E. BATHEN  
Chief Hydrographer



**THE PANAMA CANAL**  
DEPARTMENT OF OPERATION AND MAINTENANCE  
SECTION OF METEOROLOGY AND HYDROGRAPHY



## SEISMOLOGICAL RECORD AT BALBOA HEIGHTS, CANAL ZONE

Lat. 8° 57' 39" N.

Long. 79° 33' 29" W.

h = 36 meters.

Lithologic foundation: Basalt.

Time Correction: Within 1.0 sec.

### INSTRUMENTS—FIXED CONSTANTS

INSTRUMENTS	SYMBOL	REGISTRATION	DAMPING	PAPER SPEED	MASS
Wood-Anderson	I	Photographic	Magnetic	60 mm. per min.	1.3 gr.
Bosch-Omori	II	Smoked Sheet	Air	15 mm. per min.	100 kg.

### INSTRUMENTS—DETERMINED CONSTANTS

INSTRUMENTS	COMPONENT	T <sub>c</sub>	V	C	DETERMINED
Wood-Anderson	<b>N-S</b>	<b>1.0</b>	<b>1370</b>	<b>14 to 1</b>	<b>June 30, 1947</b>
Wood-Anderson	<b>E-W</b>	<b>1.0</b>	<b>1370</b>	<b>18-to 1</b>	" " "
Bosch-Omori	<b>Not in operation</b>				
Bosch-Omori					

Month June 1948Page No. 11

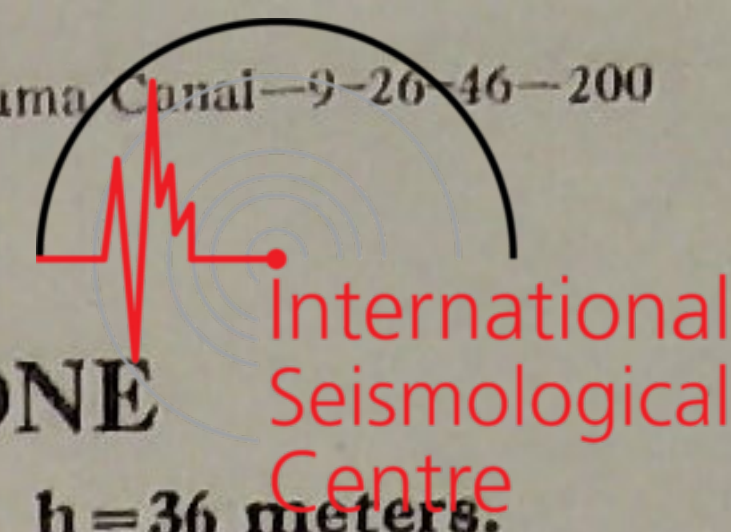
No. and Date	Phase	Time G. M. T.			Period	AMPLI- TITUDE  mm	REMARKS
		h	m	s			
#50 June 8	e	03:54:56					Nearby
	F	04:01					
#51 June 10	e	02:00:00					Nearby
	F	02:03					
#52 June 13	e	13:08:49					Nearby
	F	13:11					
#53 June 16	1P	04:42:03				18.0N 13.5E	Approximate distance 110 miles
	1S	04:41:26					
	F	04:45					
#54 June 16	eP	07:56:13					Approximate distance 110 miles
	1S	07:56:36					
	F	07:59					
#55 June 16	eP	08:47:08					Approximate distance 110 miles
	1S	08:47:31					
	F	08:50					
#56 June 22	eP	22:32:16					Approximate distance 105 miles
	eS	22:32:38					
	F	22:34					







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**SEISMOLOGICAL RECORD AT BALBOA HEIGHTS, CANAL ZONE**

Lat. 8° 57' 39" N.

Long. 79° 33' 29" W.

h = 36 meters.

Lithologic foundation: Basalt.

Time Correction: Within 1.0 sec.

**INSTRUMENTS—FIXED CONSTANTS**

INSTRUMENTS	SYMBOL	REGISTRATION	DAMPING	PAPER SPEED	MASS
Wood-Anderson	I	Photographic	Magnetic	60 mm. per min.	1.3 gr.
Bosch-Omori	II	Smoked Sheet	Air	15 mm. per min.	100 kg.

**INSTRUMENTS—DETERMINED CONSTANTS**

INSTRUMENTS	COMPONENT	T.	V	G	DETERMINED
Wood-Anderson	N-S	1.0	1370	14 to 1	June 30, 1947
Wood-Anderson	E-W	1.0	1370	18 to 1	" " "
Bosch-Omori	Not in operation.				
Bosch-Omori					

Month JULY 1948

Page No. 13

No. and Date	Phase	Time G. M. T.			Period	AMPLI- TUDE mm	REMARKS
		h	m	s			
#58 July 12	eP	08	06	19			Local.
	eS	08	05	39			
	F	08	07				Approximate distance 95 miles.
#59 July 15	eP	06	47	02			
	IS	06	48	05			
	F	06	54				Approximate distance 305 miles.
#60 July 16	e	07	15	18			Distant.
	e	07	22	39			
	F	07	40				Weak.
#61 July 20	eP	11	07	42			Weak.
	eS	11	18	25			U.S.C. & G.S. Reports Epicenter 17° S Lat. 74-1/2° W Long. - S.W. of Peru.
	F	11	25				Approximate distance 1330 miles.
#62 July 26	IP	03	34	07		22.0M	
	IS	03	34	45		E-W, Record Lost	
	F	03	44				Approximate distance 180 miles.
#63 July 26	IP	06	11	58		19.5M	
	IS	06	12	37		E-W, Record Lost	
	F	06	23				Same location as #62.



## SEISMOLOGICAL RECORD AT BALBOA HEIGHTS, CANAL ZONE

Month JULY 1948Page No. 14

No. and Date	Phase	Time G. M. T.			Period s	AMPLI- TUDE mm	REMARKS
		h	m	s			
#64	1P	07:45:28					
	1S	07:46:03					
July 26	F	07:50					Approximate distance 180 miles.
#65	eP	19:03:57					
	1S	19:04:31					
July 26	F	19:06					Approximate Distance 160 miles.
#66	1P	01:11:45					Weak.
	1S	01:12:09					
July 28	F	01:14					Approximate distance 115 miles.
#67	e	04:11:18					Weak.
	e	04:11:26					
July 28	F	04:13					Same as #66.
#68	1P	14:22:36			42.5M		Felt at Balboa, Canal Zone, by few.
	1S	14:23:11			33.0M		Intensity II modified Mercalli Scale.
July 28	F	14:28					Approximate distance 165 miles.
#69	eP	14:39:15					
	1S	14:39:50					
July 28	F	14:42					Same as #68.
#70	1P	14:51:17					
	eS	14:51:51					
July 28	F	14:56					Same as #69.
#71	1P	15:06:27			49.0M		Felt by few in Canal Zone at Balboa Heights
	1S	15:07:02			45.5M		and Coco Solo.
July 28	F	15:26					Intensity II modified Mercalli Scale. Same location as #68.
#72	1P	15:47:36					
	1S	15:48:11					
July 28	F	15:52					Same location as #68.
#73	eP	15:54:28					
	eS	15:55:02					
July 28	F	15:57					Same location as #68.
#74	eP	17:28:37					
	eS	17:29:11					
July 28	F	Merged with #73					Same location as #69.



## SEISMOLOGICAL RECORD AT BALBOA HEIGHTS, CANAL ZONE

Month JULY 1948Page No. 18

No. and Date	Phase	Time G. M. T.			Period s	AMPLI- TUDE mm	REMARKS
		h	m	s			
#75 July 28	e	17:31:09					
	eS	17:31:45					
	F	17:34					Same location as #68.
#76 July 28	e	17:32:23					
	e	17:32:54					
	F	17:33					Same location as #68.
#77 July 28	1P	19:44:41					
	1S	19:45:16					
	F	19:52					Same location as #68.
#78 July 28	1P	20:54:31					
	1S	20:55:06					
	F	20:59					Same location as #68.
#79 July 28	1P	23:10:58					
	1S	23:11:33					
	F	23:14					Same location as #68.
#80 July 28	1P	23:23:33					
	1S	23:24:08					
	F	23:27					Same location as #68.
#81 July 29	eP	07:08:45					
	eS	07:04:17					
	F	07:07					Same location as #68.
#82 July 29	1P	16:07:07			4.5E		
	1S	16:07:42			3.5E		
	F	16:12					Same location as #68.
#83 July 29	1P	18:59:41			22.5N		
	1S	18:59:16			16.0E		
	F	19:12					Same location as #68.
#84 July 29	eP	19:32:54					
	1S	19:33:29					
	F	19:38					Same location as #68.
#85 July 29	1P	19:58:45			29.0N		
	1S	19:59:21			24.5E		
	F	20:02					Same location as #68.



## SEISMOLOGICAL RECORD AT BALBOA HEIGHTS, CANAL ZONE

JULY 1948

Page No. 16

Month

No. and Date	Phase	Time G. M. T.			Period s	AMPLI- TUDE mm	REMARKS
		h	m	s			
#86	1P	20:44:03					
	1S	20:44:33					
July 29	F	20:49					Same location as #83.
#87	1P	20:50:36			12.5N		
	1S	20:51:13			13.5E		
July 29	F	20:59					Same location as #83.
#88	eP	20:59:16					
	eS	20:59:51					
July 29	F	21:03					Same location as #83.
#89	1P	21:52:49			5.6N		
	1S	21:53:24			4.0E		
July 29	F	21:57					Same location as #83.
#90	1P	22:15:23					
	1S	22:16:03					
July 29	F	22:18					Same location as #83.
#91	eP	22:23:43					
	eS	22:23:17					
July 29	F	22:51					Same location as #83.
#92	1P	22:35:13			4.0E		
	1S	22:35:50			3.0E		
July 29	F	22:40					Same location as #83.
#93	eP	22:45:34					
	1S	22:46:29					
July 29	F	22:50					Same location as #83.
#94	eP	22:50:12					
	eS	22:50:47					
July 29	F	22:54					Same location as #83.
#95	1P	20:50:15					
	1S	20:50:50					
July 30	F	20:55					Same location as #83.
#96	1P	21:24:55					
	1S	21:25:30					
July 30	F	21:31					Same location as #83.
#97	eP	10:32:03					
	eS	10:32:43					
July 31	F	10:35					Same location as #83.



## SEISMOLOGICAL RECORD AT BALBOA HEIGHTS, CANAL ZONE

Month JULY 1948Page No. 17

No. and Date	Phase	Time G. M. T.			Period s	AMPLI- TUDE mm	REMARKS
		h	m	s			
#98	1P	11:29:49					Numbers 98 through 109 have same origin as # 68
	1S	11:30:24					
July 31	F	11:34					
#99	1P	19:04:49			63.5N	Strong.	
	1S	19:05:24			35.0E		
July 31	F	Merged with #100					
#100	eP	19:13:15					
	1S	19:13:50					
July 31	F	19:23					
#101	eP	19:27:01					
	1S	19:27:36					
July 31	F	19:30					
#102	e	19:33:00				Weak.	
July 31	F	19:40					
#103	eP	19:43:55				Weak.	
	eS	19:44:30					
July 31	F	19:46					
#104	eP	20:05:07					
	eS	20:05:42					
July 31	F	20:08					
#105	1P	20:29:06					
	1S	20:29:41					
July 31	F	Merged with #106					
#106	eP	20:33:12					
	eS	20:33:46					
July 31	F	20:37					
#107	e	21:13:50				Weak.	
	e	21:16:26					
July 31	F	21:17					
#108	eP	21:17:50				Weak.	
	eS	21:18:25					
July 31	F	21:28					
#109	1P	23:53:04					
	eS	23:53:59					
July 31	F	23:57					



**THE PANAMA CANAL**  
DEPARTMENT OF OPERATION AND MAINTENANCE  
SECTION OF METEOROLOGY AND HYDROGRAPHY



**SEISMOLOGICAL RECORD AT BALBOA HEIGHTS, CANAL ZONE**

Lat. 8° 57' 39" N.

Long. 79° 33' 29" W.

h = 36 meters.

Lithologic foundation: Basalt.

Time Correction: Within 1.0 sec.

**INSTRUMENTS—FIXED CONSTANTS**

INSTRUMENTS	SYMBOL	REGISTRATION	DAMPING	PAPER SPEED	MASS
Wood-Anderson	I	Photographic	Magnetic	60 mm. per min.	1.3 gr.
Bosch-Omori	II	Smoked Sheet	Air	15 mm. per min.	100 kg.

**INSTRUMENTS—DETERMINED CONSTANTS**

INSTRUMENTS	COMPONENT	T.	V	G	DETERMINED
Wood-Anderson	N-S	1.0	1370	14 to 1	June 30, 1947
Wood-Anderson	E-W	1.0	1370	18 to 1	June 30, 1947
Bosch-Omori	} Not in Operation				
Bosch-Omori					

Month AUGUST, 1948

Page No. 18

No. and Date	Phase	Time G. M. T.			Period	AMPLI- TUDE mm	REMARKS
		h	m	s			
#110 August 1	e F	00:39:43 00:43				Weak Distant	
#111 August 1	eP eS F	03:23:02 03:23:38 03:26				Approximate distance 165 miles	
#112 August 1	e e F	05:38:26 05:39:01 05:41				Weak Local	
#113 August 2	e e F	04:47:08 04:47:44 04:51				Weak Same location as #111	
#114 August 2	e e F	05:44:26 05:45:01 05:47				Weak Local	
#115 August 2	eP eS F	10:40:36 10:41:11 10:45				Same location as #111	
#116 August 2	e e F	17:29:31 17:30:06 17:32				Weak Same location as #111	



## SEISMOLOGICAL RECORD AT BALBOA HEIGHTS, CANAL ZONE

Month August, 1948Page No. 19

No. and Date	Phase	Time G. M. T.			Period s	AMPLI- TUDE mm	REMARKS
		h	m	s			
#117 August 3	eP	15	07	51		Weak Nearby	
	e	15	08	26			
	F	15	10				
#118 August 4	eP	05	54	53		Approximate distance 120 miles	
	IS	05	55	18			
	F	05	57				
#119 August 5	e	04	28	05		Faint trace Nearby	
	e	04	28	42			
	F	04	30				
#120 August 6	1P	09	56	27		Approximate distance 165 miles	
	IS	09	57	03			
	L	09	58	59			
	F	10	07				
#121 August 11	e	10	40	14		Faint - U.S.C. & G.S. Reports epicenter 17-1/2° N. lat., 95-1/2° W. Long.	
	F	11	00				
#122 August 12	eP	03	18	30		Approximate distance 105 miles	
	IS	03	18	52			
	F	03	22				
#123 August 14	1P	11	23	22		Approximate distance 225 miles	
	IS	11	24	09			
	F	11	28				
#124 August 16	eP	11	47	55		Approximate distance 145 miles	
	IS	11	48	20			
	F	11	51				



## SEISMOLOGICAL RECORD AT BALBOA HEIGHTS, CANAL ZONE

Month August, 1948Page No. 20

No. and Date	Phase	Time G. M. T.			Period s	AMPLI- TUDE mm	REMARKS
		h	m	s			
#125 August 19	I	20:00:09			8.5	12.5M	Local
	I	20:00:58					
	L	20:02:41					
	F	20:19					
#126 August 20	eP	06:45:04				8.5M	Approximate distance 240 miles
	IS	06:45:54					
	F	06:52					
#127 August 25	e	06:16:29					Distant
	e	06:22:42					
	F	07:01					
#128 August 25	e	19:46:52					Approximate Distance 270 miles
	IS	19:47:48					
	F	19:51					
#129 August 27	e	18:40:48					Local
	IS	18:41:36					
	F	18:45					
#130 August 28	e	00:48:04					Approximate distance 300 miles
	IS	00:49:06					
	F	00:52					
#131 August 28	e	12:44:38					Local
	eS	12:44:51					
	F	12:48					
#132 August 30	eP	16:42:15				7.0M	Approximate distance 195 miles
	IS	16:42:56					
	F	16:46					

G. E. Matthew

Chief Hydrographer



DEPARTMENT OF OPERATION AND MAINTENANCE  
SECTION OF METEOROLOGY AND HYDROGRAPHY

## SEISMOLOGICAL RECORD AT BALBOA HEIGHTS, CANAL ZONE

Lat. 8° 57' 39" N.

Long. 79° 33' 29" W.

h = 36 meters.

Lithologic foundation: Basalt.

Time Correction: Within 1.0 sec.

## INSTRUMENTS—FIXED CONSTANTS

INSTRUMENTS	SYMBOL	REGISTRATION	DAMPING	PAPER SPEED	MASS
Wood-Anderson	I	Photographic	Magnetic	60 mm. per min.	1.3 gr.
Bosch-Omori	II	Smoked Sheet	Air	15 mm. per min.	100 kg.

## INSTRUMENTS—DETERMINED CONSTANTS

INSTRUMENTS	COMPONENT	T.	V	C	DETERMINED
Wood-Anderson	N-S	1.0	1370	14 to 1	June 30, 1947
Wood-Anderson	E-W	1.0	1370	18 to 1	June 30, 1947
Bosch-Omori					
Bosch-Omori	Not in Operation				

Month September 1948Page No. 21

No. and Date	Phase	Time G. M. T.			Period	AMPLI- TUDE mm	REMARKS
		h	m	s			
# 133 Sept. 6	e e f	21:52:46 21:53:11 21:56					Nearby
# 134 Sept. 8	e e f	15:22:45 15:33:09 16:48					Distant. Provisional determination of epicenter by the U. S. Coast & Geodetic Survey places it in the Pacific Ocean near the Tonga Islands, Lat. 21° S., Long 174° W.
# 135 Sept. 10	i p e s f	22:29:28 22:30:10 22:35			4.0 N		Approximate distance 200 miles
# 136 Sept. 13	e p i s f	11:41:25 11:42:05 11:45					Approximate distance 190 miles
# 137 Sept. 16	i p e s f	01:40:32 01:41:31 01:46					Approximate distance 280 miles
# 138 Sept. 16	e p i s f	12:13:10 12:14:00 12:18					Approximate distance 240 miles
# 139 Sept. 18	i p e s f	08:37:21 08:38:19 08:48			18.0 N 5.5 E		Approximate distance 280 miles U.S.C. & G.S. reports epicenter near 8° N. 84° W - off SW. coast of Costa Rica.
# 140 Sept. 22	e p e s f	18:50:13 18:50:57 18:54			6.0 N		Approximate distance 210 miles
# 141 Sept. 24	e p i s f	05:31:46 05:32:22 05:35					Approximate distance 175 miles

G. E. Matthew,

Chief Hydrographer.



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Lat. 8° 57' 39" N.

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h=36 meters.

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Time Correction: Within 1.0 sec.

**INSTRUMENTS—FIXED CONSTANTS**

INSTRUMENTS	SYMBOL	REGISTRATION	DAMPING	PAPER SPEED	MASS
Wood-Anderson	I	Photographic	Magnetic	60 mm. per min.	1.3 gr.
Bosch-Omori	II	Smoked Sheet	Air	15 mm. per min.	100 kg.

**INSTRUMENTS—DETERMINED CONSTANTS**

INSTRUMENTS	COMPONENT	T.	V	Q	DETERMINED
Wood-Anderson	N-S	1.0	1370	14 to 1	June 30, 1947
Wood-Anderson	E-W	1.0	1370	18 to 1	June 30, 1947
Bosch-Omori	Not in operation				
Bosch-Omori					

Month OCTOBER 1948

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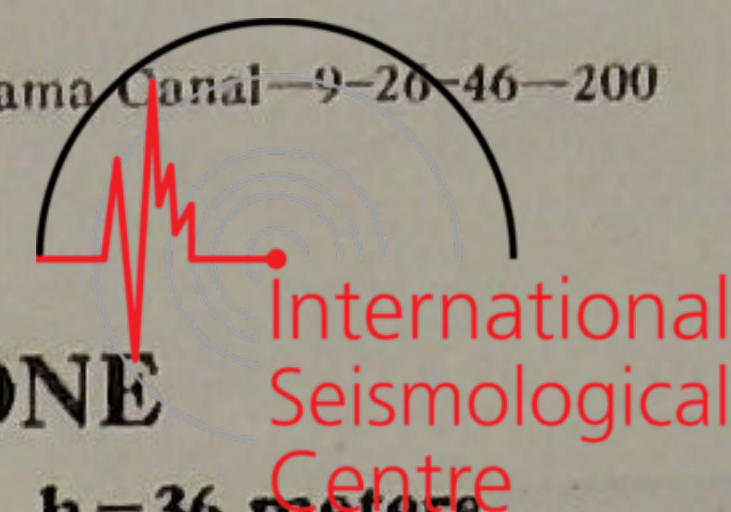
No. and Date	Phase	Time G. M. T.			Period	AMPLI- TUDE mm	REMARKS
		h	m	s			
#142 Oct. 4	• P	17:	27:	14			Approximate distance 290 miles Faint trace
	• S	17:	28:	14			
	F	17:	31				
#143 Oct. 7	1 P	16:	55:	51			Approximate distance 145 miles
	1 S	16:	56:	21			
	F	17:	00				
#144 Oct. 14	1 P	8:	59:	34			Approximate distance 105 miles
	1 S	8:	59:	56		5.0H	
	F	9:	03			3.0E	
#145 Oct. 14	1 P	9:	07:	23			Vibrations of "P" and early part of "S" waves were very rapid and this portion of photographic record is very faint. Maximum trace amplitudes of both components appear to be about 10 millimeters. The faint record indicates a distance from Balboa Heights about the same as for the preceding shock, or 105 miles. Intensity I. The occurrence of the shock is shown on the barograph trace at the Administration Building at Balboa Heights. It is considered strong enough to have been felt by any one in a favorable position and has been so classified.
	F	9:	12				
#146 Oct. 21	• P	4:	52:	36			Approximate distance 640 miles U.S. Coast & Geodetic Survey reports probable epicenter 12 1/2° N. Lat., 88° W. Long. Off west coast of Nicaragua.
	• S	4:	54:	23			
	F	5:	02				







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Lat. 8° 57' 39" N.

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### INSTRUMENTS—FIXED CONSTANTS

INSTRUMENTS	SYMBOL	REGISTRATION	DAMPING	PAPER SPEED	MASS
Wood-Anderson	I	Photographic	Magnetic	60 mm. per min.	1.3 gr.
Bosch-Omori	II	Smoked Sheet	Air	15 mm. per min.	100 kg.

### INSTRUMENTS—DETERMINED CONSTANTS

INSTRUMENTS	COMPONENT	T.	V	G	DETERMINED
Wood-Anderson	N-S	1.0	1370	14 to 1	June 30, 1947
Wood-Anderson	E-W	1.0	1370	18 to 1	" "
Bosch-Omori	) Not in operation				
Bosch-Omori					

Month November, 1948Page No. 24

No. and Date	Phase	Time G. M. T.			Period	AMPLI- TUDE  mm	REMARKS
		h	m	s			
#150 Nov. 8	• P	1:	20:	36			Approximate distance 125 miles
	• S	1:	21:	02			
	F	1:	23:				
#151 Nov. 8	• P	14:	44:	56			Approximate distance 275 miles
	• S	14:	45:	53			
	F	14:	47:				
#152 Nov. 10	1 P	20:	55:	01			Approximate distance 115 miles
	1 S	20:	55:	25	10.5 N		
	F	20:	58:		5.0 E		
#153 Nov. 12	•	2:	06:	18			Nearby Fair trace
	F	2:	09:				
#154 Nov. 12	1 P	4:	47:	21	3.2 N		Nearby
	•	4:	48:	01	5.0 E		
	F	4:	51:		4.8 N	3.2 E	
#155 Nov. 13	1 P	4:	04:	52			Approximate distance 40 miles
	1 S	4:	05:	00	15.0 N		
	F	4:	07:		7.0 E		
#156 Nov. 19	1 P	1:	05:	24	13.5 N		Provisional epicenter is located by U.S. Coast & Geodetic Survey in Lat. 9° N., Long. 84° W., near Pacific Coast of Costa Rica. This indicates a distance from Balboa Heights of approximately 310 miles.
	•	1:	06:	07	15.0 E		
	F	1:	24:		52.0 N	41.5 E	
#157 Nov. 19	•	1:	10:	07			Trace is superposed and lost on that of preceding shock. Distant.
	•	1:	11:	13	5.2 N		
	F	-	-	-	4.8 E		



## SEISMOLOGICAL RECORD AT BALBOA HEIGHTS, CANAL ZONE

Month November 1948Page No. 25

No. and Date	Phase	Time G. M. T.			Period s	AMPLI- TUDE mm	REMARKS
		h	m	s			
#158 Nov. 19	• F	13:03:32					Nearby. Faint trace
#159 Nov. 27	• F	12:23:17					Nearby. Very faint trace
#160 Nov. 27	• P • S F	18:26:41					Approximate distance 170 miles

G. E. MATTHEW  
Chief Hydrographer



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**INSTRUMENTS—DETERMINED CONSTANTS**

INSTRUMENTS	COMPONENT	T.	V	G	DETERMINED
Wood-Anderson	N-S	1.0	1370	14 to 1	June 30, 1947
Wood-Anderson	E-W	1.0	1370	13 to 1	June 30, 1947
Bosch-Omori	} NOT IN OPERATION				
Bosch-Omori					

Month DECEMBER, 1948

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No. and Date	Phase	Time G. M. T.	Period	AMPLI-	REMARKS
				TUDE	
				mm	
#161	1P	3:42:27 <sup>s</sup>			
Dec. 13	es	3:43:13			Nearby
	P	3:46			
#162	1P	11:32:07		10.5H	Approximate Distance 145 Miles
Dec. 17	es	11:32:37		5.5H	
				30.5H	
	P	11:42		25.5H	
#163	esP	11:57:49			Approximate Distance 145 Miles
Dec. 17	1S	11:58:17		5.2H	
	P	12:02		4.0E	
#164	esP	12:26:16			Nearby
Dec. 17	e	12:26:39			
	P	12:29			
#165	esP	5:54:38			Nearby
Dec. 27	e	5:55:05			
	P	5:59			
#166	esP	14:02:26			Approximate Distance 100 Miles
Dec. 29	1S	14:02:45			
	P	14:05			



## SEISMOLOGICAL RECORD AT BALBOA HEIGHTS, CANAL ZONE

Month DECEMBER 1968Page No. 27

No. and Date	Phase	Time G. M. T.			Period s	AMPLI- TUDE mm	REMARKS
		h	m	s			
#167	eP	7	09	59			Approximate Distance 525 Miles
Dec. 31	eS	7	11	23			
	F	7	18				
#168	eP	7	33	34			Approximate Distance 525 Miles
Dec. 31	eS	7	34	42			
	F	7	39				

 HYDROGRAPHIC OFFICE,  
BALBOA HEIGHTS, C. Z.