CLEVELAND

SEISMOLOGICAL OBSERVATORY
JOHN CARROLL UNIVERSITY, CLEVELAND 18, OHIO, U. S. A.

41° 29′ 27.90″ North, 81° 31′ 52.22″ West, h ≈ 326 m.

Seismographs: Two Sprengnether long-period horizontal, one Sprengnether vertical.

PREFACE

A pioneer in American seismology, Reverend Frederick L. Odenbach, S. J. built an original seismograph at John Carroll University (then St. Ignatius College, Cleveland) in 1900. His instrument used a Hengler-Zollner type of suspension on a horizontal pendulum. A second design embodied a heavy vertical pendulum whose motion was converted through four carbon microphones set 90 degrees apart, into electrical energy.

On February 2, 1909, Father Odenbach advocated a program of research in seismology by the American Jesuit colleges and universities and imported eighteen Wiechert seismographs to America for their use. This action marked the beginning of what is now the Jesuit Seismological Association.

When John Carroll University moved to its new campus in University Heights in 1932, Father Odenbach transferred his scientific equipment to the half-finished buildings. The following winter was too severe for his advanced age and he fell a victim to a sudden collapse on March 15, 1933.

Reverend Joseph S. Joliat, S. J. succeeded to the post of director in 1933, operating one of the original Wiechert horizontal seismographs. In 1946, gifts from the Louis D. Beaumont Trust and The Cleveland Foundation financed the purchase of three electromagnetic seismographs of the Sprengnether type, one for each horizontal component and one for the vertical component.

The instruments were installed during the months July-September, 1947. The first complete recording with all three components was made September 20, 1947. The monthly bulletins, of which this is the initial number will publish the arrival times and phases of all recorded teleseismic activity.

A monthly microseismic report will be included, giving the amplitudes of the microseisms on both horizontal components at 0, 6, 12 and 18 hrs., G.M.C.T., following the recommendations of the United States Coast and Geodetic Survey in its cooperative study of microseisms.

CONSTANTS

It has been possible to determine the latitude, longitude and elevation of the John Carroll Observatory with considerable precision since the University tower was a datum point for the latest Regional Geological Survey. Detailed instrumental constants will be published later.

Geographical coordinates: λ = 81° 31' 52.22" West

ϕ_g = 41° 29' 27.90" North

Geocentric latitude: ϕ_s = 41° 18'

h = 326 m. = 1070 ft.

H + h = 3.1 km.

Lithological foundation: hard glacial clay.

STAFF

Reverend Henry F. Birkenhauer, S. J., Director
Reverend Joseph S. Joliat, S. J., Associate Director
Dr. Edward J. Walter, Assistant Director
Mr. Richard Becka
Miss Jeanne Carrabine

March 1, 1948

Gnwch. Date and Number	Phase and Component	G.M.C.T.	Remarks
September 20		23^h48^m to 00^h21^m	Surface waves
September 22 No. 1	eP E e E i E eM N F E	$02^h22^m19^s$ 02 27 02 02 29 24 02 34.9 02 42	Epicenter by U.S.C. & G.S. 43°5 N. 128°0 W. H = 2^h 16.1^m Off the coast of Oregon. Record very weak. By J.S.A. tentative 43°1 N. 126°5 E. H = 02^h 16^m 19^s
September 23		8^h09^m to 8^h37^m	Surface waves
September 23 No. 2	iSKS E iS E ePS NE i E i E e NE i E L? NE F E	$12^h52^m23^s$ 12 53 10 12 54 27 12 57 16 12 58 10 12 58 39 13 01 14 13 10 14 15 44	Epicenter by J.S.A. Region of 34°1 N. 57°6 E. Province of Khurassan, Iran H = $12^h28^m22^s$
Note: Earthquake of September 23, 1947, epicenter by U.S.C.&G.S. 41° N. 125° W. (off Cape Mendoceno California) H 13^h 53.1^m, lost in surface waves of previous quake.			
September 25		23^h39^m to 01^h56^m	Seismic activity
September 26		03^h50^m to 04^h34^m	Surface waves

Gnwch. Date and Number	Phase and Component	G.M.C.T.	Remarks
September 26 No. 3	eP Z	$16^h16^m13^s$	Epicenter by J.S.A.
	eP E	16 16 30	Region of
	epP E	16 17 10	21°7 N.
	e N	16 19 28	122°4 E
	eP N	16 20 16	H = 16^h 01^m 52^s
	e E	16 20 30	Focal depth 150± KM.
	iPR_1 N	16 20 46.0	Report felt on
	iPR_1 E	16 20 47.5	Ishigaki Island and
	iPR_1 Z	16 20 48.0	Miyako, Jimo
	i Z	16 20 52.5	By U.S.C.&G.S.
	$ipPR_1$ E	16 21 11.5	Provisional
	$ipPR_1$ Z	16 21 13.5	26° N.
	i Z	16 21 17.5	126° E.
	iSKS E	16 26 33.5	H = 16^h 02.3^m
	iSKS N	16 26 34.9	Focal depth 200 KM.
	isSKS N	16 27 25.5	
	i E	16 27 33.5	
	iPS N	16 30 12.5	
	iL N	16 54 35.5	
	F N	18 46	
September 28		04^h 13^m to 05 25	Surface waves

MICROSEISMIC REPORT

Amplitudes are read to the nearest tenth millimeter
at 0, 6, 12, 18 hrs. G.M.C.T.
Decimal point is dropped in recording the amplitude

SEPTEMBER, 1947

Date \ Hour	Component EW 0	6	12	18	Component NS 0	6	12	18
20				05				09
21	02	07	09	10	07	09	10	10
22	08	10	10	10	10	10	10	11
23	10	12	11	13	13	20	13	18
24	13	20	27	22	13	30	38	38
25	23	19	13	(1)	26	20	16	(1)
26	16	11	10	07	18	19	13	10
27	06	05	03	04	07	05	05	05
28	04	04	04	07	10	07	08	09
29	07	08	(2)	06	09	09	10	10
30	07	08	08	08	08	10	08	05

(1) No record.
(2) Lost on record holder.

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41° 29′ 27.90″ North, 81° 31′ 52.22″ West, h = 326 m.
Seismographs: Two Sprengnether long-period horizontal, one Sprengnether vertical.

Bulletin for October, 1947

Gnwch. Date and Number	Phase and Component	G.M.C.T.	Remarks
October 3 No. 4	iSKS E i E i N e E i N eSR$_1$ E e E i E F E	$06^h38^m49.5^s$ 06 43 58.5 06 43 59.5 06 44 53.5 06 46 21.9 06 47 08.5 06 47 32.5 06 51 56.5 08 03	Epicenter by J.S.A. Region of 26° N. 55° E. H = $06^h\ 14^m\ 00^s$ Δ about 104° Record weak
October 3 No. 5	iP Z ipP Z e E e N e E F E	$08^h17^m06.8^s$ 08 17 17.5 08 21 50 08 22 52 08 22 56 08 40	Epicenter by J.S.A. 16°9 N. 99°4 W. h = 50± km. H = $08^h\ 11^m\ 08^s$ Δ = 30°3 By U.S.C.& G.S. 16°5 N. 99°0 W. Near southeast coast of State of Guerrero, Mexico.
October 3 No. 6	eP ZN iP E i Z ipP NEZ i Z iPR$_1$ NZ iPR$_1$ Z i Z i Z ipPR$_1$ NE iS N iS E i E i N isS E iSR$_1$ E isSR$_1$ N F E	$23^h38^m02.1^s$ C 23 38 03.1 23 38 05.1 23 38 22.1 23 38 32.7 23 38 40.1 23 38 45.1 23 38 50.1 23 39 02.1 23 39 07.1 23 42 46.1 23 42 48.1 23 43 10.1 23 43 18.1 23 43 26.1 23 43 56.1 23 44 36.1 01 04	Epicenter by J.S.A. 18°6 N. 101°5 W. h = 100± km. H = $23^h\ 32^m\ 15^s$ Δ = 28°1 By U.S.C.& G.S. 19° N. 102° W. h = 100 km. H = $23^h\ 32.2^m$ Strongly felt in Guerrero and Michoacan, Mexico.

Gnwch. Date and Number	Phase and Component	G.M.C.T.	Remarks
October 4		$16^h 21^m$ to 17 25	Surface waves
October 5 No. 7	eP' Z ePR$_1$ Z e Z e NE e NE e NE ePS NE F E	$19^h 00^m 08^s$ 19 02 18 19 02 43 19 03 43 19 03 58 19 04 04 19 12 20 22 03	Epicenter by J.S.A. 4°0 S. 133°7 E. H= $18^h 40^m 42^s$ Δ = 130°8 By U.S.C.& G.S. 3°0 S. 140°0 E. Northern Coast of New Guinea H = $1^h 41.0^m$
October 6 No. 8	iP Z e E i NEZ i Z i E i E i E iS E iS N i E i N eM N F E	$20^h 07^m 20.2$dil 20 07 24.5 20 07 25.2 20 07 29.7 20 07 31.3 20 07 39.7 20 07 39.7 20 16 55.7 20 16 57.7 20 17 23.7 20 17 56.7 20 30.5 00 57	Epicenter by J.S.A. 36°9 N. 21°7 E. H = $19^h 55^m 40^s$ Δ = 75°1 By U.S.C.& G.S. 37° N. 21° E. H = $19^h 55.6^m$ Near coast of Southern Greece
October 7 No. 9	iP Z i Z i Z e E iS E i E i E i E i E F	$02^h 01^m 29.3$dil 02 01 33.6 02 03 19.9 02 07 48.9 02 08 01.3 02 16 18.3large 02 16 31.3 02 16 38.3 02 16 48.3 Lost in aftershock	Epicenter by J.S.A. 64°0 N. 148°6W. H = $01^h 53^m 23^s$ Δ = 43°8 By U.S.C. & G.S. 64°5 N. 146° W. Central Alaska H = $1^h 53.4^m$
October 7 No. 10	e E e E i E F E	$03^h 18^m 07^s$ 03 20 23 03 20 38.0 04 20	Aftershock of preceding quake. Record very weak. By J.S.A.H=$02^h 57^m 30^s$ BY U.S.C.& G.S. H = $02^h 57.5^m$

Gnwch. Date and Number	Phase and Component	G.M.C.T.	Remarks
October 7		05^h01^m to 05 12	Seismic activity possibly a second aftershock of earthquake of $01^h53^m23^s$
October 10 No. 11	eP Z iP Z iS NE i N eM E F N	$07^h44^m38^s$ 07 44 44.9 07 55 03.6 07 55 59.3 08 17.1 09 20	Epicenter by J.S.A. 44°3 N. 145°9 E. $H=07^h\ 32^m\ 47^s$ h= 300+ km. Δ = 84°5 By U.S.C.& G.S. 40° N. 144° E. Off Northeast coast of Honshu Island, Japan $H = 7^h\ 32.3^m$ h = 300 km. Record weak.
October 10 No. 12	eSKS E ePS E e E M E F E	$14^h08^m21^s$ 14 12 12 14 12 30 14 42.2 16 55	Epicenter by J.S.A. 31°0 S. 177°8 W. $H = 13^h\ 42^m\ 52^s$ h = 100± km. By U.S.C.&G.S. 30°S 180° W $H = 13^h\ 42.6^m$ Kermadec Islands Record weak
October 13		01^h26^m to 01 49	Seismic activity mainly surface waves.
October 13		07^h34^m to 11 10	Sinusoidal waves

Gnwch. Date and Number	Phase and Component	G.M.C.T.	Remarks
October 14 No. 13	eSKS E e E ePS E e N iSR$_1$ E M E F E	$02^h06^m45^s$ 02 07 43 02 10 30 02 10 50 02 16 59.8 02 40.4 04 17	Epicenter by J.S.A. 32°8 S., 178°4 E. H = $01^h 41^m 14^s$ By U.S.C.& G.S. 32° S. 180° E Kermadec Islands H = $1^h 14.1^m$
October 15		04^h31^m to 04 40	Seismic activity
October 15		09^h14^m to 09 20	Seismic activity
October 15 No. 14	iP Z eS E eSR$_1$ N iL NE F E	$19^h42^m47.5^s$ dil 19 49 29 19 52 39 19 57 25.1 20 35	ΔS - P = 44°6 H = $19^h34^m35.5^s$ Record weak and obscured by microseisms.
October 16 No. 15	iP Z iP NEZ ipP NEZ i Z e E eS E e Z e(SR$_1$) Z F E	$02^h17^m51.6^s$ comp 02 17 52.6 02 18 01.6 02 19 46.3 02 24 18 02 24 25 02 25 48.3 02 27 35 06 35	Epicenter by J.S.A. 63°8 N., 148°1 W. H = $02^h09^m50^s$ h = 50± km. Some damage at Fairbanks, Alaska Δ = 43°7 By U.S.C.& G.S. 64°5 N., 148°8 W. about 40 miles S.W. of Fairbanks, Alaska. Felt, some property damage. H = $02^h 09^m 45^s$ Record very strong.
October 17 No. 16	i E i E eM N F E	$10^h46^m01.3^s$ 10 46 18.4 10 49 10 10 53	Record weak

Gnwch. Date and Number	Phase and Component	G.M.C.T.	Remarks
October 19 No. 17	e E e NE eM N F N	$13^h05^m43^s$ 13 06 06 13 08 47 13 21	Record weak
October 20 No. 18	eP NZ iP NZ i E i NEZ iS N eS E iS E e SR_1 E i N iM N F E	$01^h51^m23^s$ 01 51 28.7 01 51 29 01 53 16 01 57 55.8 01 57 56 01 58 02.2 02 00 48 02 01 15.4 02 06 19 05 08	Epicenter by J.S.A. 64°0 N., 147°9 W. H = $01^h\ 43^m\ 17^s$ Δ = 43°7 By U.S.C.& G.S. Aftershock of quake of Oct. 16, 2nd h 64°5 N., 148°8 W. H = $01^h\ 43^m\ 16^s$ Record strong. May have slight depth of focus.
October 21 No. 19	iP Z eM E F E	$09^h58^m20.7^s$ 10 36.5 10 58	Record very weak.
October 22		18^h21^m to 19 19	Seismic activity
October 27		11^h46^m to 12 03	Seismic activity
October 31		03^h33^m to 03 50	Seismic activity
October 31		04^h30^m to 04 52	Surface waves

MICROSEISMIC REPORT

Amplitudes are read to the nearest tenth millimeter
at 0, 6, 12, 18 hrs. G.M.C.T.
Decimal point is dropped in recording the amplitude

OCTOBER, 1947

	Component EW				Component NS			
Date \ Hour	0	6	12	18	0	6	12	18
1	07	12	10	09	10	19	20	11
2	09	07	09	08	11	10	10	09
3	08	10	09	16	13	15	14	10
4	08	07	03	02	07	10	08	04
5	02	02	03	05	03	02	02	03
6	04	05	05	02	05	05	09	07
7	03	04	04	08	07	06	05	06
8	07	10	10	10	07	09	08	09
9	09	08	06	09	10	10	10	09
10	10	09	09	08	10	10	10	09
11	07	07	09	08	10	10	08	10
12	05	07	09	07	10	10	09	11
13	06	08	08	09	10	10	11	10
14	09	10	10	12	10	19	16	20
15	21	29	29	23	18	29	36	35
16	20	12	10	08	30	20	12	10
17	09	09	09	12	10	12	11	18
18	30	25	39	29	19	29	32	30
19	29	17	11	10	40	30	20	11
20	10	08	08	05	11	10	09	09
21	07	08	08	09	09	08	10	10
22	10	10	34	40	11	17	46	42
23	32	58	88	45	36	60	85	60
24	42	28	40	60	43	30	58	55
25	30	24	13	13	40	27	20	14
26	10	09	10	08	12	10	10	10
27	09	09	09	10	10	11	11	21
28	18	19	15	09	29	23	20	18
29	08	10	10	10	13	10	10	10
30	10	10	09	09	10	10	11	10
31	10	10	11	13	14	15	19	13

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41° 29' 27.90" North, 81° 31' 52.22" West, h = 326 m.
Seismographs: Two Sprengnether long-period horizontal, one Sprengnether vertical.

Bulletin for November, 1947

Gnwch. Date and Number	Phase and Component	G.M.C.T.	Remarks
November 1 No. 20	iP Z	$06^h19^m19.4^s$ dil	Δ PS - P = 130°2
	e N	06 22 18	H = $06^h\ 03^m\ 11^s$
	iP' Z	06 22 23.6	Record weak
	i NZ	06 22 37.6	
	i N	06 22 55.6	
	iSKS N	06 29 30.4	
	iS N	06 32 33.8	
	ePS N	06 34 54	
	eSR_1 N	06 42 08	
	eL E	07 02.4	
	eM E	07 12.0	
	F E	08 30	
November 1 No. 21	iP NZ	$15^h08^m04.8^s$ comp	Epicenter by J.S.A.
	iP N	15 08 06.8	10°8 S. 74°5 W.
	e E	15 08 15	H = $14^h\ 58^m\ 54^s$
	e E	15 08 22	Probably deeper
	i N	15 08 23	than normal,
	i N	15 09 21	destructive in
	i E	15 09 28	Peru.
	iPR_1 N	15 10 11	Δ = 52°6
	iPR_2 N	15 11 10	By U.S.C.&G.S.
	i N	15 11 30	11° S. 75° W.
	i E	15 11 31	About 150 miles
	i E	15 12 03	N.E. of Lima, Peru.
	i N	15 13 21	53 reported dead,
	e N	15 15 15	considerable pro-
	i E	15 15 29	perty damage.
	iS N	15 15 36	H = 14^h 58.9^m
	F N	20 12	Record very strong.
November 2 No. 22	iP Z	$01^h41^m29.4^s$	By U.S.C.&G.S.
			Aftershock of
			preceding quake
			of November 1, 14^h
			H = 01^h 32.2^m

Bulletin for November, 1947

Gnwch. Date and Number	Phase and Component	G.M.C.T.	Remarks
November 2 No. 23	iP Z e Z i Z e E e E iS NE i E iL E iM E F E	$07^h07^m18.2^s$ 07 07 25 07 07 37.5 07 12 36 07 12 41 07 12 46.9 07 13 37.6 07 17 51 07 21 14 C 28	Epicenter by J.S.A. 40°6 N. 126°5 W. $H = 07^h\ 00^m\ 26^s$ By U.S.C.& G.S. 40° N. 127° W. Off Cape Mendoceno California $H = 07^h\ 00.3^m$
November 4	Quake of 0^h lost. No records		
November 7 No. 24	e(P) N eS N eSR1 E e N eSR_2 N e E eL E eM E F E	$23^h09^m49^s$ 23 17 12 23 20 53 23 21 19 23 22 32 23 22 53 23 24.8 23 30.0 23 55	Epicenter by J.S.A. 10°8 S. 74°5 W. $H = 23^h\ 00^m\ 29^s$ Probably deeper than normal. $\Delta = 52.6$ By U.S.C.& G.S. 11° S. 75° W. $H = 23^h\ 00.5^m$ About 150 miles S.W. of Lima, Peru Aftershock of Nov. 1st quake. Record weak and obscured by microseisms.
November 8		04^h40^m to 05 00	Seismic activity
November 8		05^h30^m to 05 55	Seismic activity
November 9	Lost quake of 04^h. No records; repair work.		
November 12 No. 25	The following four quakes are probably from the same epicenter. The records are weak but all show similar characteristics: First Quake e N i N iM E	 $01^h07^m\ 21^s$ 01 12 02 01 17 39	

Bulletin for November, 1947

Gnwch. Date and Number	Phase and Component	G.M.C.T.	Remarks
November 12 No. 26	Second Quake eL E iM E	$01^h53.0^m$ $01^h55^m\ 02^s$	Epicenter by U.S.C.&G.S. 29° N. 114° W. H = $01^h\ 39.8^m$ Gulf of California Epicenter by J.S.A. 30° N. 113.5° W. H = $01^h\ 39^m\ 55^s$
November 12 No. 27	Third Quake eM E	$02^h32^m00^s$	
November 12 No. 28	Fourth Quake eL E iM E F E	$02^h57.2^m$ 02 59 21^s 03 17	Epicenter by U.S.C.& G.S. 29° N. 114° W. H = $2^h\ 44.0^m$ Gulf of California By J.S.A. Aftershock of No.28 H = $02^h\ 44^m\ 11^s$
November 12 No. 29	i E i E e N i E M E F E	$11^h09^m11^s$ 11 16 18 11 16 25 11 24 13 11 36.6 12 16	Record weak
November 12 No. 30	e E iSKS E i E iPS E M E F E	$16^h39^m31^s$ 16 44 49 16 47 26 16 48 52 17 17.0 18 36	Epicenter by U.S.C.& G.S. 23° S. 171° E. H = $16^h\ 18.9^m$ Loyalty Islands By J.S.A. 23°5 S. 170°5 E. H = $16^h\ 18^m\ 58^s$
November 12		22^h04^m to 22 28	Surface waves

Bulletin for November, 1947

Gnwch. Date and Number	Phase and Component	G.M.C.T.	Remarks
November 14 No. 31	iP Z ipP Z iPR$_1$ Z iS E eS N e N i E esSKS E isSKS N M E F E	$11^h02^m41.5^s$ comp 11 03 30.1 11 06 03.0 11 12 48.0 11 12 50.5 11 13 00 11 13 02.2 11 13 53 11 13 56.2 11 33.7 12 05	Epicenter by U.S.C.& G.S. 46° N. 143° E. H = 10^h 50.5^m h = 200 km. Off Northern coast of Hokkaiko, Japan Record weak. By J.S.A. 44°3 N. 143°6 E. H = 10^h 50^m 30^s h = 200± km.
November 17		08^h41^m to 09 00	Surface waves Probably foreshock of following quake.
November 17 No. 32	e E eS E e E eSR$_1$ N eSR$_1$ E M E F E	$10^h10^m21^s$ 10 10 54 10 11 37 10 13 31 10 13 35 10 15.0 10 46	Epicenter by U.S.C.& G.S. 14° N. 45° W. H = 9^h 56.5 Atlantic Ridge off N.E. coast of South America Δ meas = 42°0 Record weak By J.S.A. 17° N. 46°3 W. H = 09^h 56^m 51^s
November 17 No. 33	e E e E M E F E	$11^h40^m49^s$ 11 44 53 11 47.6 12 13	Probably aftershock of preceding quake.
November 20 No. 34	e N eS E e N eSR$_2$ E L E M E F E	$08^h41^m07^s$ 08 41 16 08 41 32 08 50 12 08 58.6 09 03.9 09 27	Epicenter by U.S.C.&G.S. 47° N. 153° E. H= $08^h19.3^m$ Δ meas = 79° Record weak By J.S.A. 48°8 N. 154°8 E. H = 08^h 19^m 48^s

Bulletin for November, 1947

Gnwch. Date and Number	Phase and Component	G.M.C.T.	Remarks
November 21 No. 35	eP Z eP E iP Z iP EZ i EZ i Z iPR_1 Z iPR_2 Z i Z e E eS Z eS E F E	$04^h00^m32^s$ dil 04 00 33 04 00 36.5 dil 04 00 41.9 comp 04 00 48.3 04 01 13.3 04 01 33.8 04 01 50.7 04 02 13.9 04 04 53 04 05 47 04 05 49 06 14	Epicenter by U.S.C. & G.S. 19° N 107° W. 150 miles off Western coast of Mexico. H = $03^h\ 54^m\ 15^s$ Δ meas = 31°1 iP refers to the main shock. By J.S.A. 19° N. 107°3 W. H = $03^h\ 54^m\ 15^s$
November 21 No. 36	iP Z	$04^h24^m05.5^s$	Aftershock of preceding quake. H = $04^h\ 17^m\ 39^s$ by U.S.C.& G.S. Secondary phases lost in surface waves of preceding quake. By J.S.A. aftershock of preceding quake. H = $04^h\ 17^m39^s$
November 23 No. 37	iP Z eP E iP Z iP NE i N i Z iPR_1 E iPR_1 N iPR_2 E iPR_2 N i E iS N iS E iSR_1 NE i E iL NE iM N iM E F E	$09^h51^m01.2^s$ dil 09 51 01.8 09 51 04.6 main shock 09 51 06.2 dil 09 51 10.2 09 51 22.2 09 51 25.5 09 51 25.9 09 51 38.7 09 51 39.1 09 51 58.7 09 55 07 09 55 09 09 55 38 09 56 25 09 57 33 09 58 43 09 58 59 11 09	Epicenter by U.S.C.& G.S. 44° 47' N. 112° 02' W. H = $09^h\ 46^m\ 05.5^s$ Southwestern Montana. Felt in Montana and Idaho. Δ meas = 22°5 By J.S.A. 44°54' N. 111° 43' W. H = $09^h\ 46^m\ 05^s$

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Gnwch. Date and Number	Phase and Component	G.M.C.T.	Remarks
November 25 No. 38	iP Z i Z i Z i Z i Z eL E eM E F E	$18^h24^m27^s$ 18 24 34 18 24 36 18 24 38 18 24 42 18 37.8 18 44.5 19 05	Epicenter by U.S.C.& G.S. 11° S. 75° W. H = 18^h 15.1^m About 150 miles N.E. of Lima, Peru Δ meas = 52°7 Record very weak By J.S.A. 10°8 S. 74°5 W. H = 18^h 15^m 10^s h = 50± km.

MICROSEISMIC REPORT

Amplitudes are read to the nearest tenth millimeter
at 0, 6, 12, 18 hrs., G.M.C.T.
Decimal point is dropped in recording the amplitude

November, 1947

	Component EW				Component NS			
Date \ Hour	0	6	12	18	0	6	12	18
1	10	12	12	(3)	21	20	13	(3)
2	10	09	10	04	10	11	09	10
3	07	08	(2)	(1)	11	13	16	(1)
4	(1)	(1)	(1)	04	(1)	(1)	(1)	10
5	05	06	13	18	08	09	12	15
6	10	19	28	13	22	24	20	22
7	19	12	13	10	18	19	14	15
8	10	13	18	(1)	10	19	13	(1)
9	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)
10	(1)	08	13	(4)	(1)	13	12	09
11	10	10	09	10	13	19	12	10
12	08	09	07	31	10	10	10	19
13	34	44	67	38	20	41	65	40
14	36	20	20	23	30	28	25	23
15	20	27	40	48	28	35	28	60
16	55	69	50	42	50	59	50	63
17	34	40	33	32	39	38	33	40
18	(1)	(1)	(1)	25	(1)	(1)	(1)	(1)
19	25	27	17	21	27	27	29	29
20	25	20	18	17	29	27	22	(1)
21	17	19	13	(1)	(1)	(1)	(1)	(1)
22	(1)	(1)	(1)	09	(1)	(1)	(1)	11
23	10	21	21	20	13	28	23	24
24	19	21	20	29	20	20	21	34
25	39	40	30	27	50	45	(2)	39
26	24	18	17	17	23	20	20	30
27	20	30	32	23	59	42	41	30
28	13	15	08	05	29	20	13	10
29	05	08	08	03	10	13	10	09
30	04	07	09	10	10	10	10	10

(1) No record
(2) Lost on record holder
(3) Lost in quake
(4) Lost in large amplitudes

CLEVELAND

SEISMOLOGICAL OBSERVATORY
JOHN CARROLL UNIVERSITY, CLEVELAND 18, OHIO, U. S. A.

41° 29' 27.90" North, 81° 31' 52.22" West, h = 326 m.

Seismographs: Two Sprengnether long-period horizontal, one Sprengnether vertical.

Bulletin for December, 1947

Gnwch. Date and Number	Phase and Component	G.M.C.T.	Remarks
December 1		3^h07^m to 3 29	Surface waves
December 1		5^h20^m to 6 51	Surface waves
December 2		21^h10^m to 21 21	Very regular surface waves on E-W component only
December 3		20^h08^m to 20 17	Very regular surface waves on E-W component only.
December 6		00^h18^m to 00 43	Surface waves
December 10		00^h23^m to 00 49	Surface waves
December 11		20^h37^m to 20 49	Surface waves
December 12		20^h10^m to 20 20	Surface waves
December 13		02^h24^m to 02 36	Surface waves
December 13		10^h19^m to 10 36	Surface waves

Bulletin for December, 1947

Gnwch. Date and Number	Phase and Component	G.M.C.T.	Remarks
December 13		20^h21^m to 20 32	Surface waves
December 14		19^h55^m to 20 08	Very regular surface waves on E-W component only.
December 14 No. 39	iP Z ipP Z	$02^h27^m29.3^s$ dil 02 27 58.3	Epicenter by U.S.C.& G.S. North Central Argentina 26° S. 63° W. H = 2^h 16.2^m h = 100 km. Record very weak Only preliminaries recorded.
December 15 No. 40	eP' Z $19^h39^m12^s$ C iPR_1 Z 19 40 33.5 iPR_1 NE 19 40 34.5 e N 19 50 10 e N 19 50 12 e N 19 50 14 iPS E 19 50 20 F Lost in changing records at 21^h20^m		Epicenter by U.S.C.& G.S. 59° S. 161° W. H = 19^h 20.5m South Pacific Ocean, about 2000 miles south of New Zealand. Depth 100 km. Δ meas = 121°3
December 16		21^h22^m to 21 46	Surface waves
December 17		19^h33^m to F lost in changing records at 21^h10^m	
December 18		20^h26^m to 20^h34^m	Surface waves
December 19		19^h34^m to 19 42	Surface waves

Gnwch. Date and Number	Phase and Component	G.M.C.T.	Remarks
December 21		17^h33^m to 17 58	Surface waves
December 23 No. 41	iP Z e Z i Z eS E eS N e F	$02^h01^m54.8^s$ C 02 02 57 02 02 59.7 02 05 03 02 05 06 02 17.3 02 20	Δ(S - P) 16°2 H = $01^h\ 58^m\ 07^s$ Record very weak
December 24 No. 42	iP' Z iP' Z i Z i Z e N e Z i Z e E e(PS) N e N F E	$05^h41^m53^s$ C 05 41 58.4 05 42 47.0 05 42 51.2 05 46 31 05 46 33 05 46 51.7 05 53 48 05 53 56 05 57 03 07 31	ΔPS - P' = 126°6 Record weak Interpretation doubtful.
December 24 No. 43	eP Z e E e N eS E F N	$16^h42^m52^s$ 16 47 43 16 47 50 16 47 55 17 09	Epicenter by U.S.C.& G.S. 16°N. 98° W. Near coast of Oaxaca, Mexico. H = $16^h\ 36.7^m$ Δ S - P = 29.6° Δ P - H = 29.6° Δmeas = 29.6° Record weak
December 24 No. 44	eP Z e N eS E F N	$17^h42^m37^s$ 17 47 37 17 47 40 18 08	Epicenter same as above H = $17^h\ 36.5^m$ Δ S - P = 29.6° Δ P - H = 29.4° Δ meas = 29.6°

Gnwch. Date and Number	Phase and Component	G.M.C.T.	Remarks
December 25		02^h57^m to 03 16	Surface waves
December 25		21^h07^m to 21 22	Surface waves
December 26		17^h13^m to 19 07	Seismic activity
December 26		20^h46^m to 21 28	Surface waves
December 29		18^h29^m to 18 42	Seismic activity
December 29		18^h57^m to 19 16	Seismic activity
December 30 No. 45	iP Z eP N ePR1 N eS N e E e E eM N F E	$02^h01^m40.7^s$ 02 01 43 02 02 41 02 07 04 02 08 13 02 09 04 02 12 53 03 02	Epicenter by USS.G.& G.S. 9°5 N. 84°5 W. Near coast of Costa Rica. H = 1^h 55.3^m
December 30 No. 46	iP Z (e)? E eM E F E	$07^h06^m50^s$ 07 12 33 07 16 55 07 50	Record very weak. Probable after-shock of preceding quake.
December 30		09^h23^m to 09 30	Surface waves
December 31		05^h49^m to 06 00	Surface waves
December 31		10^h10^m to 10 40	Surface waves

Bulletin for December, 1947

Gnwch. Date and Number	Phase and Component	G.M.C.T.	Remarks
December 31 No. 47	iP Z eSKS E e E ePS E L E M E F E	$15^h 20^m 38.7^s$ 15 31 02 15 31 35 15 33 46 15 53.4 15 58.4 16 52	Epicenter by U.S.C.& G.S. 15° S. 176° W. Samoan Region H = 15^h 06.5^m Depth slightly greater than normal.

MICROSEISMIC REPORT

Amplitudes are read to the nearest tenth millimeter
at 0, 6, 12, 18 hrs., G.M.C.T.
Decimal point is dropped in recording the amplitude

	Component EW				Component NS			
Date \ Hour	0	6	12	18	0	6	12	18
1	09	09	(2)	04	10	11	11	(5)
2	05	07	07	03	(5)	06	06	05
3	04	06	(2)	09	06	07	(2)	09
4	10	08	(2)	09	10	10	(2)	09
5	09	10	09	10	10	10	11	15
6	13	22	36	54	20	30	30	46
7	60	84	79	53	58	79	82	60
8	42	23	35	45	49	33	43	39
9	60	32	26	30	60	42	32	29
10	20	20	20	20	20	20	10	20
11	32	35	22	22	32	46	36	20
12	26	20	(2)	26	29	25	(2)	27
13	38	29	(2)	13	37	30	(2)	19
14	10	12	09	10	20	14	10	11
15	07	08	10	15	08	13	19	20
16	23	23	31	27	20	30	31	27
17	18	18	21	20	28	19	20	24
18	15	16	20	23	22	21	18	30
19	20	22	29	26	28	36	32	25
20	17	15	28	22	19	29	23	28
21	20	11	10	12	22	18	11	17
22	17	25	(2)	13	21	30	(2)	25
23	20	20	13	23	23	26	30	20
24	26	19	17	20	26	29	19	20
25	22	21	21	14	29	19	20	23
26	12	21	23	20	22	32	28	20
27	30	29	33	34	30	38	42	33
28	20	19	19	20	30	32	23	20
29	18	15	17	18	24	26	25	22
30	20	20	23	23	20	20	23	19
31	28	23	22	20	26	29	21	26

(2) Lost on record holder
(5) Lost in changing records