Georgetown University Publication

THE REGISTRATION OF EARTHQUAKES

AND

DISPATCHES ON EARTHQUAKES

FROM

JANUARY 1, 1920 TO JANUARY 1, 1921

BY

F. A. TONDORF, S. J.

WASHINGTON, D. C.

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Bulletin of the

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THE REGISTRATION OF EARTHQUAKES

at the

GEORGETOWN UNIVERSITY STATION

and

DISPATCHES ON EARTHQUAKES

Received at the

GEORGETOWN STATION

From

January 1, 1920, to January 1, 1921

by

F. A. TONDORF, S. J.

Chief Seismologist

INSTALLATION AND EQUIPMENT OF THE SEISMOLOGICAL OBSERVATORY OF GEORGETOWN UNIVERSITY.

On the basis of a gift from Patrick H. O'Donnell, A.B., '92, A.M., '93, LL.B., '94, the foundation of the Georgetown University Seismological Observatory became possible. The original installation consisted of an horizontal and vertical seismograph after Wiechert, each carrying a stationary mass of 80 kilos. These instruments were tentatively placed, January, 1911, at the base of the South Tower of the Healy building. It was soon ascertained that this choice of position was unfortunate because of the rocking of the tower, 212 feet in height, under heavy wind conditions. A cave was promptly excavated beneath the quadrangle, measuring 12 ft. 4 in. in width, 30 ft. 10 in. in length and 11 ft. high. This station is designated as Station A. Care was taken to make this new home of the seismographs heat and damp proof. A new Wiechert horizontal seismograph, with a stationary mass of 200 kilos, was purchased to replace the one of 80 kg. mass. This smaller instrument is now installed in Guatemala City, Guatemala, and is in charge of Senor Claudio Urrutia, consulting engineer to the Guatemalan Government. The cave also houses a vertical seismograph after Wiechert, two Bosch-Omori pendulums of 25 kilos each, and two conical pendulums after Mainka, of 135 kgs. mass. A concrete building, situated on observatory hill, at an altitude of 159 feet above sea level, designated as Station B, shelters a Bosch photographic instrument with pendulums of 200 grams each. The time is automatically registered on these instruments by five contact clocks noting minutes and hours. The clocks are corrected daily by signals, received through the courtesy of the Western Union Telegraph Company and the Arlington Wireless Station.

CONSTANTS

CONSTANTS OF THE STATION

Latitude and longitude of the seismograph rooms:
$\varphi = 38°\ 54'\ 25''$ N. Lat.
$\lambda = 77°\ 04'\ 24''$ W. from Greenwich.

TIME. All determinations are reduced to Greenwich mean civil time.

ALTITUDE, Station A, 42.4 meters above mean sea level.
Station B, 48.2 meters above mean sea level.

GEOLOGY, subsoil of piers: decayed diorite.

CONSTANTS OF THE SEISMOGRAPHS.

BOSCH-OMORI TROMOMETERS (25 Kilos).

	Period.	*Magnification.*
N-S Component	8.6	13.5
E-W Component	8.8	13.7

WIECHERT HORIZONTAL SEISMOGRAPH (200 Kilos).

	Period.	*Magnification.*
N-S Component	5.2	143
E-W Component	5.4	165

MAINKA CONICAL PENDULUM (135 Kilos).

	Period.	*Magnification.*
N-S Component	5.4	70
E-W Component	4.0	93

WIECHERT VERTICAL SEISMOGRAPH (80 Kilos).

Period.	*Magnification.*
3.0	80

BOSCH PHOTOGRAPHIC SEISMOGRAPH (200 gms).

	Period.	*Magnification.*
N-S Component	5.0	133
E-W Component	5.0	133

SYMBOLS AND NOTATIONS

1. *Character of the Earthquake.*

ROSSI-FOREL SCALE OF EARTHQUAKE INTENSITIES:

I. *Microseismic shock*: recorded by a single seismograph or by seismographs of the same model, but not by several seismographs of different kinds; the shock felt by an experienced observer.

II. *Extremely feeble shock*: recorded by several seismographs of different kinds; felt by a small number of persons at rest.

III. *Very feeble shock*: felt by several persons at rest; strong enough for the direction or duration to be appreciable.

IV. *Feeble shock*: felt by persons in motion; disturbances of movable objects, doors, windows; creaking of ceilings.

V. *Shock of moderate intensity*: felt generally by everyone; disturbance of furniture, beds, etc., ringing of swinging bells.

VI. *Fairly strong shock*: general awakening of those asleep; general ringing of house bells; oscillation of chandeliers; stopping of pendulum clocks; visible agitation of trees and shrubs; some startled persons leave their dwellings.

VII. *Strong shock*: overthrow of movable objects; fall of plaster; ringing of church bells; general panic, without damage to buildings.

VIII. *Very strong shock*: fall of chimneys, cracks in walls of buildings.

IX. *Extremely strong shock*: partial or total destruction of some buildings.

X. *Shock of extreme intensity*: great disaster, buildings ruined, disturbance of the strata, fissures in the ground, rock-falls from mountains.

d (terrae motus domesticus)	Local shock (origin nearby, perceptible at the station).
v (terrae motus vicinus)	Near shock (origin less than 1,000 kilometers distant).
r (terrae motus remotus)	Distant shock (origin from 1,000 to 5,000 kilometers distant).
u (terrae motus ultimus)	Very distant shock (origin more than 5,000 kilometers).

2. *Phases of the Seismogram.*

P (undae primae)	First phase, or first preliminary tremors.
PRn	Waves n-times reflected at the earth's surface.
S (undae secundae)	Second phase, or second preliminary tremors.
SRn	Waves n-times reflected at the earth's surface.
PS	Waves changed from longitudinal to transverse oscillation, or vice versa, through reflection at earth's surface.
L (undae longae)	Long waves, chief phase, or principal part.
M (undae maximae)	Greatest motion in the chief phase.
C (cauda)	Tail or end portion.
F (finis)	End of discernible movement.

3. *Nature of the Motion.*

i (impetus) Sudden beginning of the motion.

e (emersio) Gradual beginning of the motion.

T (period) Time of one complete oscillation.

A amplitude of the motion, measured from the median line in millimeters. Instrumental trace.

AE E-W component of A.

AN N-S component of A.

AZ Vert. component of A.

REGISTRATION OF EARTHQUAKES AT THIS STATION

From January 1, 1920 to January 1, 1921.

Date.	Character.	Phase.	Time.	Periods.	Amplitude A_N	Amplitude A_E	Amplitude A_Z	Remarks.
			H. M. S.					
**Jan. 4		eP_E	4 27 53					No distinct M.
		eP_N	4 27 53					
		S_E	4 32 52					
		S_N	4 32 46					
		eL	4 35.3					
		F	5 20					
Jan. 30		eP_E	18 33 18					Heavy microseisms.
		eP_N	18 33 18					
		S_E	18 39 11					No distinct M.
		S_N	18 39 11					
		eL_E	18 43.3	10				
		L_E	18 44 48	16				
		L_N	18 46 22	18				
		F	19 (ca.)					
Feb. 2		e_E	11 40 00					e possibly soon
		e_N	11 40 00					Heavy
		S_E??	11 48 45					microseisms.
		eL_E?	12 5.2	17				Apparently two
		eL_N	12 4.7	17				quakes overlapp
		L_E	12 27	25				
		L_N	12 26 23	26				
		M_E 1	12 37 09	24		1.0mm.		
		M_N	12 35 00	24	0.7mm.			
		M_E 2	12 41 16	16		0.9mm.		
		F	14 (ca.)					
Feb. 7		eL_E	12 9.6	16				Very heavy
		L_N	12 10 21	21				microseisms.
		F	12 20					First phases lost in above.
Feb. 7			Sheets put on at 13h. 30m. Very heavy microseisms. quake. Impossible to evaluate.					Suspicion of

*Instrumental Trace

**All records, unless otherwise noted, are from grams on the Wiechert Horizontal (200) and Vertical (80) Seismographs.

Date.	Character.	Phase.	Time.	Periods.	Amplitude			Remarks.
					A_N	A_E	A_Z	
			H. M. S.					
eb. 10		iP_E	22 12 10					
		iP_N	22 12 10					
		iS_E	22 16 15					
		iS_N	22 16 15					
		eL_E	22 17.5	15				
		eL_N	22 17.4	15				
		L_E	22 20 25	19				
		L_N	22 19 10	18				
		M_E	22 26 06	14		4.1mm.		
		M_N	22 26 10	14	3.0mm.			
		F	0 20					
eb. 10		P_Z	22 12 10					
		S_Z	22 16 16					
		eL_Z	22 17.4	19				
		L_Z	22 19 10	19				
		F	23 (ca.)					
eb. 12		eP_E	0 31 18					Heavy microseisms. No distinct M.
		eP_N	0 31 18					
		S_E	0 35 18					
		S_N	0 35 18					
		L_E	0 40 11	11				
		L_N	0 40 00	11				
		F	0 50					
eb. 12		e_E	17 54 10					Heavy microseisms.
		e_N	17 53 59					
		L_N	18 06 17	24				
		F	18 10					
eb. 22		P_E	17 47 52					
		P_N	17 47 52					
		S_E	17 57 41					
		S_N	17 57 41					
		i_E	17 57 52					
		i_N	17 57 52					
		F	18 25					

Date.	Character.	Phase.	Time.	Periods.	Amplitude			Remarks.
					A_N	A_E	A_Z	
			H. M. S					
Feb. 28		P_E	18 50 09					E-W component not so well defined. Heavy microseisms.
		P_N	18 50 09					
		S_E	18 57 53					
		S_N	18 57 53					
		eL	19 5.1	7				
		L_E	19 14 20	19				
		L_N	19 14 31	22				
		F	19 20					
Mar. 10		e_E	16 30 03					
		e_N	16 30 08					
		F	16 35					
Mar. 15		L_E	13 04 09	22				Sheets changed at 13hrs. 15m. Quake still on.
		L_N	13 05 09	22				
Mar. 19		e_E	17 55					Early phases lost microseisms. Heavy microseisms.
		e_N	17 55					
		F	18 03					
Mar. 20		e_E?	18 04 27					F' lost in 2nd quake. Heavy microseisms.
		e_N?	18 04 05					
		S_E	18 08 05					
		S_N	18 08 05					
		eL_E	18 10.3	9				
		eL_N	18 9.8	9				
		L_E	18 11 05	13				
Mar. 20		eL_Z	18 10.3					F lost in 2nd quake.
		L_Z	18 14 17	17				

Date.	Character.	Phase.	Time.	Periods.	Amplitude			Remarks.
					A_N	A_E	A_Z	
			H. M. S.					
h. 20		eP_E	18 43 33					
		eP_N	18 43 26					
		eS_E	18 53 43					
		iS_N	18 53 40					
		eL_E	19 7.2	16				
		eL_N	19 7.5	16				
		L_E	19 11 11	28				
		L_N	19 12 00	27				
		F	21 (ca.)					
h. 20		eP_Z	18 43 18					No distinct M.
		S_Z?	18 53 49					
		eL_Z	19 7.2	14				
		L_Z	19 15 00	16				
		F	20 (ca.)					
h. 22		L_E	20 58 to 21 01	21				
h. 23		eP_E	15 28 05					No distinct M.
		eP_N	15 28 05					
		S_E	15 33 07					
		S_N	15 33 07					
		eL_E	15 35.7					
		eL_N	15 35.7					
		L_N	15 41 04	10				
		F	15 50					
h. 29		eP_E	5 15 15					Gram from Mainka seismograph.
		eP_N	5 15 33					
		eS_E	5 21 05					
		eL_E	5 24.4	9				
		eL_N	5 24.5	8				
		M_E 1	5 29 51	11		10.9mm.		
		M_N	5 31 57	13	2.4mm.			
		M_E 2	5 31 54	13		13.5mm.		
		F	6 40					

Date.	Character.	Phase.	Time.	Periods.	Amplitude			Remarks.
					A_N	A_E	A_Z	
			H. M. S.					
March 29		eP_Z	5 15 15					
		eS_Z	5 21 27					
		M_Z	5 31 31	13			2.7mm.	
		F_Z	6 35					
April 6		eP_E	16 49 37					Heavy microseisms.
		eP_N	16 49 37					
		S_N?	16 55 10					
		F	17 12					
April 11		e_E	23 16 00					Heavy microseisms.
		e_N	23 16 00					
		S_E?	23 26 17					
		S_N?	23 26 17					
		L_N	23 52 04	18				
		F	23 56					
April 16		e_E	22 46 29					Heavy microseisms.
		e_N	22 46 29					
		L_E	23 10 18	19				
		L_N	23 10 18	16				
		F	23 20					
April 18		S_E	21 31 49					e masked in very heavy microseisms.
		S_N	21 31 49					
		eL	21 33.2	10				
		F	22 13					
April 18		S_Z	21 31 49					Microseisms.
		L_Z	21 35 17	8				
		F_Z	21 55					
April 19		P_E	21 12 13					No distinct M. Phases identical on photographic machine.
		P_N	21 12 13					
		S_E	21 16 55					
		S_N	21 16 56					
		eL_E	21 18.7	7				
		eL_N	21 18.7	7				
		F	21 55					

REGISTRATION OF EARTHQUAKES—Continued.

Date.	Character.	Phase.	Time.	Periods.	Amplitude			Remarks.
					A_N	A_E	A_Z	
			H. M. S.					
April 19		P_Z	21 12 12					
		eL_Z	21 18.7	8				
		L_Z	21 28 13	10				
		F	21 55					
May 7		e_E	21 59					Microseisms.
		e_N	21 59					
		eL_E?	22 3.6					No distinct M.
		eL_N?	23 3.7					
		L_N	22 14 06	22				
		L_N	22 27 30	16				
		L_E	22 28 22	16				
		F	23 45					
May 13		eP_E?	2 10 00					
		eP_N?	2 10 00					
		S_E?	2 20 04					
		S_N?	2 20 05					
		eL_N?	2 47.0					
		L_E	2 51 00	27				
		L_N	2 50 00	29				
		F	4 (ca.)					
May 13		e_Z	2 09 16					
		L_Z	2 50 23	30				
		F_Z	4 10					
May 20		L_E	8 22 00	30				Microseisms
		L_N	8 26 00	22				
		F	8 52					
May 30		e_E?	21 04 19					Microseisms.
		e_N?	21 04 19					
		eL_N	21 06 1[illegible]					
		F	21 14					

Date.	Character.	Phase.	Time.	Periods.	Amplitude			Remarks.
					A_N	A_E	A_Z	
			H. M. S.					
June 2		eP_E	22 18 46					
		eP_N	22 18 46					
		S_E?	22 22 36					
		S_N?	22 22 36					
		eL_E	22 23.5					
		eL_N	22 23.6					
		L_E	22 24 42	8				
		L_N	22 24 24	8				
		F	22 51					
June 5		eP_E	4 40 48					
		eP_N	4 40 48					
		S_E	4 48 10					
		S_N	4 48 13					
		eL_E	4 57.3					
		L_E	5 18 21					
		L_N	5 28 27					
		M_E	5 38 16	16		0.6mm.		
		M_N	5 37 16	16	1.2mm.			
		F_N	6 30					
June 9		e_E	11 53					Heavy microseisms.
		e_N	11 53					
		F	12 20					
June 18		eP_E	10 25 43					
		eP_N	10 25 49					
		S_E?	10 28 49					
		eL_E	10 29.7	9				
		F	10 45					
June 22		e_E	3 07					Microseisms.
		e_N	3 05					
		S_E?	3 10 44					
		F	3 18					

REGISTRATION OF EARTHQUAKES—Continued.

Date.	Character.	Phase.	Time.	Periods.	Amplitude A_N	Amplitude A_E	Amplitude A_Z	Remarks.
			H. M. S.					
July 2		eL_N	19 39.5					Heavy microseisms.
		L_E	19 45 31	23				
		L_N	19 45 15	23				
		F	19 57					
July 2		e_E	21 30 25					Very heavy microseisms.
		e_N	21 30 25					
		S_E?	21 39 25					Doubtful.
		S_N?	21 39 25					
		i_N	21 57 20					
		F	22 25					
July 7		eP_E	18 49 40					Microseisms.
		eP_N	18 49 40					
		S_E?	18 56 30					
		S_N?	18 56 20					
		eL_E	19 4.2	7				
		eL_N	19 4.4	7				
		M_E	19 05 20	6		10.5mm.		
		M_N	19 05 25	6	5.7mm			
		F	19 50					
July 7		e_E	20 02					Microseisms.
		e_N	20 02					
		F	20 11					
July 26		e_E	5 23 58					Very heavy microseisms.
		e_N	5 23 58					
		S_E?	5 33 17					
		S_N?	5 33 17					
		F	6 (ca.)					
Aug. 3		e_E	3 24					
		e_N	3 24					
		F	3 35					

REGISTRATION OF EARTHQUAKES—Continued

Date.	Character.	Phase.	Time.	Periods.	Amplitude			Remarks.
					A_N	A_E	A_Z	
			H. M. S.					
ug. 3		eP_E	20 08 11					
		eP_N	20 08 11					
		S_E	20 17 11					
		S_N	20 17 11					
		eL_E	20 28.2					
		eL_N	20 28.2					
		L	20 31 37	26				
		F	21 20					
ug. 13		e_E	8 37 10					Heavy microseisms.
		L_E	9 25 11	18				
		L_N	9 25 10	17				
		F	10 30					
ug. 20		eL_E	16 56.2	24				Sheets taken off at 16hrs. 21m.
		eL_N	16 56.0	24				
		L_E	17 03	11				On at 16hrs. 29m.
		L_N	17 01 16	16				Quake in progress.
		F	18					
ug. 26		iP_E	23 10 13					Heavy microseisms.
		iP_N	23 10 14					
		S_E	23 18 31					
		eL	23 30					
		L_E	23 33	9				
		L_N	23 34 11	20				
		F	0 30					
ept. 7		eL	6 26					
ept. 8		e_E	2 06 33					
		e_N?	2 06 16					
		i_E	2 10 42					
		S_E?	2 11 45					
		S_N?	2 11 54					
		i_N	2 20 44					
		eL_E	2 21.5	22				
		L_E	2 45 16	22				
		F	3 30					

Date.	Character.	Phase.	Time. H. M. S.	Periods.	Amplitude A_N	Amplitude A_E	Amplitude A_Z	Remarks.
Sept. 9		eL_E	19 58					
		L_E	20 01 24	24				
		F	20 45					
Sept. 20		eP_E	14 57 55					No distinct M. on N-S Component.
		eP_N	14 57 55					
		i_E	15 06 22					
		eS_E	15 09 17					
		eS_N	15 09 17					
		eL_E	15 28.4					
		eL_N	15 29.3					
		L_E	15 38	27				
		L_N	15 38 14	22				
		M_E 1	15 41 00	24		2.0mm.		
		M_E 2	15 48 00	20		2.2mm.		
		F	17 45					
Sept. 20		e_Z	14 58					
		S_Z	15 09 30					
		eL_Z	15 28.4	22				
		L_Z	15 37 35	34				
		M_Z	15 44 26				0.9mm.	
		F	17 20					
Sept. 21		e_E	18 05					
		e_N	18 05 14					
Sept. 24		eP_E	22 01 43					Heavy microseisms.
		eP_N	22 01 43					
		S_E	22 07 04					
		S_N	22 07 07					
		eL	22 10.1					
		L_E	22 13 28	19				
		F	22 33					

Date.	Character.	Phase.	Time.	Periods.	Amplitude A_N	Amplitude A_E	Amplitude A_Z	Remarks.
			H. M. S.					
t. 27		$e_■$	5 42					Heavy microseisms.
		e_N	5 42					
		S_E?	5 45 17					
		F	6 00					
. 1		e_E	19 01 09					Heavy microseisms.
		e_N	19 01 09					
		eL?	19 16.7					
		F	19 58					
. 5		e_E	19 19 19					
		e_N	19 19 17					
		F	19 40					
. 7		eP_E	21 03 21					N-S Component out of order.
		iS_E	21 11 13					
		eL_E	21 19.5	22				
		F	21 55					
. 8		eP_E	16 56 47					N-S Component out of order.
		S_E	17 01 41					
		eL_E	17 53					
		L_E	17 11 20	10				
		F	17 48					
. 18		iP_E	8 23 14					N-S Component out of order.
		iS_E	8 33 30					
		eL_E	8 48.5					
		L_E	8 59	22				
		F	9 50					
t. 22		iP_Z	12 19 46					Heavy microseisms.
		eS_Z	12 28 55					
		eL_Z	12 41.9					
		F	13					
t. 28		L_Z	8 08 30	24				Heavy microseisms.
		F	8 12					

REGISTRATION OF EARTHQUAKES—Continued.

Date.	Character.	Phase.	Time.	Periods.	Amplitude			Remarks.
					A_N	A_E	A_Z	
			H. M. S.					
Oct. 28		eP_E	13 00 00					Sheets off at 13hrs. 51m. Quake still on.
		iP_N	12 59 55					
		iS_E	13 10 20					
		eS_N	13 10 11					
		eL	13 22.1	23				
Nov. 4		e_E	2 16 00					Very heavy microseisms.
		e_N	2 16 00					
		S_E	2 20 05					
		S_N	2 20 05					
		L	2 28 11	9				
		F	2 40					
Nov. 6		e_E	10 53 40					
		e_N	10 53 44					
		eL_E	10 59.4	11				
		eL_N	10 59.7	14				
		F	11 10					
Nov. 12		e_E	5 57 27					Heavy microseisms. N-S does not show
		L_E	6 09 22	21				
		F	6 20					
Nov. 16		P_E	8 38 55					N-S Component out of order.
		eL_E	8 46.6					
		F	9 30					
Nov. 28		e_E	11 42 36					Heavy microseisms.
		e_N	11 42 36					
		S_E?	11 48 58					
		S_N?	11 48 58					
		F	12 30					

REGISTRATION OF EARTHQUAKES—Continued

Date.	Character.	Phase.	Time.	Periods.	Amplitude A_N	Amplitude A_E	Amplitude A_Z	Remarks.
			H. M. S.					
Nov. 29		P_E	8 11 44					Heavy microseisms.
		S_E	8 18 45					Difficult to
		eL_E	8 24					interpret
		F	9 20					
Dec. 10		e_E	4 38					Very heavy microseisms.
		e_N	4 38					
		S_N	4 47 44					
		eL_E	5 4.0	32				
		eL_N	5 5.3	27				
		L_E	5 07	27				
		L_N	5 10	22				
		F	6 (ca.)					
Dec. 11		e_E	21 28					Heavy microseisms.
		e_N	21 27 11					
		S_N	21 33 44					
		eL_N	21 38.7					
		F	22 15					
Dec. 13		e_N?	4 17 11					Very heavy microseisms.
		L_E	4 41	30				
		L_N	4 42	30				
		F	5 20					
Dec. 16.		eP_E	12 24 32					Heavy microseisms.
		eP_N	12 24 26					
		S_N	12 30 47					S_E not
		eL	12 39.6					discernible.
		L	12 52	28				
		M_E 1	12 59 46	30		10.5mm.		P possibly sooner.
		M_N 1	13 09	22	9.3mm.			
		M_E 2	13 05	24		14.1mm.		
		M_N 2	13 12 21	24	13.7mm.			
		M_E 3	13 10	24		9.2mm.		
		F	16 (ca.)					

REGISTRATION OF EARTHQUAKES—Continued.

Date.	Character.	Phase.	Time.	Periods.	Amplitude			Remarks.
					A_N	A_E	A_Z	
			H. M. S.					
Dec. 16		eP_Z	12 24 29					Heavy microseisms.
		S_Z	12 30 24					
		eL_Z	12 39.5	22				
		M_Z 1	13 09	22			5.7mm.	
		M_Z 2	13 13 21	19			6.2mm.	
		F	15 30					
Dec. 17		eP_E	19 11 20					Very heavy microseisms.
		eP_N?	19 11 20					
		S_E	19 20 43					
		S_N?	19 20 38					
		eL_N	19 40.1	10				
		eL_N	19 43 25	25				
		F	20 20					
Dec. 25		L_E	12 27 16	22				Heavy microseis
		L_N	12 30	22				
		F	12 55					

DISPATCHES OF EARTHQUAKES RECEIVED AT THIS STATION.

From January 1, 1919 to January 1, 1920.

Place	Date	Local Time*	Character	Source of Information	Remarks
Corona, Calif., U. S. A.	Jan. 1.	2 hs. 20 m. G. M. T.	Feeble	L.O.	
Mexico City, Mexico.	Jan. 3.	10 P. M.	Very Severe	A.P.	50 reported killed.
San Joaquin, Mexico.	Jan. 13.	5 hrs. 18 m. A. M.	Very Severe	A.P.	
Coast of Sea of Marmora.	Jan. 19.	Not Indicated.	Not Indicated	A.P.	
Vera Cruz, Mexico.	Jan. 22.	3 hrs. to 5 hrs. A. M.	Severe	A.P.	Buildings damaged.
Seattle, Washington, U. S. A.	Jan. 24.	11 hrs. 8 m.	Very Strong	A.P.	Three distinct shocks.
Clallam Bay, Wash., U. S. A	Jan. 24.	7 hrs. 9 m. G. M. T.	Moderate	L.O.	
Jiguero Light Station, P. R.	Jan. 26.	5 hrs. 10 m. 6 hrs. 50 m. 8 hrs. 8 m.	Moderate	L.O.	
Santa Barbara, Calif., U. S. A.	Jan. 30.	23 hrs. 30 m.	Very Feeble	L.O.	
Minas Geraes, Brazil.	Feb. 1.	Not Indicated.	Severe	A. P.	Houses damaged.
Clark, Wyoming, U. S. A.	Feb. 2.	0 hrs. 45 m. G. M. T.	Very Feeble	L.O.	Felt generally.
Vera Cruz, Mexico.	Feb. 6.	12 hrs. 50 m. A. M.	Moderate	A.P.	
Jiguero Light Station, P. R.	Feb. 11.	Not Indicated.	Slight	A.P.	
Cadiz, Spain.	Feb. 19.	Not Indicated.	Severe	A.P.	Damage to houses.
Gori, Italy.	Feb. 23.	Not Indicated.	Severe	A.P.	
Grakali, Russia.	Feb. 24.	Not Indicated.	Moderate	L.O.	
Springfield, Missouri, U. S. A.	Feb. 28.	2 hrs. 55 m. G. M. T.	Feeble	L.O.	
Glenona, Washington, U. S. A.	Mar. 2.	4 hrs. 20 m. G. M. T.	Feeble	L.O.	
Redondo Beach, Cal. U. S. A.	Mar. 4.	3 hrs. 25 m. G. M. T	Very Feeble	L.O.	
Calexico, Calif. U. S. A.	Mar. 9.	5 hrs. 50 m. G. M. T	Extremely Feeble	L.O.	
Hamet, Calif., U. S. A.	Mar. 18.	13 hrs. 40 m. G. M. T.	Extremely Feeble	L.O.	
San Luis Obispo, U. S. A.	Mar. 20.	7 hrs. 4 m. G. M. T.	Feeble	L.O.	
Eureka, Calif., U. S. A.	Mar. 20.	17 hrs. 30 m. G. M. T.	Feeble	L.O.	
Fort de France, Martinique.	Mar. 21.	Early Morning.	Strong	A.P.	
Springville, Tenn., U. S. A	Apr. 7.	20 hrs. 45 m. G. M. T	Extremely Feeble	L.O.	
Calexico, Calif.	Apr. 13.	4 hrs. 35 m. G. M. T.	Very Feeble	L.O.	
Crater Lake, Oregon.	Apr. 14.	11 hrs. 45 m. G. M. T.	Moderate	L.O.	
Mexico City, Mexico.	Apr. 19.	2 hrs. 30 m. P. M.	Severe	A.P.	
Eureka, Calif., U. S. A.	Apr. 20.	6 hrs. 20 m. G. M. T.	Very Feeble	L.O.	
Centralia, Illinois, U. S. A.	Apr. 30.	15 hrs. 12 m. G. M. T	Feeble	L.O.	
Columbia, Missouri, U. S. A.	May 1.	15 hrs. 15 m. G. M. T	Feeble	L.O.	
Mt. Vernon, Illinois, U. S. A.	May 1.	15 hrs. 15 m. G. M. T.	Moderate	L.O.	Second shock one hr. la
McLeansboro, Illinois, U. S. A.	May 1.	17 hrs. G. M. T.	Extremely Feeble	L.O.	
San Luis Obispo, Cal., U. S. A.	May 7.	1 hr. 59 m. G. M. T.	Feeble	L.O.	
El Centro, Cal., U. S. A.	May 18.	6 hrs. 25 m. G. M. T	Moderate	L.O.	
Santa Monica, Cal., U. S. A.	May 18.	18 hrs. G. M. T.	Very Feeble	L.O.	
San Diego, Cal. U. S. A.	May 20.	13 hrs. 30 m. G. M. T	Moderate	L.O.	Second quake one hr. la
Concord, N. H., U. S. A.	May 23.	8 hrs. (ca) G. M. T.	Very Feeble	L.O.	
Kennett, Calif., U. S. A.	Jun. 3.	5 hrs. 55 m. G. M. T.	Very Feeble	L.O.	

* Time, unless otherwise indicated, is local time.
A.P.—Associated Press.
L.O.-Local Observer.

DISPATCHES OF EARTHQUAKES RECEIVED—Continued

Place	Date	Local Time*	Character	Source of Information	Remarks
ara, Italy.	Jun. 4.	5 hrs. 45 m.	Feeble	A.P.	
nosa, Japan.	Jun. 5.	Not Indicated	Severe	A. P.	Casualties.
merville, S. C. U. S. A.	Jun. 5.	14 hrs. 1 m. G. M. T.	Very Feeble	L.O.	
, Maine, U. S. A.	Jun. 8.	3 hrs. A. M.	Feeble	L.O.	
eport, Calif., U. S. A.	Jun. 10.	10 hrs. 53 m. G. M. T	Very Feeble	L.O.	
nas, California, U. S. A.	Jun. 16.	12 hrs. 15 m. G. M. T.	Very Feeble	L.O.	
Angeles, Cal., U. S. A.	Jun. 18.	10 hrs. 8 m. G. M. T.	Very Feeble	L.O.	
ner Springs, Cal., U. S. A.	Jun. 21.	7 hrs. 20 m. G. M. T.	Not Indicated	L.O.	
stow, Calif., U. S. A.	Jun. 21.	20 hrs. 24 m. G. M. T.	Very Feeble	L.O.	
ta Monica, Cal., U. S. A.	Jun. 22.	2 hrs. 45 m.	Moderate	L.O.	
Angeles, Cal., U. S. A.	Jun. 23.	4 A. M.	Slight	A.P.	
horage, Alaska.	Jun. 25.	4 hrs. 41 m. P. M.	Pronounced	A.P.	2 shocks.
Luis Obispo, Cal., U. S. A.	Jun. 28.	9 hrs. 1 m. G. M. T.	Moderate	L.O.	
gston, Jamaica.	July 2.	12 hrs. 20 m. A. M.	Not Indicated	A.P.	No damage.
ttier, Calif., U. S. A.	July 5.	15 hrs. 55 m. G. M. T	Very Feeble	L.O.	
Angeles, Cal., U. S. A.	July 10.	5 hrs. 25 m.	Very Feeble to Feeble	L.O.	
ricus, S. Dak., U. S. A.	July 14.	23 hrs. G. M. T.	Not Indicated	L.O.	
Angeles, Calif., U. S. A.	July 16.	18 hrs. 8 m. G. M. T.	Strong	L.O.	Slight damage.
adena, Calif., U. S. A.	July 16.	21 hrs. 26 m. G. M. T.	Very Feeble	L.O.	
Angeles, Calif., U. S. A.	July 17.	2 hrs. 14 m. G. M. T.	Very Feeble	L.O.	
loud, Calif., U. S. A.	July 23.	3 hrs. 55 m. G. M. T.	Very Feeble	L.O.	
ding, Calif., U. S. A.		14 hrs. G. M. T.	Fairly Strong	L.O.	
		16 hrs. G. M. T.			
		20 hrs. G. M. T.			
ray, Virginia, U. S. A.	July 25.	Not Indicated.	Severe	A.P.	
Angeles, Calif., U. S. A.	July 26.	12 hrs. 12 m. G. M. T.	Very Feeble	L.O.	
tiago, Chile.	July 26.	12 hrs. 30 m. A. M.	Strong	A.P.	Stronger at Valparaiso.
Angeles, Calif., U. S. A.	July 27.	8 hrs. 2 m. G. M. T.	Very Feeble	L.O.	
Angeles, Calif., U. S. A.	July 28.	19 hrs. 28 m. G. M. T.	Feeble	L.O.	
mmerville, S. Dak., U. S. A.	Aug. 1.	11 hrs. 53 m. G. M. T.	Extremely Feeble	L.O.	
lena, Montana, U. S. A.	Aug. 16.	18 hrs. 5 m. G. M. T.	Very Feeble	L.O.	
ver, Utah, U. S. A.	Aug. 18.	8 hrs. 20 m. G. M. T.	Very Feeble	L.O.	
inas, Calif., U. S. A.	Aug. 18.	7 hrs. 20 m. G. M. T.	Very Feeble	L.O.	
ntiago, Chile.	Aug. 19.	See Remark.	Intense	A.P.	Between hrs. of 11 A. M. & 4 P. M. series of shocks.
Angeles, Calif., U. S. A.	Aug. 23.	23 hrs. 10 m. G. M. T.	Feeble	L.O.	
and of Malta.	Aug. 29.	2 hrs. 45 m. A. M.	Considerable Force	A.P.	Damage.
Angeles, Calif., U. S. A.	Sept. 3.	4 hrs. 50 m. G. M. T.	Very Feeble	L.O.	
izzano, Italy.	Sept. 7.	7 hrs. 55 m. A. M.	Violent	A.P.	Heavy damage.
lo Alto, Calif., U. S. A.	Sept. 9.	16 hrs. 44 m. G. M. T.	Very Feeble	L.O.	
ilia District, Italy.	Sept. 9.	2 hrs. 35 m. A. M.	Violent	A.P.	Casualties.
ps. Switzerland,	Sept. 9.	Not Indicated.	Severe	A.P.	
verside, Calif., U. S. A.	Sept. 10.	5 hrs. 16 m. A. M.	Moderate	A.P.	
ssino, Italy.	Sept. 10.	Not Indicated.	Severe	A.P.	No damage reported.

DISPATCHES OF EARTHQUAKES RECEIVED—Continued

Place	Date	Local Time*	Character	Source of Information	Remarks
Comrie, Scotland.	Sept. 13.	Morning.	Moderate	A.P.	
Los Angeles, Calif., U. S. A.	Sept. 15.	12 hrs. 50 m. G. M. T.	Very Feeble	L.O.	
Lakeport, Calif., U. S. A.	Sept. 17.	6 hrs. 20 m. G. M. T.	Feeble	L.O.	
Los Angeles, Calif., U. S. A.	Sept. 18.	11 hrs. 45 m. G. M. T.	Feeble	L.O.	
Salt Lake City, Utah, U.S.A.	Sept. 18.	21 hrs. 10 m. G. M. T.	Feeble	L.O.	
Brigham, Utah., U. S. A.	Sept. 19.	13 hrs. 50 m. G. M. T	Moderate	L.O.	
Crihuela, Spain.	Sept. 26.	10 hrs 45 m. P. M	Sharp	A.P.	
Giarre, Sicily.	Sept. 27.	Not Indicated.	Violent	A.P.	Heavy damage.
Harrisonville, Mo., U. S. A.	Oct. 3.	14 hrs. 15 m. G. M. T.	Extremely Feeble	L.O.	
Eureka, Calif., U. S. A.	Oct. 4.	13 hrs. 21 m. G. M. T.	Very Feeble	L.O.	
Issoire, France.	Oct. 4.	Morning.	Moderate	A.P.	
Eureka, Calif., U. S. A.	Oct. 5.	4 hrs. 46 m. G. M. T.	Feeble	L.O.	
Salinas, Calif., U. S. A.	Oct. 5.	19 hrs. 4 m. G. M. T.	Moderate	L.O.	
San Francisco, Calif., U. S. A.	Oct. 7.	5 hrs. 33 m. G. M. T.	Moderate	L.O.	
Vera Cruz, Mexico.	Oct. 8.	10 hrs. 30 m. A. M.	Severe	A.P.	No casualties. Heavy damage.
Baguis, Philippine Islands.	Oct. 10.	Not Indicated.	Severe	A.P.	No casualties. damage heavy.
Calexico, Calif., U. S. A.	Oct. 12.	17 hrs. 58 m. G. M. T.	Very Feeble	L.O.	
Haute Pyrennese Dept., France.	Oct. 19.	Not Indicated,	Not Indicated	A.P.	
Granada, Spain.	Oct. 22.	6 hrs. P. M.	Severe	A.P.	No casualties. Heavy damage.
Copiape, Chile.	Oct. 28.	8 hrs. 5 m. A. M.	Violent	A.P.	No casualties.
El Centro, Calif., U. S. A.	Oct. 31.	6 hrs. 32 m. G. M. T.	Extremely Feeble	L.O.	
Eastport, Maine., U. S. A.	Nov. 8.	7 hrs. 40 m. P. M.	Very Feeble	L.O.	
Portland, Oregon., U. S. A.	Nov. 9.	12 hrs. 20 m. A. M.	Very Feeble	L.O.	
Brigham, Utah., U. S. A.	Nov. 19.	9 hrs. 40 m. P. M.	Fairly Strong	L.O.	
St. George, Utah., U. S. A.	Nov. 25.	5 hrs. P. M.	Not Indicated	L.O.	
Portland, Oregon., U. S. A.	Nov. 28.	3 hrs. 40 m. A. M.	Feeble	L.O.	
Maricopa, Calif., U. S. A.	Nov. 30.	5 hrs. 30 m. P. M.	Feeble	A.P.	No damage.
Los Alamos, Calif., U. S. A.	Dec. 4.	3 hrs. 55 m. A. M.	Feeble	L.O.	
Tepelini District, Italy.	Dec. 5.	Not Indicated.	Severe	A.P.	15000 persons rendered homeless.
Maricopa, Calif., U. S. A.	Dec. 5.	4 hrs. 3 m. A. M.	Feeble	L.O.	Felt at Santa Barbara.
Los Angeles, Calif., U. S. A.	Dec. 6.	12 hrs. 25 m. A. M.	Very Feeble	L.O.	
Lone Pine, Calif., U. S. A.	Dec. 13.	9 hrs. 37 m. A. M.	Feeble	L.O.	
Vallarica District, Chile.	Dec. 14.	11 P. M.	Severe	L.O.	
San Diego. Calif., U. S. A.	Dec. 14.	7 hrs. 57 m. P. M	Very Feeble	A.P.	
Vallarica District, Chile.	Dec. 14.	11 P. M.	Pronounced	A.P.	No Fatalities.
Peking, China.	Dec. 16.	8 hrs. 20 m. P. M.	Severe	A.P.	No damage.
Mendoza, Argentine.	Dec. 17.	2 hrs. 57 m. P. M. 3 hrs. 29 m. P. M.	Strong	A.P.	150 reported killed.
Algiers, France.	Dec 17.	Not Indicated.	Violent	A.P.	Two shocks referred to
Hemet, Calif., U. S. A.	Dec. 18.	9 hrs. 26 m. A. M.	Moderate	L.O.	

DISPATCHES OF EARTHQUAKES RECEIVED—Continued

Place	Date	Local Time*	Character	Source of Information	Remarks
preckels, Calif., U. S. A.	Dec. 18.	11 hrs. 15 m. A. M.	Very Feeble	L.O.	
		12 hrs. 30 m. P. M.	Very Feeble	L.O.	
preckels, Calif., U. S. A.	Dec. 19.	4 hrs. 15 m. A. M.	Very Feeble	L.O.	Possibly not seismic.
Brawley, Calif., U. S. A.	Dec. 19.	8 hrs. 30 m. P. M.	Very Feeble	L.O.	
Calexico, Calif., U. S. A.	Dec. 19.	9 hrs. 31 m. P. M.	Extremely Feeble	L.O.	
Calexico, Calif., U. S. A.	Dec. 20.	6 hrs. 46 m. A. M.	Very Feeble	L.O.	
Buenos Aires, Argentina.	Dec. 20.	Not Indicated.	Not Indicated	A.P.	
Calexico, Calif., U. S. A.	Dec. 21.	6 hrs. 48 m. A. M.	Very Feeble	L.O.	
Salinas, Calif., U. S. A.	Dec. 21.	11 hrs. 55 m. A. M.	Very Feeble	L.O.	
Spreckels, Calif., U. S. A.	Dec. 21.	8 hrs. 18 m. P. M.	Feeble	L.O.	
Crossville, Tennessee, U. S. A.	Dec. 24.	2 hrs. 30 m. A. M.	Feeble	A.P.	
Los Angeles, Calif., U. S. A.	Dec. 27.	5 hrs. 55 m P. M	Very Feeble	L.O.	
New Castle, Col., U. S. A.	Dec. 28.	8 hrs. P. M.	Very Feeble	L.O.	
New Castle, Col., U. S. A.	Dec. 29.	7 hrs. 50 m P. M.	Moderate	L.O.	
New Castle, Col., U. S. A.	Dec. 30.	2 hrs. 50 m. A. M.	Feeble	L.O.	
		10 hrs. 50 m. A. M	Moderate		