

SECTION V.—SEISMOLOGY.

SEISMOLOGICAL ABBREVIATIONS USED IN THE INSTRUMENTAL REPORTS.

CHARACTER OF THE EARTHQUAKE.

I=noticeable.
 II=conspicuous.
 III=strong.
 d=(terræ motus domesticus)=local earthquake (sensible or felt).
 v=(terræ motus vicinus)=near-by earthquake (within 1,000 km.).
 r=(terræ motus remotus)=distant earthquake (1,000 to 5,000 km. distant).
 u=(terræ motus ultimus)=very distant earthquake (beyond 5,000 km.).
Examples.—I₁ indicates a local earthquake of small intensity but sensible to individuals.
 III₁ indicates a distant earthquake whose record shows motions of considerable amplitude.

PHASES.

P=(undæ primæ)=first preliminary tremors.
 PR_n=P waves reflected *n* times at the earth's surface.
 S=(undæ secundæ)=second preliminary tremors.

SR_n=S waves reflected *n* times at the earth's surface.
 PS=transformed waves; longitudinal (P) to transversal (S) or vice versa.
 L=(undæ longæ)=long waves in the principal portion.
 M=(undæ maximæ)=greatest motion in the principal portion.
 C=(coda)=trailers.
 F=(finis)=end of sensible disturbance.

NATURE OF THE MOTION.

i=(impetus)=abrupt beginning.
 e=(emersio)=gradual appearance.
 T=period=twice the time of oscillation.
 A=amplitude of the earth's movement, reckoned from the zero line.
 E, N, or Z attached to a symbol signifies the E-W, the N-S, or the vertical component, respectively, thus:
 A_E is the E-W component of A
 A_N is the N-S component of A
 A_Z is the vertical component of A } measured in microns (μ), $\frac{1}{1,000}$ mm.

INSTRUMENTAL CONSTANTS.

T₀=period of the instrument.
 V =magnification of the instrument.
 ϵ =damping ratio.

SEISMOLOGICAL REPORTS FOR JANUARY, 1916.

By W. J. HUMPHREYS, Professor in charge of Seismological Investigations.

[Dated: Weather Bureau, Washington, D. C., March 1, 1916.]

TABLE 1.—Noninstrumental earthquake reports, January, 1916.

Day.	Approximate time, (Greenwich Civil.)	Station.	Approximate latitude.	Approximate longitude.	Intensity Rossi-Forel.	Number of shocks.	Duration.	Sounds.	Remarks.	Observer.
CALIFORNIA.										
1	H. m. 23 55 23 55 23 55	Claremont..... Corona..... Rialto.....	34 07 33 52 34 12	117 44 117 35 117 27	3 3 3	1 2	1	Rumbling..... Rumbling..... Rattled windows and doors.....		F. P. Brackett. J. W. Garthwaite. South California Edison Co.
11	5 15	Cabuilla.....	33 32	118 43	4	1	10	Rumbling.....	Windows rattled.....	Dr. W. L. Shawk.
16	0 41	Peachland.....	38 24	122 50	2	1	4			E. H. Parnell.
INDIANA.										
7	19 45	Worthington.....	39 08	86 58	3	1	5			D. W. Sollday.
NEVADA.										
18	9 00	Rebel Creek.....	41 39	117 45		1	2			F. Whitaker.
NEW YORK.										
5	13 56 13 56	Caldwell..... Gloversville.....	43 24 43 05	73 43 74 21	5 1	2				Chas. Forsell. (Press report.)
OREGON.										
4	18 40	Newport.....	44 38	124 08	3-4	2			Dishes rattled.....	Wm. Matthews.
WASHINGTON.										
2	0 52 0 52 0 52 0 52	Olympia..... Sedalia..... Silverton..... Sumner.....	47 02 47 38 48 00 47 12	122 55 122 30 121 32 122 13	4 4 1 4	3	3 2 5 2		Windows rattled..... Doors moved..... Rumbling..... Shook buildings.....	S. R. Holcomb. U. S. Weather Bureau. C. M. Mackintosh. H. E. Thompson.
PORTO RICO.										
7	15 05	Vieques.....	18 09	85 27	2	1	1	Faint.....		H. M. Pease.

TABLE 2.—Instrumental seismological reports, January, 1916.

Time used: Mean Greenwich, midnight to midnight. Nomenclature: International.

Date.	Char-acter.	Phase.	Time.	Period. T.	Amplitude.		Dis-tance.	Remarks.
					Λ_n	Λ_w		

Alaska. *Sitka. Magnetic Observatory.* U. S. Coast and Geodetic Survey. J. W. Green.

Lat., 57° 03' 00" N.; long., 135° 30' 06" W. Elevation, 15.2 meters.

Instruments: Two Bosch-Omori, 10 and 12 kg.

Instrumental constants: $\begin{matrix} V & T_0 \\ E & 10 & 16.7 \\ N & 10 & 15.6 \end{matrix}$

1916.			H. m. s.	Sec.	μ	μ	Km.		
Jan. 1.		P	13 33 25	6					
		S	13 43 38	7					
		eLw	13 52 38	26					
		Mw	14 01 30	21		30			
		Mw	14 05 28	16	185				
		Cw	14 06 00	21					
		Cw	14 09 30	17					
		Fw	14 50 00						
		Fw	15 35 00						
		13		P	8 44 57	7			
S	8 51 11			15					
Lw	8 58 14			26					
eLw	9 06 13			26					
Mw	9 07 28			24	12				
Mw	9 16 10			20		6			
Cw	9 20 00			19					
Cw	9 34 00			18					
Fw	11 06 00								

Arizona. *Tucson. Magnetic Observatory.* U. S. Coast and Geodetic Survey. F. P. Ulrich.

Lat., 32° 16' 48" N.; long., 110° 56' 06" W. Elevation, 769.6 meters.

Instruments: Two Bosch-Omori, 10 and 12 kg.

Instrumental constants: $\begin{matrix} V & T_0 \\ E & 10 & 16 \\ N & 10 & 19.6 \end{matrix}$

1916.			H. m. s.	Sec.	μ	μ	Km.	
Jan. 1.		Lw	14 05 35	26				No motion on N-S.
		Mw	14 13 50	18	50			
		Cw	14 25 00	17				
		Fw	15 57 00					
13		eLw	7 13 48	22				
		Mw	7 24 00	17	1			
		Fw	7 34 53					
13		eLw	8 55 59	4				
		Mw	9 15 35	22	6			
		Mw	9 28 39	18	1			
		Fw	10 20 49					
15		P	10 00 27	3				
		Lw	10 01 17					
		Mw	10 01 28	3	3			
		Mw	10 01 53	5		1		
24		eLw	7 46 00	21				
		eLw	7 48 25	28				
		Mw	7 56 55	21	1			
		Mw	7 17 15	21		2		
Fw		Fw	8 11 47					
		Fw	8 14 41					

California. *Berkeley. University of California.*

Lat., 37° 52' 18" N.; long., 122° 15' 37" W. Elevation, 35.4 meters.

(See Bulletin of the Seismographic Stations, University of California.)

California. *Mount Hamilton. Lick Observatory.*

Lat., 37° 20' 24" N.; long., 121° 38' 34" W. Elevation, 1,281.7 meters.

(See Bulletin of the Seismographic Stations, University of California.)

Date.	Char-acter.	Phase.	Time.	Period. T.	Amplitude.		Dis-tance.	Remarks.
					Λ_n	Λ_w		

California. *Point Loma. Raja Yoga Academy.* F. J. Dick.

Lat., 32° 43' 03" N.; long., 117° 15' 10" W. Elevation, 91.4 meters.

Instrument: Two-component, C. D. West seismoscope.

(Report for January, 1916, not received.)

California. *Santa Clara. University of Santa Clara.* J. S. Ricard, S. J.

Lat., 37° 26' 36" N.; long., 121° 57' 03" W. Elevation, 27.43 meters.

(See record of the Seismographic Station, University of Santa Clara.)

Colorado. *Denver. Sacred Heart College. Earthquake Station.*

A. W. Forstall, S. J.

Lat., 39° 40' 36" N.; long., 104° 56' 54" W. Elevation, 1,655 meters.

Instrument: Wiechert 80 kg., astatic, horizontal pendulum.

1916.			H. m. s.	Sec.	μ	μ	Km.	
Jan. 1		M	13 -- --					Doubtful indica-tions of quake.
		F	14 -- --					
13								Doubtful activity here.
15								No sure record here.
16		Mw	15 -- --					Visible activity but no record.
		Fw	18 -- --					
22		Mw	15 20 00					Activity at hours marked and also during day.
		Fw	17 40 00					
24-27								Activity at intervals on both compo-nents.
28		Mw	10 30 --					Activity on E-W.
		Fw	15 -- --					

District of Columbia. *Washington. U. S. Weather Bureau.*

Lat., 38° 54' 12" N.; long., 77° 03' 03" W. Elevation, 21 meters.

Instrument: Marvin (vertical pendulum, undamped. Mechanical registration).

Instrumental constants: $\begin{matrix} V & T_0 \\ 110 & 6.4 \end{matrix}$

1916.			H. m. s.	Sec.	μ	μ	Km.					
Jan. 1	II _n	P	12 39 45				5,250	P indeterminate.				
		S	13 46 41									
		L	13 53 30									
		L	13 58 23									
		L	14 12 30	60								
		L	14 16 30	32								
		L	14 23 00	24								
		F	16 35 00									
		13		S	6 40 12							
				L	6 58 00							
L	7 19 30			24								
F	7 30 10			20								
13	II _n	P	8 29 52				12,875?					
		L	8 42 44									
		L	9 01 00	48								
		L	9 14 30	60								
		L	9 20 30	30								
		L	9 29 40	30								
		F	9 36 30	20								
19		L	20 04 40									
		F	20 40 00									

TABLE 2.—Instrumental seismological reports, January, 1916—Continued.

Date.	Char-acter.	Phase.	Time.	Period. T.	Amplitude.		Dis-tance.	Remarks.
					A _m	A _x		
District of Columbia. Washington. U. S. Weather Bureau—Contd.								
1916. Jan. 24	I ₀	P?	H. m. s.	Sec.	μ	μ	Km.	
		S	7 06 58				8,520?	
		L	7 16 44					
		L	7 30 00	42				
		L	7 37 00	28				
		F	8 30 00					
26	I ₀	P	7 49 17				7,275?	
		S?	7 58 00					
		L	8 12 30					
		F	8 30 00					
26	I ₀	P	12 40 05				11,500?	
		S?	12 52 06					
		L	13 12 30	49				
		L	13 20 30	20				
		L	13 29 30					
		F	14 15 00					
30		L	21 24 30					
		L	21 32 30					
		F	21 50 00					
31	I ₀	P	18 07 35				8,950	
		S	18 17 43					
		L	18 28 45					
		L	18 31 29	24				
		L	18 37 00	20				
		F	19 15 00					

District of Columbia. Washington. Georgetown University.
F. L. Tondorf, S. J.

Lat., 38° 54' 25" N.; long., 77° 04' 24" W. Elevation, 42.4 meters. Subsoil: decayed diorite.

Instruments: Wiechert 200 kg. astatic horizontal pendulums, 80 kg. vertical.

Instrumental constants: $\begin{matrix} V & T_0 & a \\ E & 165 & 5.4 & 2.6 \\ N & 143 & 5.2 & 3.4 \\ Z & 80 & 5.0 & 0 \end{matrix}$

Date.	Char-acter.	Phase.	Time.	Period. T.	Amplitude.		Dis-tance.	Remarks.
					A _m	A _x		
1916. Jan. 1	III _r	eP _N	H. m. s.	Sec.	μ	μ	Km.	
		eP _N	13 41 07					Microseisms present; record very doubtful. Mauniki shows P later. No distinct M. Recorded on vertical.
		S _N ?	13 41 13					
		S _N ?	13 50 00					
		L _N	13 58 44					
		L _N	13 58 40					
		F	15 46 00					
13	III _r	e _N	7 25 16					
		e _N	7 26 03					
		L _N	7 27 18					
		L _N	7 28 20					
		F	7 56 00					
13	III _r	eP _N	8 40 18					Microseisms present. Recorded on vertical.
		eP _N	8 40 22					
		S _N	8 43 49					
		S _N	8 43 52					
		L _N	9 00 21					
		L _N	9 00 24					
		M _N	9 22 32	30	3			
		M _N	9 22 36	30				
		M _N	9 29 04	30	6			
		M _N	9 29 52	30		5		
		M _N	9 38 02	20		5		
		M _N	9 38 45	20		5		
		E _N	10 35 00					
		E _N	10 42 00					
24	II _r	e _N	6 19 07					
		e _N	6 19 12					
		S _N ?	6 24 15					
		S _N ?	6 24 18					
		F	6 42 00					
24	II _r	eP _N	7 07 00					Series of long waves from 7 ^h 32 ^m to 7 ^h 55 ^m . No distinct M.
		eP _N	7 07 01					
		eL	7 31 06	30				
		F	8 27 00					
31	III _r	eP _N	18 09 33					No distinct maximum.
		eP _N	18 09 39					
		S	18 20 03					
		R	18 28 20					
		L _N	18 30 25	20				
		L _N	18 33 17	20				
		F	19 39 00					

Hawaii. Honolulu. Magnetic Observatory. U. S. Coast and Geodetic Survey. Wm. W. Merrymon.

Lat., 21° 19' 12" N.; long., 158° 03' 46" W. Elevation, 15.2 meters.

Instrument: Milne seismograph of the Seismological Committee of the British Association.

Instrumental constant... 18.8

Date.	Char-acter.	Phase.	Time.	Period. T.	Amplitude.		Dis-tance.	Remarks.
					A _m	A _x		
1916. Jan. 1		P	H. m. s.	Sec.	μ	μ	Km.	
		S	13 30 12					
		L	13 38 12					
		L	13 44 12	22				
		M	13 50 36				*17,200	
		C	15 01 24					
		F	19 37 48					
1		P	23 55 24					
2		L	0 00 48					
		M	0 02 06				*200	
		C	0 07 24					
		F	0 25 00					
2		e	2 04 00					
		M	2 06 00				*100	
		F	2 19 48					
3		e	23 22 12					
		M	23 29 00				*200	
		F	23 34 00					
11		e	11 38 30					
		L	11 43 48					
		M	11 48 00				*200	
		C	12 02 00					
		F	12 22 00					
11		e	17 02 48					
		M	17 08 48				*200	
		F	17 22 12					
13		P	6 30 00					
		S	6 39 18					
		L	6 51 18	22				
		M	7 00 00				*8,600	
		C	7 05 48					
13		P	8 32 50					
		S	8 42 00					
		L	8 52 30	23				
		M	8 58 00				*17,200	
		C	9 10 00					
		F	12 55 00					
13		L	22 20 06	22				
		M	22 27 30				*200	
		C	22 32 06					
		F	22 56 54					
18		e	14 22 48	22				
		M	14 27 30				*200	
		F	14 52 00					
19		e	11 32 06					
		M	11 37 12				*100	
		F	12 01 48					
19		P	19 14 48					
		S	19 20 18					
		L	19 25 48	20				
		M	19 28 54				*2,200	
		C	19 43 36					
		F	20 11 48					
24		e	7 23 06					Phases not well defined.
		M	7 39 54				*400	
		L	7 52 48	24				
		M	8 16 18				*600	
		C	8 27 24					
		F	9 39 00					
26		eL	8 34 06					
		M	8 46 12				*100	
		C	8 51 36					
		F	9 23 06					
26		e	12 39 24					M looks something like a local shock.
		L	12 42 42					
		M	12 44 00				*3,200	
		M	12 48 48				*2,300	
		C	12 56 30					
		F	14 04 36					

* Trace amplitude.

TABLE 2.—Instrumental seismological reports, January, 1916—Continued.

Date.	Char-acter.	Phase.	Time.	Period. T.	Amplitude.		Dis-tance.	Remarks.
					A _m	A _w		
Hawaii. Honolulu. Magnetic Observatory—Continued.								
1916.			<i>H. m. s.</i>	<i>Sec.</i>	μ	μ	<i>Km.</i>	
Jan. 30		P	20 29 06					
		L	20 32 42					
		M	20 35 30		*200			
		F	20 44 00					
30		P	20 51 00					
		S	20 53 54					
		L	20 57 06					
		M	20 59 12		*1,200			
		C	21 04 48					
		F	21 32 54					
31		P	18 19 30					End confused by air currents.
		S	18 24 30					
		L	18 30 00	21				
		M	18 36 42		*2,400			
		C	18 43 30					

*Trace amplitude.

Kansas. Lawrence. University of Kansas. Department of Physics and Astronomy. F. E. Kester.

Lat., 38° 57' 30" N.; long., 95° 14' 58" W. Elevation, 301.1 meters.

Instrument: Wiechert.

Instrumental constants. $\begin{cases} E & V & T_0 & \epsilon \\ N & 205 & 3.4 & 4.0 \\ & & 3.4 & 3.8 \end{cases}$

Date.	Char-acter.	Phase.	Time.	Period. T.	Amplitude.		Dis-tance.	Remarks.
					A _m	A _w		
1916.			<i>H. m. s.</i>	<i>Sec.</i>	μ	μ	<i>Km.</i>	
Jan. 1		P	13 29 49					E-W record lost.
		P	13 45 53	2-3				
		S	13 49 14					
		S7	13 53 21					
		S or L	13 59 25					
		L	14 07 33	40-45				
		M	14 24 45	15-20		12		
		F	15 48 00					
13		P	6 36 56					
		P _N ?	6 38 54					
		P _N ?	6 38 59					
		S	6 48 56					
		S _W or L	6 55 20					
		M	7 09 26					
		F	7 45 00					
13		P	8 40 04					
		P _N ?	8 40 55					
		S	8 46 26					
		S _W ?	8 46 33					
		L	8 57 46					
		M	8 57 56					
		M	9 22 56	24-25	9			
		M	9 27 41	22-24		4		
		F	10 45 00					

Maryland. Cheltenham. Magnetic Observatory. U. S. Coast and Geodetic Survey. George Hartnell.

Lat., 38° 44' 09" N.; long., 76° 50' 30" W. Elevation, 71.6 meters.

Instruments: Two Bosch-Omori, 10 and 12 kg.

Instrumental constants. $\begin{cases} E & V & T_0 & \epsilon \\ N & 10 & 31 & \\ & & 10 & 29 \end{cases}$

Date.	Char-acter.	Phase.	Time.	Period. T.	Amplitude.		Dis-tance.	Remarks.
					A _m	A _w		
1916.			<i>H. m. s.</i>	<i>Sec.</i>	μ	μ	<i>Km.</i>	
Jan. 1		P	13 40 32					
		S	13 51 10					
		S _W	13 51 29	12				
		L	13 58 16	36				
		L	13 58 34	42				
		M	14 20 58	20		25		
		M	14 35 10	18		15		
		C	14 43 00	17				
		F	16 05 00					
13		eL _N	7 29 00	19				Phases very uncertain.
		eL _N	7 30 16	19				
		eL _N	7 35 00	20	2			
		M	7 38 00	20		2		
		E	7 43 00					
		F	7 55 00					
13		P	8 44 11					
		P	8 44 20					
		L	9 00 34	40				
		L _W	9 01 26	44				
		M	9 31 19	25	12	16		
		C	9 42 00	20				
		F	10 35 00					
24		eL _N	7 31 09	40				Phases uncertain.
		M	7 43 09	17	3			
		M	7 48 00	17		2		
		C	7 57 00	17				
		F	8 14 00					

Date.	Char-acter.	Phase.	Time.	Period. T.	Amplitude.		Dis-tance.	Remarks.
					A _m	A _w		
Massachusetts. Cambridge. Harvard University Seismographic Station. J. B. Woodworth.								
Lat., 42° 22' 36" N.; long., 71° 06' 59" W. Elevation, 5.4 meters. Foundation: Glacial sand over clay.								
Instrument: Two Bosch-Omori, 100 kg., horizontal pendulums (mechanical registration).								
Instrumental constants. $\begin{cases} V & T_0 & \epsilon \\ E & 30 & 23 & 0 \\ N & 50 & 25 & 41 \end{cases}$								

Date.	Char-acter.	Phase.	Time.	Period. T.	Amplitude.		Dis-tance.	Remarks.
					A _m	A _w		
1916.			<i>H. m. s.</i>	<i>Sec.</i>	μ	μ	<i>Km.</i>	
Jan. 1		Of	13 24 55					Ottawa makes distance 13,000 Km. I may be P.R.
		L	13 41 30					E-W records were changed between 13 ^h 46 ^m and 13 ^h 50 ^m : N-S between 13 ^h 54 ^m and 14 ^h 08 ^m . Time on E-W inter polated from hour marks after 13 ^h 50 ^m because of failure of minute ticks. E-W stylus left drum at 14 ^h 27 ^m 20 ^s , returning at 14 ^h 45 ^m 40 ^s .
		S _W	13 48 26	8				
		eL _N ?	13 58 30					
		L	14 10 10	44				
		L _W	14 10 12					
		M	14 27 20	24				
		C	14 52 00					
		F	16 10 00					
6		M	3 32 50	0.37		90	0	Local frost crack. Freezing after rain on snow.
6		F	3 32 53					
6		M	11 13 12	0.44		37		Similar to preceding.
13		Of	6 08 09				12,950?	Distance and O from eL-3, but eL may be earlier among micro-seisms.
		eL	6 40 30					
		eL	6 41 21					
		eL	6 41 28					
		eL	6 41 53					
		S _W ?	6 47 41	7				
		eL	7 13 11	40				
		L	7 16 02	48				
		L	7 26 06	30				
		M	7 34 59	20				F merged in following quake.
		L	7 38 23	18				
13		Of	3 33 30				7,020?	
		eL	8 43 59					
		eL	8 44 01					
		eL	8 49 30	6				
		S _W	8 52 29					
		eL	9 01 08	48				
		eL	9 01 23	46				
		M	9 35 08	21				
		M	9 39 41	21				
		M	9 43 50	20				
		M	9 47 28	20				
		F	11 34 00					
19		L	20 05 25	20				Emerges from heavy micro-seisms.
		F	20 50 00					
24		O	6 55 30				8,250	N-S stylus thrown against rim of drum.
		P	7 07 05					
		S	7 16 36	14				
		eL	7 30 40					
		L	7 34 30	26				
		M	7 42 08	17		19		
		F	8 57 00					
26		Of	7 19 22				6,500?	P lost in micro-seisms. All amplitudes very small.
		S _W ?	7 57 25	6				
		eL	8 06 49					
		eL	8 08 56	30				
		L	8 16 46	16				
		F	8 47 00					
26		Of	12 08 50				12,420?	P and S doubtful; difficult to read.
		eP	12 45 02	4				
		S	12 54 37	10				
		i	12 58 10	8				
		eL _N ?	13 19 39					L well defined. Sheets changed at 13 ^h 43 ^m .
		L	13 23 14	24-20				
		L	14 04 41	15				
		L	14 10 39					
		F	14 58 00					
30		Of	20 57 01				9,380?	Sinusoidal waves to F.
		eP	21 09 24					No maximum.
		S	21 15 52	24				
		eL	21 24 37	28				
		L	21 39 08	18-16				
		L	21 55 07					
		L	22 00 45	15				
		F	22 08 00					

TABLE 2.—Instrumental seismological reports, January, 1916—Continued.

Date.	Char-acter.	Phase.	Time.	Period. T.	Amplitude.		Dis-tance.	Remarks.
					A _m	A _w		
Massachusetts. Cambridge. Harvard University Seismographic Station—Continued.								
1916. Jan. 31		Op	H. m. s.	Sec.	μ	μ	Km.	
		Op _N	13 11 05				4,930	
		Op _N	18 19 35					Masked by micro-seisms.
		Op _N	18 23 10	4				
		Sw	18 26 13					
		Sp _N	18 28 43	8				
		Sp _N	18 33 55	24				
		oLw	18 34 59					
		Lw	18 36 05					
		Lw	18 44 30	15				
		Mw	18 45 49	20				3 waves.
		Lw	18 52 44					
		Lw	19 18 20	16-12				
		F	19 50 00					

Missouri. St. Louis. St. Louis University. Geophysical Observatory.
J. B. Goesse, S. J.

Lat., 38° 38' 15" N.; long., 90° 13' 58" W. Elevation, 160.4 meters. Foundation, 12 feet of tough clay over limestone of Mississippi System, about 300 feet thick.

Instrument: Wiechert 80 kg. astatic, horizontal pendulum.

Instrumental constants. $\frac{V}{T_0} \epsilon: 1$
80 7 5: 1

Date.	Char-acter.	Phase.	Time.	Period. T.	Amplitude.		Dis-tance.	Remarks.
					A _m	A _w		
New York. Buffalo. Canisius College. John A. Curtin, S. J.								
1916. Jan. 1	III _r	oP _N	H. m. s.	Sec.	μ	μ	Km.	
		oP _N	13 30 36					Times doubtful owing to microseisms and wind disturbances.
		SP	13 34 36					
		L _N	13 35 48					
		F	13 46 00					
12		C _N	15 26 00					
		F	15 38 00					
12		C _N	15 43 30					
		F	15 46 18					
12		Sw	18 17 18					Microseisms strong from 18h 38m 12s to 4h 9m on Jan. 13.
		F	18 24 00					
13		C _N	7 10 36					
		F	7 33 00					
13		C _N	7 28 30					
		F	7 33 00					
13		C _N	8 41 42					
		F	8 50 00					
13	II _r	oP _N	8 54 00				7,000	
		oP _N	9 03 30					
		L _N	9 12 42					
		L _N	9 23 12					
		F	9 48 00					
24		C _N	1 36 00					
		L _N	1 40 00					
		F	1 52 00					

New York. Buffalo. Canisius College. John A. Curtin, S. J.

Lat., 42° 53' 02" N.; long., 78° 52' 40" W. Elevation, 190.5 meters.

Instrument: Wiechert 80 kg. horizontal.

Instrumental constants. $\frac{V}{T_0} \epsilon: 1$
80 7 5: 1

Date.	Char-acter.	Phase.	Time.	Period. T.	Amplitude.		Dis-tance.	Remarks.
					A _m	A _w		
New York. Fordham. Fordham University. W. C. Repetti, S. J.								
1916. Jan. 1	III _r	oP _N	H. m. s.	Sec.	μ	μ	Km.	
		oP _N	13 47 15				5,000	
		oP _N	13 47 15					
		oP _N	13 53 15					
		eS _N	13 53 30					
		L _N	14 12 15	40		10		
		L _N	14 15 00	35	8			
		M _N	14 20 00	30		25		
		M _N	14 21 00	25	50			
		M _N	14 29 00	30	14			
		M _N	14 31 00	25		25		
		M _N	14 32 00	24	12			
		M _N	14 37 00			12		
		F	15 43 00					Last maxime followed by aftershakes.
13	III _r	oP _N	6 56 30					
		L _N	7 26 00					
		L _N	7 30 00					
		M _N	7 33 00	30	6			
		M _N	7 35 00					
		C _N	7 40 00					
		F	7 51 00					

Date.	Char-acter.	Phase.	Time.	Period. T.	Amplitude.		Dis-tance.	Remarks.
					A _m	A _w		
New York. Buffalo. Canisius College—Continued.								
1916. Jan. 13	III _r	oP _N	H. m. s.	Sec.	μ	μ	Km.	
		oP _N	8 41 50					
		oP _N	8 42 30					
		oP _N	8 43 00					
		oP _N	8 43 10					
		L _N	8 59 00					
		M _N	9 00 00					
		M _N	9 24 10	40	9			
		M _N	9 24 20	30		6		
		M _N	9 33 00	30	11			
		M _N	9 36 00	25	5			
		M _N	9 41 30	35		9		
		C _N	9 42 00					
		F _N	9 52 00					
		F _N	10 42 00					

New York. Fordham. Fordham University. W. C. Repetti, S. J.

Lat., 40° 57' 47" N.; long., 73° 53' 08" W. Elevation, 23.9 meters.

Instrument: Wiechert 80 kg.

Instrumental constants. $\frac{V}{T_0} \epsilon: 1$
 $\begin{matrix} E & 72 & 7.2 & 1.5 \\ N & 73 & 7.2 & 3.75 \end{matrix}$

(Report for January, 1916, not received.)

Panama Canal Zone. Balboa Heights Isthmian Canal Commission.

Lat., 8° 57' 39" N.; long., 79° 33' 29" W. Elevation, 27.6 meters.

Instruments: Two Bosch-Omori, 100 kg.

Instrumental constants. $\frac{V}{T_0} \epsilon: 1$
10 20

Date.	Char-acter.	Phase.	Time.	Period. T.	Amplitude.		Dis-tance.	Remarks.
					A _m	A _w		
Porto Rico. Vieques. Magnetic Observatory. U. S. Coast and Geodetic Survey. H. M. Pease.								
1916. Jan. 1		L _N	H. m. s.	Sec.	μ	μ	Km.	
		L _N	14 20 10					Distance and direction unknown, No record on N-S, at work on instrument.
		M _N	14 24 30		150			
		F _N	15 02 40					
13		F _N	8 40 44				7,240	
		F _N	8 40 40					
		L _N	9 02 41					
		M _N	9 34 30		50			
		M _N	9 34 31			70		
		F _N	10 32 00					
17		F _N	12 29 12				480	Direction unknown.
		F _N	12 29 18					
		L _N	12 30 15					
		L _N	12 30 17					
		M _N	12 30 18			250		
		M _N	12 31 26		300			
		F _N	12 35 22					
		F _N	12 35 34					
24		P _N	19 48 35				350	Direction unknown.
		L _N	19 49 19					
		L _N	19 49 27			80		
		M _N	19 49 29			50		
		M _N	19 51 50					
		F _N	19 52 00					
31		F _N	18 05 30				4,830	Waves moved in N-S direction.
		F _N	18 05 36					
		Sw	18 13 00				150	
		Sw	18 13 05					
		L _N	18 19 30					
		L _N	18 20 26					
		M _N	18 21 40		50			
		M _N	18 23 28					
		F _N	18 41 00					
		F _N	18 44 00					

Porto Rico. Vieques. Magnetic Observatory. U. S. Coast and Geodetic Survey. H. M. Pease.

Lat. 18° 09' N.; long., 65° 27' W. Elevation, 19.8 meters.

Instruments: Two Bosch-Omori.

Instrumental constants. $\frac{V}{T_0} \epsilon: 1$
 $\begin{matrix} E & 10 & 21.4 \\ N & 10 & 21.1 \end{matrix}$

(Report for January, 1916, not received.)

TABLE 2.—Instrumental seismological reports, January, 1916—Continued.

Vermont. *Northfield. U. S. Weather Bureau. Wm. A. Shaw.*
 Lat., 44° 10' N.; long., 72° 41' W. Elevation, 256 meters.
 Instruments: Two Bosch-Omori, mechanical registration.

Instrumental constants: $\begin{matrix} V & T_0 \\ E & 10 & 15 \\ N & 10 & 16 \end{matrix}$

Date.	Char-acter.	Phase.	Time.	Period. T.	Amplitude.		Dis-tance.	Remarks.
					A _m	A _w		
1916. Jan. 1	I _u	P?	13 40 20				4,640?	
		S?	13 46 43					
		I _u	13 58 26	45				
		L _u	14 13 03	40				
		L _u	14 21 50	28				
		L _u	14 25 40	20				
		F _u	16 20 00					
		S	6 40 35					Phases indetermi- nabla.
		F	6 50 00					
		S	8 42 40					P indeterminabΔ.
		L	9 00 47	40				
		L	9 29 15	21				
F	11 00 00							
24	I _u	P?	7 06 56				8,420?	
		S?	7 16 37					
		L _u	7 29 20	40				
		L _u	7 34 00	28				
F _u	8 10 00							
31	S?	L	18 19 09					
		L	18 40 00	21				
		F	19 00 00					

Canada. *Ottawa. Dominion Astronomical Observatory. Earthquake Station. Otto Klotz.*

Lat., 45° 23' 38" N.; long., 75° 42' 57" W. Elevation, 83 meters.
 Instruments: Two Bosch photographic horizontal pendulums, one Spindler & Hoyer 30 kg. vertical seismograph.

Instrumental constants: $\begin{matrix} V & T_0 \\ E & 120 & 26 \end{matrix}$

Date.	Char-acter.	Phase.	Time.	Period. T.	Amplitude.		Dis-tance.	Remarks.		
					A _m	A _w				
1916. Jan. 1	PRI	P?	13 40 39				13,000	Time at origin— 20 ^s 40 ^m .		
		i	13 46 34							
		i	13 48 06							
		iS?	13 48 34							
		i	13 51 00							
		eL?	13 58 00	44						
		L _u	14 10 00	24						
		eL?	14 12 00	44						
		L _u	14 22 00	22						
		L _u	14 30 00	22-16						
		L _u	15 41 00							
		F _u	16 35 00							
13	i	i	6 40 48					Very distant.		
		i	6 49 10							
		i	6 50 00	10						
		eL _u	7 12 00	40						
		L _u	7 14 00	40						
		L _u	7 16 00	40						
		L _u	7 27 00	22-16						
		L _u	7 55 00							
		F _u	8 20 00							
		13	PRI	PRI?	8 42 38				6,600?	
				S?	8 48 06					
				S?	8 48 18					
eL _u	9 00 00			44						
L _u	9 08 00			28						
L _u	9 18 00			38						
L _u	9 30 00			20						
L _u	9 40 00			18						
L _u	10 03 00			18						
L _u	10 30 00			20						
F _u	11 05 00									
19	eL _u			L _u	20 00 42	18				
		L _u	20 06 00	18-16						
		F _u	20 38 00							
24	PRI	P	7 07 06	2			8,160			
		PRI	7 10 34							
		S	7 16 32							
		SRI	7 21 50							
		eL _u	7 30 18	40						
		eL _u	7 39 54	40						
		L _u	7 33 00	35-28						
		L _u	7 38 00	24						
		L _u	7 43 00	16						
		L _u	7 46 00	14						
		F _u	8 30 00							

Canada. *Ottawa. Dominion Astronomical Observatory—Continued.*

Date.	Char-acter.	Phase.	Time.	Period. T.	Amplitude.		Dis-tance.	Remarks.		
					A _m	A _w				
1916. Jan. 26		P?	7 50 14				5,600?			
		S	7 57 30							
		eL _u	8 07 30	30						
		L _u	8 12 00	26						
		L _u	8 16 00	17						
		F _u	8 35 00							
		26	iE?	L _u	12 54 08					
				L _u	13 14 06	40				
				L _u	13 20 00	27				
				L _u	13 25 00	18				
				L _u	13 30 00					
				L _u	13 40 00	16-14				
F _u	14 10 00									
30	L _u			L _u	21 32 00	24				
				L _u	21 35 00	20-15				
				L _u	21 55 00					
				F _u	22 16 00					
				31	P _N	L _u	18 09 57			
		S	18 19 53							
		eL _u	18 33 18			40				
		L _u	18 35 00			30				
		L _u	18 41 00			22-20				
		L _u	18 46 00			16				
		L _u	18 50 00			15				
		L _u	19 02 00			14				
F _u	19 45 00									

Canada. *Toronto. Dominion Meteorological Service.*
 Lat., 43° 40' 01" N.; long., 79° 23' 54" W. Elevation, 113.7 meters. Subsoil: Sand and clay.

Instrument: Milna horizontal pendulum, North. In the meridian.
 Instrumental constant: $\begin{matrix} T_0 \\ 18 \end{matrix}$. Pillar deviation, 1 mm. swing of boom=0.59".

Date.	Char-acter.	Phase.	Time.	Period. T.	Amplitude.		Dis-tance.	Remarks.						
					A _m	A _w								
1916. Jan. 1		P?	13 39 54					Very large disturb- ance.						
		eS?	13 48 18											
		i	13 50 12											
		i	13 51 12				*400							
		S?	13 55 42											
		L _u	13 57 24											
		iL _u	13 58 00	36-42										
		L _u	14 09 42											
		L _u	14 18 36	12-24										
		L _u	14 22 18											
		L _u	14 26 00	18-24										
		M _u	14 35 48				*20,000							
M _u	14 34 42				*8,000									
M _u	14 41 48	18			*4,150									
L _u	15 26 36													
M _u	15 28 42				*1,150									
11	eL _u	L _u	12 58 48					Small vibrations go- ing on when paper was changed.						
		M _u	12 30 00			*150								
		F _u	12 43 36											
12								Marked thickening, 18 ^s 40 ^m 48 ^s to 18 ^s 47 ^m 48 ^s . Possibly air currents.						
13	P	P	6 59 36					P and S merge with trailers from prece- ding quake.						
		S	6 57 24											
		L _u	7 09 18											
		L _u	7 15 00											
		iL _u	7 26 06											
		L _u	7 32 12											
		M _u	7 39 54	18-30			*3,250							
		13	iL _u	L _u	9 00 12						Trailers from preced- ing quake merge with P and S.			
				L _u	9 33 12									
				L _u	9 39 12	18								
				M _u	9 44 18	18-24				*4,150				
				L _u	9 47 24									
13	iL _u			L _u	10 31 00	18								
				M _u	10 36 18				*4,000					
				L _u	10 46 24									
				13	L _u	L _u	12 07 24							
						M _u	12 12 30						*250	
						F?	13 31 42							
						19	P	P	19 51 00					
		S?	19 35 18											
		iL _u	20 03 24											
		M _u	20 09 06									*800		
		F?	20 50 30											

* Trace amplitude.

TABLE 2.—Instrumental seismicological reports, January, 1916—Concluded.

Canada. Toronto. Dominion Meteorological Service—Continued.

Date.	Char-acter.	Phase.	Time.	Period. T.	Amplitude.		Dis-tance.	Remarks.
					A _m	A _n		
1916. Jan. 24	P?	H. m. s.	7 13 42	Sec.	μ	μ	Km.	P not well defined. There may be a minute thickening previous to P but impossible to measure.
			7 17 34					
			7 23 30					
			7 33 54					
			7 43 54					
			7 46 42					
26	L.	H. m. s.	7 59 54	Sec.	μ	μ	Km.	P and S not recorded. Waves occur from 9 ^h 26 ^m 12 ^s to 9 ^h 39 ^m 18 ^s ; may be trailers or another quake.
			8 10 54					
			8 16 24					
			8 17 42					
26	P or S.	H. m. s.	12 53 06	Sec.	μ	μ	Km.	Phases not well defined.
			13 00 00					
			13 21 48					
			13 26 54					
30	L.	H. m. s.	21 31 48	Sec.	μ	μ	Km.	P and S not recorded.
			21 42 36					
			22 12 06					
31	S.	H. m. s.	18 20 12	Sec.	μ	μ	Km.	P lost during attention to instrument.
			18 31 36					
			18 41 36					
			18 44 06					
			18 44 42					
			19 33 48					
31	F.	H. m. s.	19 37 48	Sec.	μ	μ	Km.	Gradual thickening.
			20 02 54					

* Trace amplitude.

Canada. Victoria, B. C. Dominion Meteorological Service.

Lat., 48° 24' N.; long., 123° 19' W. Elevation, 67.7 meters. Subsoil: Rock.

Instruments: Wiechert, vertical. Milne horizontal pendulum, North; in the meridian.

Instrumental constant.. 18. Pillar deviation: 1 mm. swing of boom=0.54°.

Date.	Char-acter.	Phase.	Time.	Period. T.	Amplitude.		Dis-tance.	Remarks.
					A _m	A _n		
1916. Jan. 1	P.	H. m. s.	13 33 24	Sec.	μ	μ	Km.	Very large disturbance.
			13 37 24					
			13 44 48					
			13 45 06					
			13 50 30					
			14 12 36					
			14 14 36					
			14 17 36					
			15 42 12					
			15 53 18					
			18 58 00					
			11						P.	H. m. s.	11 58 54	Sec.	μ	μ	Km.	2,440
12 02 54								
12 05 54								
12 29 54								
13	P.	H. m. s.	6 43 24	Sec.	μ	μ	Km.	6,440
			6 45 12					
			6 51 24					
			7 06 54					
			7 08 12					
13	M.	H. m. s.	7 19 06	Sec.	μ	μ	Km.	F merges into next quake.
			8 32 54					
			8 45 24					
			9 06 24					
13	L.	H. m. s.	9 27 00	Sec.	μ	μ	Km.	2,750
			10 29 30					
			10 36 42					
13	S.	H. m. s.	10 48 48	Sec.	μ	μ	Km.	P confused with trailers from preceding quake.
			10 48 48					

* Trace amplitude.

Canada. Victoria, B. C. Dominion Meteorological Service—Continued.

Date.	Char-acter.	Phase.	Time.	Period. T.	Amplitude.		Dis-tance.	Remarks.
					A _m	A _n		
1916. Jan. 13	L.	H. m. s.	11 42 42	Sec.	μ	μ	Km.	P and S lost in trailers from preceding quake.
			11 47 54					
			12 11 54					
19	P?	H. m. s.	19 40 30	Sec.	μ	μ	Km.	1,410?
			19 42 39					
			19 45 24					
			19 47 54					
24	S.	H. m. s.	7 19 00	Sec.	μ	μ	Km.	P uncertain.
			7 33 54					
			7 49 06					
24	L.	H. m. s.	9 25 30	Sec.	μ	μ	Km.	S uncertain.
			9 31 24					
			9 40 48					
26	P.	H. m. s.	8 21 00	Sec.	μ	μ	Km.	1,430
			8 23 30					
			8 24 54					
			8 25 40					
			8 39 48					
26	P?	H. m. s.	12 48 54	Sec.	μ	μ	Km.	No reports received after the 29th.
			12 52 54					
			13 10 30					
			13 16 30					
			13 47 42					
			13 47 42					

* Trace amplitude.

SEISMOLOGICAL DISPATCHES.¹

London, Jan. 6, 1916, 4.46 p. m.

An exchange telegraph dispatch from Rome says that Prof. Maladra, Government observer at Mount Vesuvius, announces the volcano has been in active eruption since January 3. Three new craters have been opened and there are constant explosions, large stones being hurled to a height of half a mile. It is said there is no immediate danger from the eruption. (Assoc. Press.)

Petrograd, Russia, Jan. 24, 1916, 5 p. m. (via London, Jan. 24, 10 p. m.)

The seismograph in the Government observatory located 20 miles southwest of here registered an earth shock at 9 o'clock this morning. The intensity of the oscillations was estimated at double those experienced in the great Messina earthquake. The center of the disturbance was fixed at a point 1,500 miles distant. (Assoc. Press.)

London, Jan. 25, 1916.

A heavy earthquake was recorded by the West Bromwich Observatory. The shock was about 2,000 miles away. From certain indications it is said that it may have occurred in Asia Minor in the vicinity of the Black Sea. (Assoc. Press.)

San Francisco, Cal., Jan. 26, 1916.

Pumice stone, presumably from a submarine disturbance, was mixed with the waves which battered the Oceanic Steamship Co's. liner *Sierra* during a hurricane three days out from Sydney, N. S. W., according to a report made by the captain of the steamer which is in port to-day. Capt. Koughan said that a few hours before leaving Sydney, January 5, it was reported to him that seismographs there registered violent disturbances at sea. The *Sierra*, he said, must have passed over the seat of the volcanic outbreak. For hours the ship was in a sea of pumice, pieces varying in size from a marble to a hat being thrown on deck by the waves. (Assoc. Press.)

¹ Reported by the organization indicated and collected by the seismological station at Georgetown University.

SECTION V.—SEISMOLOGY.

SEISMOLOGICAL REPORTS FOR FEBRUARY, 1916.

By W. J. HUMPHREYS, Professor in charge of Seismological Investigations.

[Dated: Weather Bureau, Washington, D. C., Apr. 3, 1916.]

TABLE 1.—Noninstrumental earthquake reports, February, 1916.

Day.	Approximate time, Greenwich Civil.	Station.	Approximate latitude.	Approximate longitude.	Intensity Rossi-Forel.	Number of shocks.	Duration.	Sounds.	Remarks.	Observer.	
1916.		ALABAMA.									
Feb. 21	H. m.	Anniston.....	33 39	85 50	2	1	Secs. 30			U. S. Weather Bureau.	
	23 40	Valley Head.....	34 32	85 32	2	3	14		Windows rattled.....	Dr. M. T. Floyd.	
	23 40										
		CALIFORNIA.									
	2	Julian.....	33 05	116 37	2	1	4	Rumbling.....		J. H. L. Vogt.	
	4	Hollister.....	36 50	121 20	4-5	1				J. N. Thompson.	
	19	Bridgeport.....	38 18	119 15	3	2	40			A. F. Scott.	
	25	Cahuilla.....	33 32	116 43	4	1		Rumbling.....	Shook buildings.....	Wm. L. Shawk.	
	25	Nellie.....	33 22	116 52	3	1				Esther Hewlett.	
	27	Los Alamos.....	34 45	120 15		1				J. W. Robbins.	
		GEORGIA.									
	21	Atlanta.....	33 45	84 23	4	1			Shook buildings.....	(Press report.)	
	23 40	Augusta.....	33 28	81 54	4	3			Shook dishes from shelves.....	U. S. Weather Bureau.	
	23 40	Canton.....	34 14	84 29	3-4	2				Mrs. Ada Mills.	
	23 40	Clarksville.....	34 36	83 30	2	2			Windows rattled.....	Garnett McMillian.	
	23 40	Clayton.....	34 35	82 23	4-5	1				W. R. Cannon.	
	23 40	Columbus.....	32 28	85 00	3	2	15			A. J. Land.	
	23 40	Dahlonega.....	34 32	83 59	4	1		Rumbling.....	Dishes rattled.....	Prof. B. P. Gallard.	
	23 40	Duluth.....	34 00	84 08	4	1				W. O. Medlock.	
	23 40	Gillsville.....	34 18	83 38	4	1	15			G. W. Lichtenstine.	
	23 40	Kirkwood.....	33 46	84 18	3	1	2			A. B. Nichols.	
	23 40	Macon.....	32 50	83 38	3	1	20			U. S. Weather Bureau.	
	23 40	Savannah.....	32 05	81 05	1	2				U. S. Weather Bureau.	
	23 40	Toccoa.....	34 34	83 19	4	1	30	Rumbling.....		Miss Marian Craig.	
	23 40	Washington.....	33 41	82 46	3	2	6	Rattling.....		W. H. Barnett.	
		ILLINOIS.									
	18	New Burnside.....	37 36	88 46	3	1	1			Miss May McCabe.	
		KENTUCKY.									
	21	Middlesboro.....	36 36	83 43	4	1	10	Rumbling.....	Shook buildings.....	B. W. Perkins.	
		NEVADA.									
	3	Amos.....	41 26	117 48	4	1	8			F. M. Payne.	
	5 00	Elko.....	40 51	115 45		1				G. M. Blair.	
	5 00	Eureka.....	39 23	115 59		1	1			Clay Simms.	
	5 00	Fallon.....	39 30	118 48	3	1	5			F. B. Headley.	
	5 00	Gerlach.....	40 38	119 24	6	1	30			W. Pacific Ry.	
	5 00	Rebel Creek.....	41 39	117 45	4-5	2	6			F. W. Whitaker.	
	5 00	Tuscarora.....	41 18	116 13		1				J. C. Butler.	
	5 00	Winnemucca.....	40 58	117 43	4	1	30			U. S. Weather Bureau.	
	14	Paradise Valley.....	41 32	117 34	6	1	1		Bells rung.....	R. M. Taylor.	
		NEW YORK.									
	4	Albany.....	42 39	73 45				Rumbling.....		U. S. Weather Bureau.	
	4 26	Amsterdam.....	42 55	74 08	4-5	2		do.....	Shook buildings.....	Robt. M. Hartley.	
	4 26	Ballston Lake.....	42 53	73 52	4-5	2		do.....	Awakened many.....	E. I. Schaubert.	
	4 26	Clifton Park.....	42 52	73 46	2					Martin Sharp.	
	4 26	Gloversville.....	43 04	74 20			Few.	Rumbling.....		W. L. McLean.	
	4 26	Glenn Falls.....	43 21	73 36				do.....		C. L. Williams.	
	4 26	Greenfield Center.....	43 09	73 50	4	1	30	do.....	Windows rattled.....	S. E. Darrow.	
	4 26	Little Falls.....	43 05	74 51	3	2				G. H. Phillips.	
		NORTH CAROLINA.									
	21	Alta Pass.....	35 53	82 00	3-4	1	10		Some alarm.....	J. S. Bowan.	
	23 40	Andrews.....	35 11	83 48		1		Rumbling.....		A. V. Calhoun.	
	23 40	Asheville.....	35 36	82 32	5	2	10	Rattling.....	Caused some alarm.....	U. S. Weather Bureau.	
	23 40	Black Mountain.....	35 41	82 24	5	2	30	Rumbling.....		W. C. Hall.	
	23 40	Blantyre.....	35 16	82 36	4	1	10	do.....	Doors moved.....	J. E. Davidson.	
	23 40	Brevard.....	35 12	82 45	5	2		do.....		C. H. Trowbridge.	
	23 40	Brewers.....	36 22	81 06	3	3	45	Faint.....		W. L. Brewer.	
	23 40	Caroleen.....	35 15	81 50	4			Rumbling.....		S. B. Tanner.	
	23 40	Charlotte.....	35 13	80 51	5	1	60			U. S. Weather Bureau.	
	23 40	Chimney Rock.....	35 26	82 14	5	1	4			J. M. Fack.	
	23 40	Cullowhee.....	35 15	83 10	3	1	60	Rumbling.....		F. H. Brown.	
	23 40	Elizabethton.....	34 35	78 33		1				H. H. Barnhill.	
	23 40	Elkin.....	36 14	80 51	4	1			Shook buildings.....	C. L. Myers.	
	23 40	Franklin.....	35 10	83 22		1				F. L. Smith.	

TABLE I.—Noninstrumental earthquake reports, February, 1916—Continued.

Day.	Approximate time, Greenwich Civil.	Station.	Approximate latitude.	Approximate longitude.	Intensity Rossi-Forel.	Number of shocks.	Duration.	Sounds.	Remarks.	Observer.
NORTH CAROLINA—contd.										
Feb. 21	H. m.		° ' "	° ' "			Secs.			
	23 40	Greensboro	36 05	79 50	3	3	2			A. R. Horry.
	23 40	Henderson	36 20	78 25	5	1	60			Enoch Powell.
	23 40	Hickory	35 45	81 22	5	1	40			F. B. Gwin.
	23 40	Highlands	35 02	83 24	4-5	1	60	Rumbling		B. C. Hawkins.
	23 40	Hot Springs	35 53	82 50	4	1	3			R. A. Garner.
	23 40	Lake Toxaway	35 05	82 56	5	1	1			C. B. McNulty.
	23 40	Lenoir	35 55	81 36	5	1	10	Rumbling		J. H. Beall.
	23 40	Lincolnton	35 27	81 18	5	1	1			J. T. McLean.
	23 40	Marion	35 54	82 02	4-5	2	15	Rumbling		Thos. McGuire.
	23 40	Marshall	35 47	82 40	4	2	20	Faint		M. J. Church.
	23 40	Morganton	35 45	81 38	4	2	15			J. R. P. Massey.
	23 40	Mount Airy	36 30	80 38	4	2	1			J. B. Sparger.
	23 40	Pinehurst	35 12	79 29	4	2	15			H. F. Sise.
	23 40	Raleigh	35 45	78 37	4	1	1			(Press report.)
	23 40	Salsbury	35 38	80 32	5	1	1			Thelma Wilkinson.
	23 40	Saluda	35 14	82 20	5	1	1			I. B. Cullipher.
	23 40	Settle	35 39	80 44	2	3	6			C. H. Smith.
	23 40	Skyland	35 30	82 30	6	2	20	Rumbling		A. B. Case.
	23 40	Southport	33 55	78 02	2	1	1			Mrs. C. E. Taylor.
	23 40	Statesville	35 45	80 55	4	2	12	Rumbling		D. M. Thompson.
	23 40	Swannanoa	35 36	82 23	4	2	2			J. M. Patton.
	23 40	Wilmington	34 14	77 57	3	2	Few.			U. S. Weather Bureau.
	23 40	Winston-Salem	35 06	80 17	3	2	3			H. E. Rondthaler.
SOUTH CAROLINA.										
21	23 40	Anderson	34 30	82 39	3	1	5			H. H. Russell.
	23 40	Batesburg	33 50	81 38	3	1	5		Children frightened	J. M. Johnson.
	23 40	Belton	34 30	82 34	5	3	12			M. C. Clarkscales.
	23 40	Calhoun Falls	34 05	82 36	4	1	6		Dishes rattled	L. M. Parker.
	23 40	Chappells	34 09	81 52	2	1	2			J. J. Murran.
	23 40	Charleston	32 47	79 56	2	2	15			Miss Zoe St. Amand.
	23 40	Clemson College	34 39	82 52	4	1	2		Dishes rattled	R. N. Brackett.
	23 40	Columbia	34 00	81 03	2-3	2	1		Windows rattled	Stephen Taber.
	23 40	Gaffney	35 08	81 36	4	1	40			H. A. Parrish.
	23 40	Greenville	34 50	82 24	4	1	10			J. H. Woodside.
	23 40	Greenwood	34 10	82 10	2	2	5			M. M. Calhoun.
	23 40	Landrum	35 14	82 15	4	1	1			R. H. Wilds.
	23 40	Liberty	34 47	82 41	5	1	4	Rumbling	Furniture moved	J. T. Boggs.
	23 40	Little Mountain	34 09	81 24	2	1	1			J. M. Sasse.
	23 40	Mountain Rest	34 52	83 09	5	1	1	Rumbling		J. H. Brown.
	23 40	Newberry	34 16	81 39	3-4	2	8			W. G. Peterson.
	23 40	Rock Hill	34 54	81 05	5	3	45	Rumbling	Shook buildings	W. P. Goodman.
	23 40	Santuck	34 35	81 35	5	2	5			E. W. Jetter.
	23 40	Spartanburg	34 52	81 59	5	1	20		Furniture moved	F. P. Robinson.
	23 40	Summerville	33 03	80 14	1-2	1	1			Miss E. H. Gadsden.
	23 40	Walhalla	34 45	83 04	4	1	1			N. P. Watt.
	23 40	Westminster	34 38	83 06	2	2	6			F. M. Crass.
SOUTH DAKOTA.										
24	4 30	Pine Ridge	43 02	102 32	3	2	45			W. A. Spencer.
TENNESSEE.										
21	23 40	Chattanooga	35 04	85 14	4	1	5			U. S. Weather Bureau.
	23 40	Elizabethton	36 20	82 10	4-5	1	1		Slight alarm	Chas. Boyd.
	23 40	London	35 44	84 21	3	1	15			R. W. Clark.
	23 40	McMinnville	35 40	85 48	4	1	1			H. H. Stiles.
	23 40	Newport	35 56	83 12	4-5	1	5	Rumbling	Slight alarm	C. M. Babb.
	23 40	Sevierville	35 50	83 33	5	1	5	do.	Bricks fell from chimneys	H. O. Eckel.
UTAH.										
5	5 15	Elberta	39 58	111 58	4	1	2			D. C. Walker.
5	6 10	Elberta	39 58	111 58	6	1	2			D. C. Walker.
	6 10	Santaquin	40 00	111 46	6	1	30	Rumbling	Stopped clocks.	Wm. Broadbent.
VIRGINIA.										
21	23 40	Norfolk	36 51	76 17	3	1	1			J. H. Coler.
	23 40	Richmond	37 32	77 27	3	3	3			Mrs. H. B. McElrath.
	23 40	South Boston	36 43	78 57	3	1	15			C. B. Lacy.
	23 40	Wytheville	36 56	81 05	3	2	15			R. Ewald.
WASHINGTON.										
22	11 45	Marietta	48 47	122 35	5	2	60			S. B. Mayhew.

TABLE 2.—Instrumental reports, February, 1916.

[Time used: Mean Greenwich, midnight to midnight. Nomenclature: International.]

[For significance of symbols see REVIEW for January, 1916, p. 39.]

Date.	Char-acter.	Phase.	Time.	Pe-riod. T.	Amplitude.		Dis-tance.	Remarks.	
					A _m	A _N			
Alaska. <i>Sitka. Magnetic Observatory. U. S. Coast and Geodetic Survey. J. W. Green.</i>									
Lat. 57° 03' 00" N.; long., 133° 30' 06" W. Elevation, 16.2 meters.									
Instruments: Two Bosch-Omori, 10 and 12 kg.									
					V	T ₀			
Instrumental constants:					E	10	16.7		
					N	10	15.4		
1916.			H. m. s.	Sec.	μ	μ	Km.		
Feb. 6			P _m	21 58 12	4			P and S indistinct.	
			S _m	22 02 01					
			L _m	22 05 00	22				
			L _w	22 06 14	22				
			M _m	22 07 38	20	370			
			M _w	22 14 44	16	110			
			C _m	22 15 00	12				
			C _w	22 19 40	16				
			F _m	23 24 00					
			F _w	23 38 00					
15			P.....	11 37 41	4			N-S not recording.	
			L.....	11 39 42	13				
			M.....	11 40 44	13	200			
			C.....	11 46 40	5				
			F.....	12 15 00					
20			P _m	17 52 20	2				
			S _m	17 55 50	12				
			M _m	17 55 58	12		170		
			L.....	18 00 03	16				
			M _w	18 02 22	16		100		
			M.....	18 07 00	15	60			
			C.....	18 08 00	10				
			F _m	18 40 00					
			F _w	18 54 00					
27			eP.....	20 38 48	6			N-S not recording.	
			L.....	20 56 30	21	100			
			M.....	21 08 48	15				
			C.....	21 12 00	11				
			F.....	21 48 00					

Arizona. *Tucson. Magnetic Observatory. U. S. Coast and Geodetic Survey. F. P. Ulrich.*

Lat. 32° 14' 48" N.; long., 110° 59' 06" W. Elevation, 769.6 meters.

Instruments: Two Bosch-Omori, 10 and 12 kg.

Instrumental constants: $\begin{matrix} V & T_0 \\ E & 10 & 16 \\ N & 10 & 19.6 \end{matrix}$

Date.	Char-acter.	Phase.	Time.	Pe-riod. T.	Amplitude.		Dis-tance.	Remarks.	
					A _m	A _N			
Arizona. <i>Tucson. Magnetic Observatory. U. S. Coast and Geodetic Survey. F. P. Ulrich.</i>									
Lat. 32° 14' 48" N.; long., 110° 59' 06" W. Elevation, 769.6 meters.									
Instruments: Two Bosch-Omori, 10 and 12 kg.									
					V	T ₀			
Instrumental constants:					E	10	16		
					N	10	19.6		
1916.			H. m. s.	Sec.	μ	μ	Km.		
Feb. 3			P.....	5 06 45	5				
			L.....	5 06 45					
			M _m	5 06 50	5	20			
			M _w	5 07 38	6	30			
			F.....	5 19 00					
6			eP _m	22 00 06	5				
			eP _w	22 00 26	5				
			S.....	22 08 29	6				
			L _w	22 15 06	20				
			L _m	22 18 14	22				
			M _w	22 23 14	19	20			
			M.....	22 26 05	19	40			
			C.....	22 30 00	16				
			F.....	23 38 00					
15			e _w	11 42 34	4			Barely perceptible.	
			e _m	11 49 17	5				
			M _w	11 48 04	16	10			
			M _m	11 59 47	11	10			
			F.....	12 20 00					
20			P _m	17 56 20	4				
			L _m	18 06 26	10				
			L _w	18 07 00	17				
			M _w	18 09 22	17				
			M.....	18 15 46	9	20			
			C _m	18 22 00	9				
			F _m	19 14 00					
27			P.....	20 37 42	5				
			L _w	20 37 42	17				
			L _m	20 38 59	11				
			M _w	20 41 20	18	1,040			
			M.....	20 46 21	18	2,070			
			C _m	20 48 00	13				
			C _w	20 57 03	14				
			F _m	21 59 00					
			F _w	22 28 00					

Date.	Char-acter.	Phase.	Time.	Pe-riod. T.	Amplitude.		Dis-tance.	Remarks.
					A _m	A _N		
California. <i>Berkeley. University of California.</i>								
Lat., 37° 52' 16" N.; long., 122° 15' 37" W. Elevation, 85.4 meters.								
(See Bulletin of the Seismographic Stations, University of California.)								

California. <i>Mount Hamilton. Lick Observatory.</i>								
Lat., 37° 23' 24" N.; long., 121° 33' 34" W. Elevation, 1,281.7 meters.								
(See Bulletin of the Seismographic Stations, University of California.)								

California. <i>Point Loma. Raja Yoga Academy. F. J. Dick.</i>								
Lat., 32° 43' 03" N.; long., 117° 15' 10" W. Elevation, 91.4 meters.								
Instrument: Two-component, C. D. West seismoscope.								
(Report for February, 1916, not received.)								

California. <i>Santa Clara, University of. J. S. Ricard. S. J.</i>								
Lat., 37° 28' 36" N.; long., 121° 57' 03" W. Elevation, 27.43 meters.								
(See Record of the Seismographic Station, University of Santa Clara.)								

Colorado. <i>Denver. Sacred Heart College. Earthquake Station. A. W. Forstall, S. J.</i>								
Lat., 39° 40' 36" N.; long., 104° 56' 54" W. Elevation, 1,655 meters.								
Instrument: Wiechert 80 kg., astatic, horizontal pendulum.								

Date.	Char-acter.	Phase.	Time.	Pe-riod. T.	Amplitude.		Dis-tance.	Remarks.
					A _m	A _N		
Colorado. <i>Denver. Sacred Heart College. Earthquake Station. A. W. Forstall, S. J.</i>								
Lat., 39° 40' 36" N.; long., 104° 56' 54" W. Elevation, 1,655 meters.								
Instrument: Wiechert 80 kg., astatic, horizontal pendulum.								
1916.			H. m. s.	Sec.	μ	μ	Km.	
Feb. 1								Activity on E-W from 3 ^h 30 ^m to 6 ^h .
2								Pronounced activity on E-W from 14 ^h 30 ^m to 17 ^h , and activity on both components, larger on N-S, from 17 ^h 30 ^m to 19 ^h .
6			P.....	22 06 --				P somewhat doubtful; S not discernible.
			L _m	22 18 --	25			
			L _w	22 19 --	25			
			M.....	22 20 --	26			
			C _m	22 23 --	22-26			
			C _w	22 26 --	22-28			
			F.....	22 --				
27			P _m	20 24 --				P very clear; S obscure. Time is somewhat doubtful.
			S _m	20 29 --				
			L.....	20 35 --	22	4	4	
			M _w	20 37 --	25	18		
			M.....	20 39 --	25	15		
			C _m	20 42 --	10	5		
			C _w	20 45 --	12	8		
			F _m	20 51 --				
			F _w	20 53 --				

District of Columbia. <i>Washington. U. S. Weather Bureau.</i>									
Lat., 38° 54' 12" N.; long., 77° 03' 03" W. Elevation, 21 meters.									
Instrument: Marvin (vertical pendulum), undamped. Mechanical registration.									
					V	T ₀			
Instrumental constants:					110	6			

Date.	Char-acter.	Phase.	Time.	Pe-riod. T.	Amplitude.		Dis-tance.	Remarks.	
					A _m	A _N			
District of Columbia. <i>Washington. U. S. Weather Bureau.</i>									
Lat., 38° 54' 12" N.; long., 77° 03' 03" W. Elevation, 21 meters.									
Instrument: Marvin (vertical pendulum), undamped. Mechanical registration.									
					V	T ₀			
Instrumental constants:					110	6			
1916.			H. m. s.	Sec.	μ	μ	Km.		
Feb. 1	I.....		P.....	7 55 16				4,525?	
			S ₇	8 01 32					
			L.....	8 05 30					
1	I.....		P ₇	8 15 34				8,715?	
			S ₇	8 25 30					
			L.....	8 33 00					
			L _w	8 44 30	18				
3	I.....		P.....	5 17 49				420	
			S.....	5 18 35					
			L ₇	5 19 17					
			F.....	5 30 00				F in microseisms.	
6			P.....	11 04 36				Slight tremor.	

TABLE 2.—Instrumental reports, February, 1916—Continued.

Date.	Char-acter.	Phase.	Time.	Per-iod, T.	Amplitude.		Dis-tance.	Remarks.	Date.	Char-acter.	Phase.	Time.	Per-iod, T.	Amplitude.		Dis-tance.	Remarks.
					A _E	A _N								A _E	A _N		

District of Columbia. Washington—Continued.

1916.			H. m. s.	Sec.	μ	μ	Km.	
Feb. 6	J _u	P	22 02 32				7,765	
		S	22 11 40					
		L	22 20 00					
7		L	22 23 30					
		L	22 26 00	20				Long waves continued for a long time.
		F	0 15 00					
8	I _u	P	15 43 25				5,735	
		S	15 50 47					
		F	16 15 00					
15	H _u	P	11 44 30				5,230	
		S	11 51 25					
		L	11 57 30					
		M	12 01 00	99	99			
		F	12 45 00					
20	I _u	P	17 37 59				6,750	Record on E-W very slight.
		S	18 06 15					
		L	18 13 10					
		L	18 17 35	16				
		F	19 15 00					
21	H _u	P	23 40 33				740	
		S	23 41 54					
		M	23 42 10		45	54		
		L	23 42 43					
		F	23 50 —					F in microseisms.
27	H _r	HP	20 27 14				5,330	
		S	20 32 20					
		L	20 35 30	26				L uncertain.
		M	20 36 30		191			
		M	20 39 30			200		
		F	22 — —					F in microseisms.

District of Columbia. Washington—Continued.

1916.			H. m. s.	Sec.	μ	μ	Km.			
Feb. 20		eP _E	17 57 52					Microseisms present.		
		eP _N	17 57 55							
		S _E	18 06 17							
		S _N	18 06 22							
		eL _E	18 15 28							
		eL _N	18 15 58							
		F	19 30 00					No distinct maximum.		
		21		eP _E	23 40 47					Microseisms present.
				eP _N	23 40 50					Mainka instrument gives P earlier and S later.
				S	23 41 50					
eL	23 41 56			10						
M	23 42 02			10	22	19		F lost in microseisms.		
27		VERTICAL.								
		e	25 40 43						Microseisms heavy.	
		S	25 41 56							
		eL	25 42 03	6						
		M	25 42 08	6	20					
		F	25 58 00							
		P _E	20 26 55							
		P _N	20 27 15							
		S _E	20 32 19							
		S _N	20 32 27							
27		eL	20 33 52	12						
		M _E	20 38 22	15	26					
		M _N	20 39 00	15		41				
		F	22 — —					F lost in wind markings.		
		VERTICAL.								
		P	20 27 03						Heavy wind markings.	
		S	20 32 30							
		L	20 34 12	9						
		M	20 39 29	17	38					
		F	22 — —						F lost in wind marks.	

District of Columbia. Washington. Georgetown University.

F. L. Tondorf, S. J.

Lat., 38° 54' 25" N.; long., 77° 04' 24" W. Elevation, 42.4 meters. Subsoil: Decayed diorite.

Instruments: Wiechert 200 kg. astatic horizontal pendulums, 80 kg. vertical.

Instrumental constants:	V	T ₀	ε
	E	165	5.4 2.6
	N	143	5.2 3.4
Z	80	5.0 0	

1916.			H. m. s.	Sec.	μ	μ	Km.	
Feb. 3		e	4 17 23					
		P _E	4 18 31					Light microseisms at time of quake, becoming heavier later.
		P _N	4 18 32					
1		L _E	4 20 54					No maximum.
		L _N	4 20 56					
		F	4 29 00					
3		S _E	5 08 15					
		S _N	5 08 30					
		F	5 09 29					F lost in microseisms.
6		eP _E	22 02 36					
		eP _N	22 02 54					
		S _E	22 11 36					
		S _N	22 11 53					
		eL _E	22 25 14				5	
		M _E	22 35 20	25				
7		M _N	22 36 47	30				
		F	0 40 00					
		VERTICAL.						
6		e	22 17 48					
		L	22 32 02					
		F	25 00 00					
8		eP _E	15 43 14					
		eP _N	15 43 22					
		S _E	15 48 52					
		S _N	15 49 14					
11		F	16 31 00					
		Microseisms present.						
15		e	14 50 20					
		F	15 50 00					
15		eP _E	11 43 30					
		eP _N	11 43 35					
		S _E	11 51 19					
		S _N	11 51 20					
		L _E	12 00 10	8				
		L _N	12 00 19	8				
		M _E	12 01 04	10	16			
		M _N	12 01 08	10		12		
		F	12 12 00					

Hawaii. Honolulu. Magnetic Observatory. U. S. Coast and Geodetic Survey. Wm. W. Merryman.

Lat., 21° 19' 12" N.; long., 158° 03' 48" W. Elevation, 15.2 meters.

Instruments: Milne seismograph of the Seismological Committee of the British Association.

Instrumental constant, 18.9

1916.			H. m. s.	Sec.	μ	μ	Km.	
Feb. 1		P	7 46 48					
		S	7 55 00					
		L	8 04 30	22				
		M	8 13 24					
		C	8 43 38					
1		L	9 40 24	26				
		M	9 46 24				*350	
		C	9 53 24					
2		F	11 07 54					
		eP	14 58 18					
		L	15 01 06	20				
2		M	15 03 42					*150
		C	15 05 24					
		F	15 11 36					
2		L	17 57 36					
		M	18 01 12					*50
		C	18 05 00					
2		L	20 09 12					
		M	20 13 00					*50
		C	20 24 00					
3		P	21 44 06					
		S	21 50 30					
		L	21 56 06	22				
3		M	22 00 24					*250
		C	22 10 36					
		F	22 29 24					
3		e	10 32 48	22				
		M	10 37 24					*150
		C	10 43 42					
3		F	11 03 12					
		e	19 37 00	20				
		M	19 43 18					*100
6		L	19 50 24					
		F	19 58 00					
		e	11 07 24	20				
6		M	11 12 48					*200
		C	11 23 12					
		F	11 49 48					

* Trace amplitude.

TABLE 2.—Instrumental reports, February, 1916—Continued.

Date.	Char-acter.	Phase.	Time.	Pe-riod. T.	Amplitude.		Dis-tance.	Remarks.
					A _N	A _E		
Hawaii. Honolulu—Continued.								
1916.			H. m. s.	Sec.	μ	μ	Km.	
Feb. 6	P		21 59 06					
	S		22 03 36					
	L		22 07 12	21				
	M		22 12 36		*4,950			
	C		22 21 00					
	F		1 42 00					
7								
8	P		15 59 36					
	L		16 17 12	22				
	M		16 00 00		*100			
	C		16 19 36		*50			
	F		16 25 24					
	F		16 39 18					
9	e		20 24 36	22				
	M		20 38 54		*100			
	C		20 41 42					
	F		20 48 06					
9	P		23 46 54					
	L		23 50 18	22				
	M		23 53 00		*150			
	C		23 56 48					
	F		0 09 42					
10	eP		11 18 42					
	eL		11 24 48	20				
	M		11 26 48		*150			
	C		11 30 54		*150			
	F		11 37 12					
	F		11 59 12					
11	P		8 54 00					
	eL		9 15 36	22				
	M		9 19 54		*150			
	C		9 25 06					
	F		9 29 06					
14	P		10 23 12					
	S		10 30 12					
	L		10 36 06	24				
	M		10 40 06		*500			
	C		11 02 06					
	F		11 32 54					
15	eP		11 49 18					
	S		11 51 54					
	M		11 52 48		*500			
	L		11 55 12					
	M		11 56 48		*300			
	C		12 02 42					
	F		13 26 12					
20	e		17 54 12					
	L		18 01 42	20				
	M		18 02 18		*950			
	C		18 08 06		*700			
	F		18 52 12					
	F		21 07 06					
22	L		20 20 48					
	M		20 22 00					
	C		20 35 00					
27	P		20 32 36					
	S		20 41 12					
	L		20 53 12	22				
	M		20 56 42		3,150			
	C		21 24 30					
	F		0 25 30					

*Trace amplitude.

Kansas. Lawrence. University of Kansas. Department of Physics and Astronomy. F. E. Kester.

Lat., 38° 57' 30" N.; long., 95° 14' 58" W. Elevation, 301.1 meters.

Instrument: Wiechert.

Instrumental constants. $\begin{matrix} V & T_0 & e \\ E & 177 & 3.4 & 4.0 \\ N & 205 & 3.4 & 3.3 \end{matrix}$

1916.	Char-acter.	Phase.	Time.	Pe-riod. T.	Amplitude.	Dis-tance.	Remarks.
Feb. 6	P		22 01 35				
	S		22 06 28				
	L		22 09 24				
	M		22 17 39				
	C		22 19 33				
	F		22 26 11	20	4		
	F		22 39 51	20		3	
	F		0 06 00				

Date.	Char-acter.	Phase.	Time.	Pe-riod. T.	Amplitude.		Dis-tance.	Remarks.
					A _N	A _E		
Kansas. Lawrence—Continued.								
1916.			H. m. s.	Sec.	μ	μ	Km.	
Feb. 15	P		11 43 17	2				
	S		11 49 09	3-6				
	L		11 49 12	3-6				
	M		11 56 25	4-5				
	C		11 56 30	4-5				
	M		11 57 05	5	22			
	M		11 57 18	5		5		
	L		(11 58 00)	15-20				
	F		(11 59 00)					
	F		12 36 00					
21	P		23 41 12	2				
	P		23 41 42	2				
	L		23 43 48					
	M		23 44 03		7			
	M		23 44 09			7		
	F		0 06 00					
22								
27	P		20 27 14	2-4				
	M		20 28 30	3-5				
	S		20 32 35	3-12	6	16		
	L		20 34 37	35-40				
	L		20 36 18	35-40				
	M		20 38 50	25-40		15		
	M		20 39 42	25-40				
	F		22 08 00					

L_N not discernible.

Maryland. Cheltenham. Magnetic Observatory. U. S. Coast and Geodetic Survey. George Hartnell.

Lat., 38° 44' 00" N.; long., 76° 50' 30" W. Elevation, 71.6 meters.

Instruments: Two Bosch-Omori, 10 and 12 kg.

Instrumental constants. $\begin{matrix} V & T_0 \\ E & 10 & 31 \\ N & 10 & 29 \end{matrix}$

1916.	Char-acter.	Phase.	Time.	Pe-riod. T.	Amplitude.	Dis-tance.	Remarks.
Feb. 6	eP		22 01 34				
	eS		22 11 47				
	L		22 25 30	17		140	
	M		22 34 49	17	150	140	
	M		22 36 48	18			
	C		22 46 00	18			
	F		23 45 00				
15	P		11 44 35	2			
	S		11 51 29	2			
	L		12 00 48	15			
	M		12 03 40	14	50	50	
	C		12 07 00	13			
	F		12 29 00				
20	eL		18 17 34	18			
	eL		18 17 45	16			
	M		18 24 40	18	30		
	M		18 32 24	16		30	
	F		19 10 00				
21	e		23 42 06	3			
	e		23 41 51	3			
	M		23 42 16	3		40	
	M		23 42 40	3	30		
	C		23 43 00				
	F		23 48 00				
27	P		20 27 12	3			
	P		20 27 21	4			
	S		20 32 30	10			
	L		20 36 32	19			
	L		20 38 45	18	135	220	
	M		20 39 20	20			
	C		20 41 00	16			
	F		22 01 00				

Beginning and end uncertain.

Massachusetts. Cambridge. Harvard University Seismographic Station. J. B. Woodworth.

Lat., 42° 22' 36" N.; long., 71° 06' 59" W. Elevation, 5.4 meters. Foundation: Glacial sand over clay.

Instruments: Two Bosch-Omori 100 kg. horizontal pendulums (mechanical registration)

Instrumental constants. $\begin{matrix} V & T_0 & e \\ E & 80 & 23 & 0 \\ N & 50 & 25 & 4.1 \end{matrix}$

1916.	Char-acter.	Phase.	Time.	Pe-riod. T.	Amplitude.	Dis-tance.	Remarks.
Feb. 1	O		7 45 00			15,200'	Not registered on N-S.
	eP		7 41 24	2			
	S		7 55 11	8			
	eL		8 24 56	40			
	L		8 43 22	20			
	L		8 40 24	15			
	F		9 02 00				

TABLE 2.—Instrumental reports, February, 1916—Continued.

Date.	Char-acter.	Phase.	Time.	Per-iod. T.	Amplitude.		Dis-tance.	Remarks.
					A _E	A _N		
Massachusetts. Cambridge—Continued.								
1916.			<i>H. m. s.</i>	<i>Sec.</i>	μ	μ	<i>Km.</i>	
Feb. 3			5 07 42				3,500	
			5 19 37	6				
			5 21 07	6				
			5 22 13	6				
			5 22 39	8				
			5 32 00					
6			21 49 51				9,070	
			22 02 37					
			22 03 05	2				
			22 13 26	4				
			22 28 35					
			22 35 05					
			22 35 37	24				
			22 38 20	20	75			
			22 44 42					
			0 48 30					
15			11 35 25				6,490	eP _N confused with microseisms.
			11 43 24					
			11 50 35					
			11 51 28					
			11 55 24					
			11 55 32	7				
			11 58 29	11-12				
			12 00 01	18				
			12 00 31	18				
			12 00 52					
			12 01 38					N-S pendulum shifted to the north.
			12 50 00					
20			17 48 05				6,520	
			17 58 06					
			17 58 15					
			18 06 10					
			18 13 16	15				
			18 16 12	10				
			18 21 27	22				
			18 26 07					
			18 28 00					
			19 40 00					
21			23 59 00				1,300	Earthquake reported in Georgia, Tennessee, etc. Record obscured by microseisms.
			23 42 00					
			23 44 26					
			23 44 33					
			23 44 48	4				
			23 44 56					
			23 45 03	8				
			23 50 00					
22			21 02 01	16-20				N-S out of service after 10 ^h 20 ^m , Feb. 24 because of spring of registering apparatus breaking.
			21 13 48	15				
			21 45 00					
27			20 20 45				3,950	
			20 28 20	4				
			20 29 20					
			20 33 44	9				
			20 34 50					
			20 35 00	20				
			20 37 22	35				
			20 39 58	24				Stylus went off drum.
			21 55 00	20				
			22 45 20	18				
			23 30 00					

O—time at origin.

Missouri. Saint Louis. St. Louis University. Geophysical Observatory. J. B. Goesse, S. J.

Lat., 38° 38' 13" N.; long., 90° 13' 58" W. Elevation, 160.4 meters. Foundation: 12 feet of loess clay over limestone of Mississippi system, about 300 feet thick.

Instrument: Wiechart 80 kg. astatic, horizontal pendulum.

Instrumental constants. $V T_0$ 5:1
80 7 5:1

Date.	Char-acter.	Phase.	Time.	Per-iod. T.	Amplitude.	Dis-tance.	Remarks.
					A _E	A _N	
1916.			<i>H. m. s.</i>	<i>Sec.</i>	μ	μ	<i>Km.</i>
Feb. 3	II _r	eP _N	5 10 12				1,700
		S _N	5 12 48				
		L _N	5 13 18				
		M _N	5 13 30	10		12	
		F _N	5 19 00				
6	II _r	eP _N	22 02 00				6,800
		S _N	22 10 18				
		L _N	22 27 00				
		F _N	23 28 00				

E-W record slight.

Date.	Char-acter.	Phase.	Time.	Per-iod. T.	Amplitude.		Dis-tance.	Remarks.
					A _E	A _N		
Missouri. Saint Louis—Continued.								
1916.			<i>H. m. s.</i>	<i>Sec.</i>	μ	μ	<i>Km.</i>	
Feb. 15	II _r	eP _N	11 53 00				3,500	
		eP _N	11 53 30					
		S _N	11 58 00					
		L _N	11 58 12					
		M _N	11 58 30	12	16			
		F _N	11 59 30	12		16		
		F _N	12 21 00					
20	II _r	eP _N	17 35 30				6,500	
		eP _N	17 58 00					
		S _N	18 04 00					
		L _N	18 13 00					
		M _N	18 19 24	20		12		
		M _N	18 29 42	17	9			
		F _N	19 54 00					
21	II _r	eP _N	23 40 18				686	
		S _N	23 41 46					
		L _N	23 41 54					
		M _N	23 42 00	4		12		
		M _N	23 42 38	6	19			
		F _N	23 53 00					
27	III _r	eP _N	20 24 15				3,200	
		eP _N	20 24 19					
		S _N	20 29 11					
		S _N	20 29 12					
		L _N	20 30 24					
		M _N	20 31 07	4		53		
		M _N	20 32 04	7	44			
		F _N	21 39 00					

Waves varying between 7 and 5 mm. amplitudes, and 35° to 21° period occur from 20^h 45^m 35^s to 20^h 46^m 03^s.

New York. Buffalo. Canisius College. John A. Curtin, S. J.

Lat., 42° 53' 02" N.; long., 78° 52' 40" W. Elevation, 190.5 meters.

Instrument: Wiechart 80 kg. horizontal.

Instrumental constants. $V T_0$ 5:1
80 7 5:1

Date.	Char-acter.	Phase.	Time.	Per-iod. T.	Amplitude.		Dis-tance.	Remarks.
					A _E	A _N		
1916.			<i>H. m. s.</i>	<i>Sec.</i>	μ	μ	<i>Km.</i>	
Feb. 6	II _r	eP _N	22 15 30					Earthquake reported from Schenectady, N. Y., not recorded here. Records show only pronounced microseisms.
		eP _N	22 15 30					
		S _N	22 20 30					
		L _N	22 29 00					
		M _N	22 32 00	20		8		
		M _N	22 32 00	34	6			
		C _N	22 43 00					
		C _N	22 51 00					
		F _N	23 03 00					
		F _N	23 34 00					
11	I _r	I _r	14 50 30					Single shock.
		F _N	14 50 40					
15	II _r	eP _N	11 52 15					
		eP _N	11 52 30					
		S _N	11 56 00					
		S _N	12 00 00					
		M _N	12 01 10	10	14			
		M _N	12 01 30	6		6		
		C _N	12 03 20					
		C _N	12 04 00					
		F _N	12 08 00					
		F _N	12 15 00					
20	III _r	eP _N	18 01 30					
		eP _N	18 03 30					
		S _N	18 07 45					
		S _N	18 09 30					
		S _N	18 09 45					
		L _N	18 13 00					
		M _N	18 20 00	20	3	2		Maximum weak on both components.
		M _N	18 25 00	20		2		
		M _N	18 27 00	20	4			
		C _N	18 30 00					
		C _N	18 37 00					
		F _N	19 09 00					
		F _N	19 21 00					
21		eP _N	23 40 20					
		S _N	23 42 20					
		M _N	23 45 10	10		11		
		M _N	23 45 30	10				
		F _N	23 50 00					
		F _N	23 51 00					
26								Microseisms on both components.

TABLE 2—Instrumental reports, February, 1916—Continued.

Date.	Char-acter.	Phase.	Time.	Pe-riod. T.	Amplitude.		Dis-tance.	Remarks.
					A _m	A _w		
New York. Buffalo—Continued.								
1916.			<i>H. m. s.</i>	<i>Sec.</i>	<i>μ</i>	<i>μ</i>	<i>Km.</i>	
Feb. 27	III.	IP _m	20 26 00					Reported in San Jose, Costa Rica, and Rivas, Nicaragua.
		eP _m	20 26 15					
		SP _m	20 31 20					
		SL _m	20 31 35					
		LS _m	20 34 00					
		LM _m	20 34 45					
		MS _m	20 35 20	20	28			
		MS _m	20 36 00	20		66		
		CS _m	20 43 00					
		CS _m	20 44 00					
		FS _m	21 27 00					
		FS _m	21 50 00					

New York. Fordham. Fordham University. W. C. Repetti, S. J.

Lat., 40° 51' 47" N.; long., 73° 53' 08" W. Elevation, 23.9 meters.

Instrument: Wiechert, 80 kg.

Instrumental constants. $\begin{matrix} V & T_0 \\ E & 72 & 7.2 & 1.5:1 \\ N & 72 & 7.2 & 3.8:1 \end{matrix}$

(Report for February, 1916, not received.)

Panama Canal Zone. Balboa Heights. Isthmian Canal Commission.

Lat., 8° 57' 39" N.; long., 79° 33' 29" W. Elevation, 27.6 meters.

Instruments: Two Bosch-Omori 100 kg.

Instrumental constants. $\begin{matrix} V & T_0 \\ E & 10 & 20 \end{matrix}$

Date.	Char-acter.	Phase.	Time.	Pe-riod. T.	Amplitude.		Dis-tance.	Remarks.
					A _m	A _w		
1916.			<i>H. m. s.</i>	<i>Sec.</i>	<i>μ</i>	<i>μ</i>	<i>Km.</i>	
Feb. 3		P _m	9 04 13					Distance and direction unknown.
		Pa _m	9 04 20					
8		P _m	15 55 39				210	Direction SW?
		Pa _m	15 55 46					
		LS _m	15 56 03			5,300		
		MS _m	15 56 08					
		LS _m	15 56 09					
		MS _m	15 56 14		5,150			
		FS _m	16 09 05					
		FS _m	16 09 42					
8		P	16 10 46				210	No record on E-W, adjusting instrument.
		L	16 11 01					Direction SW?
		M	16 11 25			10		
8		Pa _m	17 57 33				210	Direction SW?
		Pa _m	17 57 45					
		LS _m	17 57 56					
		MS _m	17 57 59		300			
		LS _m	17 58 11					
		MS _m	17 58 28			100		
		FS _m	18 04 50					
		FS _m	18 05 42					
8		P	18 13 00					Distance and direction unknown.
9		Pa _m	2 45 04				210	Direction unknown.
		Pa _m	2 45 12					
		LS _m	2 45 39					
		LS _m	2 45 40					
		MS _m	2 45 42		100			
		MS _m	2 45 44			100		
		FS _m	2 49 07					
		FS _m	2 49 16					
27		P _m	20 23 15				865	Direction NE?
		Pa _m	20 23 16					Pens thrown off sheet: amplitudes greater than those given.
		LS _m	20 24 53			2,200		
		LS _m	20 25 04		2,900			
		FS _m	21 06 00					
		FS _m	21 30 00					

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Date.	Char-acter.	Phase.	Time.	Pe-riod. T.	Amplitude.		Dis-tance.	Remarks.
					A _m	A _w		
Porto Rico. Vieques. Magnetic Observatory. U. S. Coast and Geodetic Survey. H. M. Pease.								
Lat., 18° 09' N.; long., 65° 27' W. Elevation, 19.8 meters.								
Instruments: Two Bosch-Omori.								
Instrumental constants. $\begin{matrix} V & T_0 \\ E & 10 & 21.4 \\ N & 10 & 21.1 \end{matrix}$								
(Report for February, 1916, not received)								

Vermont. Northfield. U. S. Weather Bureau. Wm. A. Shaw.

Lat., 44° 10' N.; long., 72° 41' W. Elevation, 256 meters.

Instruments: Two Bosch-Omori, mechanical registration.

Instrumental constants. $\begin{matrix} V & T_0 \\ E & 10 & 15 \\ N & 10 & 16 \end{matrix}$

Date.	Char-acter.	Phase.	Time.	Pe-riod. T.	Amplitude.		Dis-tance.	Remarks.
					A _m	A _w		
1916.			<i>H. m. s.</i>	<i>Sec.</i>	<i>μ</i>	<i>μ</i>	<i>Km.</i>	
Feb. 1		P	7 54 30					Phases indistinct. Small waves continue until 3 ^h 15 ^m .
1		L	8 38 00					Slight disturbance, mostly long waves. Phases indistinct.
		F	9 10 00					
3								Faint irregularities from 4 ^h 24 ^m to 4 ^h 28 ^m ; probably New York quake.
3		P?	5 17 10				980?	
		ST	5 18 56					
		L	5 20 20					
		F	5 30 00					
6		L	22 18 50	24				Beginning and earlier portion of record lost during attention to instrument.
		L	22 25 00	28				
		F	24 00 00					
15		P?	11 43 52				5,700?	
		ST	11 51 12					
		L	11 57 00					
		F	12 30 00					
20		P?	17 58 06				5,665?	
		ST	18 05 24					
		L	18 16 30					
		F	19 30 00					
21								Slight disturbances from 6 ^h 42 ^m to 6 ^h 42 ^m 15 ^s . Probably due to earthquake reported from Georgia, South Carolina, etc.
27		P	20 27 51				3,925	
		S	20 33 34					
		L	20 38 40	23				
		M	20 43 30		250	200		
		F	22 30 00					

Canada. Ottawa. Dominion Astronomical Observatory. Earthquake Station. Otto Klotz.

Lat., 45° 23' 38" N.; long., 75° 42' 57" W. Elevation, 83 meters.

Instruments: Two Bosch photographic horizontal pendulums, one Spindler & Hoyer 80 kg. vertical seismograph.

Instrumental constants. $\begin{matrix} V & T_0 \\ E & 120 & 26 \end{matrix}$

Date.	Char-acter.	Phase.	Time.	Pe-riod. T.	Amplitude.		Dis-tance.	Remarks.
					A _m	A _w		
1916.			<i>H. m. s.</i>	<i>Sec.</i>	<i>μ</i>	<i>μ</i>	<i>Km.</i>	
Feb. 1		P	7 49 36				11,000	
		Pa	8 01 11	7				
		eL _m	8 01 17					
		LS _m	8 23 54		40			
		LS _m	8 28 00		18			
		LS _m	8 35 00		18			
		L	8 40 00					
		F	9 19 00					
		F	9 40 00					

TABLE 2.—Instrumental reports, February, 1916—Continued.

Date.	Char-acter.	Phase.	Time.	Pe-riod. T.	Amplitude.		Dis-tance.	Remarks.
					A _m	A _s		
Canada. Victoria, B. C. Dominion Meteorological Service.								
Lat., 48° 24' N.; long., 123° 19' W. Elevation, 67.7 meters. Subsoil: Rock.								
Instrument: Wiechert, vertical; Milne horizontal pendulum, North. In the meridian.								
T ₁ Instrumental constant. . 18. Pillar deviation, 1 mm., swing of boom=0.54"								
1916.			H. m. s.	Sec.	μ	μ	Km.	
Feb. 1	P		7 54 13				1,730	
	S		7 57 11					
	L		7 58 41					
	M		7 59 11		*300			
	F		8 07 36					
1	S†		8 16 02					
	L		8 24 58					
	M		8 28 25		*900			
	F		9 38 51					
3	P or S.		5 05 40				270	
	L		5 06 10					
	M		5 06 40		*400			
	F		5 10 40					
6	L		11 09 16					Thickening.
	M		11 10 37		*200			
	F		11 17 34					
6	P		21 58 13					
	S		22 01 12					
	HS		22 03 40					
	S†		22 05 48					
	L		22 09 12					
	M		22 19 32		*2,500			
	F		0 00 40					
7								
8	L		15 54 42		*100			
	F		15 56 00					
10	L		11 44 48					P and S not visible.
	M		11 52 43		*400			
	F		12 03 38					
No reports received after the 12th.								

* Trace amplitude.

SEISMOLOGICAL DISPATCHES.

Schenectady, N. Y., Feb. 2, 1916.

A distinct earthquake shock was felt here at 11:25 o'clock to-night. Reports from all sections of the county showed houses were shaken, windows and dishes smashed, and persons thrown out of bed. Two distinct shocks were felt. The shocks were of such force as to shake the mammoth plant of the General Electric Co., where it was feared an explosion had occurred. Saratoga Springs, Amsterdam, and all points within a radius of 25 miles of this city also felt the shock. (Assoc. Press.)

Panama, Feb. 3, 1916.

Three sharp earth shocks occurred between 11 and 11:14 a. m. to-day. The whole city and the Canal Zone were shaken. The recording instru-

¹ Reported by the organization indicated and collected by the seismological station at Georgetown University, Washington, D. C.

ments showed that the earthquake had its center in the vicinity of Los Santos Province, where most of the earthquakes originate. (Assoc. Press.)

Fort De France, Martinique, Feb. 12, 1916.

A large earthquake occurred at 11:13 o'clock last night. No damage. (Assoc. Press.)

Stuttgart, Feb. 15, 1916.

A severe earthquake occurred in the Swabian Alps region last Sunday, February 13. Five villages were severely damaged, but no loss of lives has been reported. (Inter. News Service.)

Redding, Cal., Feb. 21, 1916.

Lassen Peak is showing renewed activity, according to reports received from residents of Hat Creek Valley. The crater, they say, is constantly emitting smoke and steam, although in small amounts. The volcano could be seen from here to-day to be in mild eruption. (Assoc. Press.)

Atlanta, Ga., Feb. 21, 1916.

An earth tremor of slight but distinct nature that made itself felt throughout Georgia, North and South Carolina, Virginia, and portions of eastern Tennessee and Alabama was reported early to-night as having been felt at about 5:45 p. m., central time. (Assoc. Press.)

[Many similar reports received from other points in the affected district.]

San Juan del Sur, Nicaragua, Feb. 27, 1916.

An earthquake shock which was felt at 2:33 o'clock this afternoon is reported to have been very severe in San Jose, Costa Rica, and in the Department of Rivas, Nicaragua. The principal church in the town of Rivas was damaged. No deaths have been reported. (Assoc. Press.)

Quebec, Feb. 29, 1916.

Three successive shocks resembling an earthquake were distinctly felt all over the Quebec district at about 12:15 a. m. to-day. The local observatory reported no seismograph record of the disturbance and was mystified. (Assoc. Press.)

TABLE 3.—Late seismological reports. (Instrumental.)

Porto Rico. Vieques. Magnetic Observatory. U. S. Coast and Geodetic Survey. H. M. Pease.

Lat., 18° 09' N.; long., 65° 27' W. Elevation, 19.8 meters.

Instruments: Two Bosch-Omoti.

Date.	Char-acter.	Phase.	Time.	Pe-riod. T.	Amplitude.		Dis-tance.	Remarks.
					A _m	A _s		
Instrumental constants. $\begin{matrix} \sqrt{E} & \sqrt{I} \\ E & 10 & 21.4 \\ N & 10 & 21.1 \end{matrix}$								
1916.			H. m. s.	Sec.	μ	μ	Km.	
Jan. 1	Sw		14 27 36	34				
	Sw		14 28 02	32				
	Mw		14 37 58	20		150		
	Mw		14 40 22	20	75			
	Cw		14 48 00	9				
	Cw		14 51 00	8				
	Fw		15 15 00					
	Fw		15 19 00					
7	L		15 04 38					Felt in Vieques.
	M		15 04 40		80	100		
	C		15 05 02					
13	Sw		9 04 00	44				
	Sw		9 25 00	40				
	Mw		9 40 00	20		80		
	Mw		9 55 00	20	20			
	Cw		10 24 00	20				
	Cw		10 30 00					

SECTION V.—SEISMOLOGY.

THE SOUTHERN APPALACHIAN EARTHQUAKE OF FEBRUARY 21, 1916.

By W. J. HUMPHREYS, Professor in charge of Seismological Investigations.

[Dated: Weather Bureau, Washington, D. C., Apr. 26, 1916.]

On February 21, 1916, about 6:40 p. m., 75th M. time, an earthquake occurred in the Appalachian Mountains of western North Carolina that was distinctly felt not only in various parts of that State but also in South Carolina, Georgia, Alabama, Tennessee, Kentucky, Virginia, and, presumably, in West Virginia. The various places from which reports of this quake were received and the corresponding intensities, as estimated by the observers, are given on the accompanying chart. Most of these reports were published in detail in the REVIEW for February, 1916.

The last earthquake of note that occurred in this general region was on January 1, 1913,¹ with the epicenter near Union, S. C. While this earthquake had a higher intensity than the one under discussion, yet the area affected was only approximately one-fifth as great. On October 29, 1915, an earthquake with an intensity of iv, Rossi-Forel, was felt in Buncombe County, N. C., the same county in which the one of February 21 was the most severe, but reported only from Asheville and its immediate vicinity. Earthquakes are not uncommon in the southern Appalachians; indeed, scarcely a year passes without one or more being felt somewhere in this region.

According to scattered reports the epicenter of the earthquake of February 21 was near Skyland, N. C., lat. 35° 30' N., long. 82° 30' W., where an intensity of vi, Rossi-Forel, was reported. The area over which this quake was felt, elliptical in shape, with the longer axis in a NE.-SW. direction, exceeded 200,000 square miles. The most distant point from the epicenter (assumed to be at Skyland, N. C.), to report feeling the shock is Norfolk, Va., 365 miles away. Instrumentally the quake was recorded at Harvard University, 1,250 miles away; Canisius College, Buffalo; University of Kansas, Lawrence; St. Louis University, St. Louis; Georgetown University, and the Weather Bureau, Washington, D. C.

The time of the disturbance, as given by a majority of the observers, whose reports show a surprisingly close agreement, was approximately 6:40 p. m., eastern time. Mr. M. L. Church, of Marshall, N. C., about 25 miles from the epicenter, gives the time of ending as 6^h 39^m 45^s, and

from his estimated duration places the beginning at 6^h 39^m 15-30^s. These values are quite reliable, as the error of Mr. Church's watch was obtained by telegraph within five minutes after the disturbance. The times of beginning at the epicenter, as determined respectively from the seismograph records of Harvard University, Georgetown University, and the Weather Bureau by means of the P-O and S-O tables of Dr. Klotz, were substantially the same and averaged 6^h 39^m 17^s.

Of course, consistent reports as to intensity could not be expected, owing to occupation of observer, nature and intensity of artificial disturbances, errors of estimation, and many other factors. Hence the isoseismals on the accompanying chart are only relative and drawn to the average values of intensity.

Sounds were quite uniformly reported within the territory bounded by the iv isoseismal. Within a radius of 200 miles from the epicenter, approximately that of the iii isoseismal, rattling of dishes and windows was noted. Several stated that it was the most severe quake they had experienced since the Charleston earthquake of August 31, 1886. Crockery and other utensils fell from shelves in several cities. Near Sevierville, Tenn., a team of horses became frightened and ran away, tearing up a buggy, while in the town bricks were shaken from chimneys. Near the same place, in Wears Valley, several springs increased in volume, some running muddy—a common earthquake phenomenon. A few observers reported the cracking of plaster. People became alarmed at several places within the territory bounded by the v isoseismal and rushed from their homes, but no damage of consequence occurred anywhere.

The data used in this note were assembled by Mr. R. H. Finch, who deserves much credit for his careful attention to the details of the seismological reports.

AN EARTHQUAKE OBSERVED WITH A TELESCOPE.

Mr. Wendell P. Hoge, of the Mount Wilson Solar Observatory, observed the earthquake of March 22 (see below, Table 1, California), in an interesting and unusual way. The following is from a card report rendered by Mr. Hoge:

This disturbance noticed while watching star image in 60-inch telescope, using high-power eyepiece. Oscillations of star image in the field rapid and short at first, becoming more marked in the middle and diminishing at the end of the disturbance. Evidently a very faint shock. Mr. G. A. Monk, using the instrument a little later at 4:50 and at 4:56 a. m., noticed two very feeble oscillations.

¹ *Taber, Stephen, in Bull. Seis. Soc. Amer., March, 1913, 3, No. 2, pp. 6-13.*

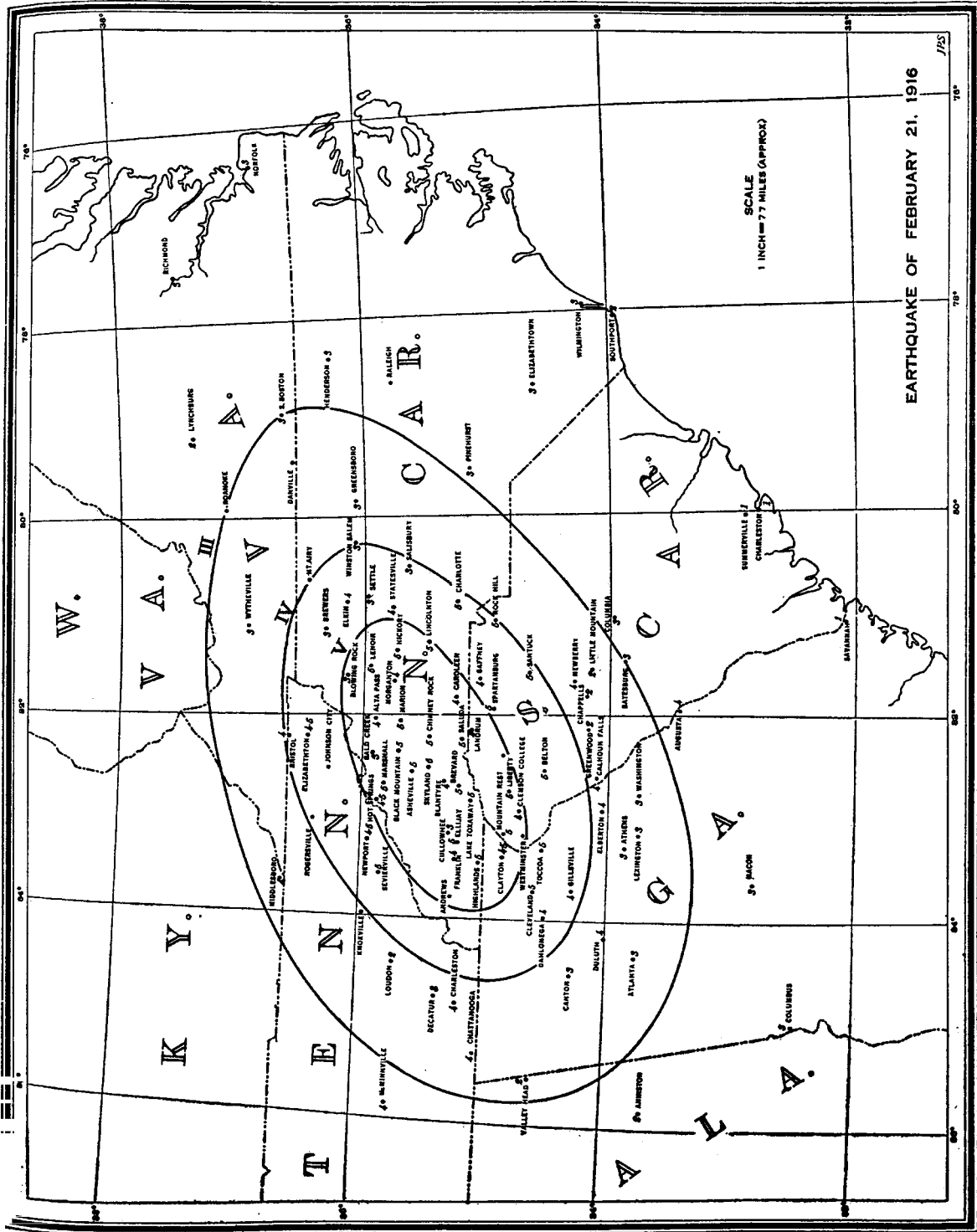


Figure 1.

SEISMOLOGICAL REPORTS FOR MARCH, 1916.

By W. J. HUMPHREYS, Professor in charge of Seismological Investigations.

[Dated: Weather Bureau, Washington, D. C., May 1, 1916.]

TABLE 1.—Noninstrumental earthquake reports, March, 1916.

Day.	Approximate time, Greenwich Civil.	Station.	Approximate latitude.	Approximate longitude.	Intensity Rossi-Forel.	Number of shocks.	Duration.	Sounds.	Remarks.	Observer.
1916. Mar. 30	H. m. 5 47	ARIZONA. Nogales.....	31 20	110 52	3	1	5	Rumbling.....		S. F. Noon.
		CALIFORNIA. Los Alamos.....	34 45	120 15		1				J. W. Robbins.
1	19 15	Imperial.....	32 50	115 35	4	1	2			D. C. Gale.
12	3 15	Mount Wilson.....	34 13	118 16	1		10		2 feebler shocks later.....	W. P. Hoge.
		NEVADA. Reno.....	39 32	119 49	1	1	2		Doors swung slightly.....	J. C. Jones.
		WASHINGTON. Cedar Falls.....	47 24	120 49	2	1	2			D. A. Brown.

TABLE 2.—Instrumental seismological reports, March, 1916.

Time used: Mean Greenwich, midnight to midnight. Nomenclature: International.

[For significance of symbols see this REVIEW, January, 1916, p. 39.]

Date.	Character.	Phase.	Time.	Period T.	Amplitude.		Distance.	Remarks.	Date.	Character.	Phase.	Time.	Period T.	Amplitude.		Distance.	Remarks.
					A _N	A _E								A _N	A _E		

Alaska. *Sitka. Magnetic Observatory.* U. S. Coast and Geodetic Survey. J. W. Green.

Lat., 57° 03' 00" N.; long., 135° 30' 06" W. Elevation, 15.2 meters.
Instruments: Two Bosch-Omori, 10 and 12 kg.

Instrumental constants: $\frac{V}{N} \frac{T_0}{10}$
 $\frac{E}{N} \frac{10}{10} \frac{17.4}{15.6}$

1916. Mar. 16		H. m. s.	Sec.	μ	μ	Km.
	eL _N	22 46 44				
	eL _E	22 47 00				
	M _N	22 47 16	8	70		
	M _E	22 48 00	8		60	
	F.....	23 06 00				
31	e.....	11 13 44	18			
	M _N	11 14 20	18	40		
	M _E	11 17 26	11		20	
	F.....	11 34 ..				

Arizona. *Tucson. Magnetic Observatory.* U. S. Coast and Geodetic Survey. F. P. Ulrich.

Lat., 32° 14' 48" N.; long., 110° 59' 06" W. Elevation, 769.6 meters.
Instruments: Two Bosch-Omori, 10 and 12 kg.

Instrumental constants: $\frac{V}{N} \frac{T_0}{10}$
 $\frac{E}{N} \frac{10}{10} \frac{15.2}{19}$

1916. Mar. 12		H. m. s.	Sec.	μ	μ	Km.
	e _N	7 36 40	4			
	L _N	7 41 38				
	L _E	7 40 44				
	M _N	7 46 38	7	10		
	M _E	7 45 22	4		10	
	F _N	7 52 -				
	F _E	7 55 -				
25	eL _N	0 03 22	6			
	eL _E	0 04 14	5			
	M _N	0 04 40	9	10		
	M _E	0 04 49	10		10	
	F.....	0 07 -				
31	P _N	11 20 26	4			
	L _N	11 25 21	11			
	M _N	11 25 46	10	60		
	C _N	11 25 58	10			
	F _N	11 34 09	8			

Clock out of adjustment on N-S.

California. *Berkeley. University of California.*

Lat., 37° 52' 16" N.; long., 122° 15' 37" W. Elevation, 85.4 meters.

(See Bulletin of the Seismographic Stations, University of California.)

California. *Mount Hamilton. Lick Observatory.*

Lat., 37° 20' 24" N.; long., 121° 38' 34" W. Elevation, 1,281.7 meters.

(See Bulletin of the Seismographic Stations, University of California.)

California. *Point Loma. Raja Yoga Academy.* F. J. Dick.

Lat., 32° 43' 03" N.; long., 117° 15' 10" W. Elevation, 91.4 meters.

Instrument: Two-component, C. D. West seismoscope.

1916. Mar. 12	I ₂	H. m. s.	Sec.	μ	μ	Km.	Intensity II Rossi-Forel.
		3 12 30		* 200	* 200		

*Amplitude on instrument.

(No shocks recorded during January and February, 1916.)

California. *Santa Clara. University of Santa Clara.* J. S. Ricard, S. J.

Lat., 37° 28' 36" N.; long., 121° 57' 53" W. Elevation, 27.43 meters.

(See record of the Seismographic Station, University of Santa Clara.)

TABLE 2.—Instrumental seismological reports, March, 1916—Continued.

Date.	Character.	Phase.	Time.	Period. T.	Amplitude.		Dis- tance.	Remarks.
					A _m	A _n		

Colorado. *Denver. Sacred Heart College. Earthquake Station. A. W. Forstall, S. J.*

Lat., 39° 40' 36" N.; long., 104° 56' 54" W. Elevation, 1,655 meters.

Instrument: Wiechert 80 kg., astatic, horizontal pendulum.

Instrumental constants.....

1915.			H. m. s.	Sec.	μ	μ	Km.	
Mar. 9	e		16 00 00					Distinct activity. Thickening of pen marks on both components.
	F		19 15 00					
15	e		16 40 00					Very small but distinct wavelets on both components.
	F		16 47 00					
15	e		17 03 00					Small waves, somewhat larger than preceding.
	F		17 05 00					
19								Activity. Thickening of pen marks at intervals during day.
20	e		18 00 00					Activity. Thickening of pen marks on E-W.
	F		18 42 00					
26	e		16 00 00					Activity. Distinct, but very irregular waves.
	F		18 15 00					
30	e		9 00 00					Quake reported from Port de France, Martinique. Long irregular waves on E-W especially.
	F		11 15 00					

District of Columbia. *Washington. U. S. Weather Bureau.*

Lat., 38° 54' 12" N.; long., 77° 03' 03" W. Elevation, 21 meters.

Instrument: Marvin (vertical pendulum), undamped. Mechanical registration.

Instrumental constants... $V \frac{T_0}{T_1}$
110 6.4

1916.			H. m. s.	Sec.	μ	μ	Km.	
Mar. 1	L _m		19 54 50					Beginning and end lost in microseisms.
12	P		7 37 25				3,290	
	S		7 42 29					
	L _F		7 45 25					
	L		7 47 30					
	F		8 15 00					
16	L _m		23 02 55					P, S, and F lost in microseisms.
	F _T		23 30 00					
28	L		7 56 25					
	F		8 05 00					
	eP		19 00 38				2,625	
	S		19 04 53					
29	L		19 11 35	20				
	F		19 25 00					
	P _T		11 25 28				3,360 ⁷	
	S _T		11 30 38					
31	M		11 34 30		64	100		
	F		12 15 00					
	e		16 56 30					All phases indeterminate.
31	F		17 15 00					

Date.	Character.	Phase.	Time.	Period. T.	Amplitude.		Dis- tance.	Remarks.
					A _m	A _n		

District of Columbia. *Washington. Georgetown University.*

F. L. Tondorf, S. J.

Lat., 38° 54' 25" N.; long., 77° 04' 24" W. Elevation, 42.4 meters. Subsoil: decayed diorite.

Instruments: Wiechert 200 kg., astatic, horizontal pendulums; 80 kg., vertical.

Astatic pendulums after Mainka, 130 kg.

Instrumental constants: $\begin{matrix} V & T_0 & T_1 & e \\ E & 165 & 5.4 & 2.6 \\ N & 143 & 5.2 & 3.4 \\ Z & 80 & 5.0 & 0 \end{matrix}$

1916.			H. m. s.	Sec.	μ	μ	Km.	
Mar. 12	eP _m		7 37 01					Wind markings. Measurements made from record of Mainka instrument. Wiechert does not show P. No distinct M.
	eL _m		7 37 25					
	S _m		7 42 49					
	S _n		7 42 58					
16	eL _m		7 46 12		6			Microseisms due to wind.
	eL _n		7 46 18		6			
	F _m		8 02 04					
	F _n		8 02 09					
29	eP		22 54 13					Microseisms present.
	S ₁		22 58 26					
	S ₂		22 58 32					
	eL _m		23 02 05					
	eL _n		23 02 10					
	L _m		23 04 08		10			
	L _n		23 04 10		9			
	F _m		23 17 00					
29	eP _m		19 05 00					Microseisms present.
	eP _n		19 05 22					
	S _m		19 09 32					
	S _n		19 09 35					
29	eL _m		19 13 54					Microseisms present.
	F _m		19 28 00					
	e		21 16 22					
	F		21 17 11					
31	eP _m		11 23 03					Microseisms present.
	eP _n		11 23 24					
	S _m		11 28 31					
	L		11 31 03					
31	M _m		11 34 09	12		6		Microseisms present.
	M _n		11 34 14	12	9			
	F		11 58 00					
	e		16 54 44					
31	eL _m		17 00 02					Microseisms present.
	eL _n		17 00 11					
	L _m		17 01 07					
	L _n		17 01 18					
	F		17 38 00					
	F		19 10 00					

TABLE 2.—Instrumental seismological reports, March, 1916—Continued.

Date.	Char-acter.	Phase.	Time.	Period. T.	Amplitude.		Dis-tance.	Remarks.
					A _s	A _N		

Hawaii. *Honolulu. Magnetic Observatory.* U. S. Coast and Geodetic Survey. Wm. W. Merrymon.

Lat., 21° 19' 12" N.; long., 158° 03' 48" W. Elevation, 15.2 meters.

Instrument: Milne seismograph of the Seismological Committee of the British Association.

Instrumental constant.. $\frac{V}{T_0}$ 19.4.

1916.		H. m. s.	Sec.	μ	μ	Km.
Mar. 4	P	7 20 00				
	S	7 27 18				
	L	7 35 36	22			
	M	7 44 06		100		
	C	7 55 42				
12	P	7 50 48				
	L	8 01 06	22			
	M	8 05 12	20			
	C	8 10 18				
	F	8 24 54				
16	e	22 57 12				
	M	22 59 12		20		
	F	23 06 12				
18	P	1 15 12				
	L	1 20 00	24			
	M	1 25 12		20		
	C	1 29 06				
	F	1 39 12				
19	P	12 10 06				
	S	12 17 42				
	L	12 23 42	23			
	M	12 30 54		70		
	F	12 36 48				
19	eP	23 37 06				
	S	23 43 42				
	L	23 51 06	22			
	M	23 54 48		20		
	F	24 02 06				
23	P	9 00 48				
	S	9 03 54				
	L	9 06 36	24			
	M	9 10 12		40		
	F	9 14 24				
26	P	0 13 12				
	S	0 19 30				
	L	0 25 24	24			
	M	0 33 36		110		
	F	0 41 00				
27	eL	23 08 54				
	M	23 14 24		10		
	C	23 17 36				
	F	23 27 36				
	31	P	11 24 12			
L		11 26 00				
M		11 27 12		30		
C		11 32 00				
F		11 56 00				

Kansas. *Lawrence. University of Kansas.* Department of Physics and Astronomy. F. E. Kester.

Lat., 38° 57' 30" N.; long., 95° 14' 58" W. Elevation, 301.1 meters.

Instrument: Wiechert.

Instrumental constants.. $\frac{V}{T_0}$ $\begin{matrix} E & T_0 & \mu \\ 177 & 3.4 & 4 \\ N & 206 & 3.4 & 4 \end{matrix}$

1916.		H. m. s.	Sec.	μ	μ	Km.
Mar. 31	P _N T	11 16 12				
	L	11 16 12				
	L	11 27 01				
	M	11 27 19	12	4		
	F	11 27 48			4	

Date.	Char-acter.	Phase.	Time.	Period. T.	Amplitude.		Dis-tance.	Remarks.
					A _s	A _N		

Maryland. *Cheltenham. Magnetic Observatory.* U. S. Coast and Geodetic Survey. George Hartnell.

Lat., 38° 44' 00" N.; long., 76° 50' 30" W. Elevation, 71.6 meters.

Instruments: Two Bosch-Omori, 10 and 12 kg.

Instrumental constants.. $\frac{V}{T_0}$ $\begin{matrix} E & T_0 \\ 10 & 32 \\ N & 10 & 27 \end{matrix}$

1916.		H. m. s.	Sec.	μ	μ	Km.
Mar. 12	P	7 33 20				
	L	7 40 16	5			
	M	7 41 40	6			
	N	7 48 08	5	10		
	F	7 49 10	6		20	
31	eL	11 30 10				
	M	11 34 20	10	50		
	N	11 35 28	9		50	
	F	11 39 00				

Massachusetts. *Cambridge. Harvard University Seismographic Station,* J. B. Woodworth.

Lat., 42° 22' 36" N.; long., 71° 06' 59" W. Elevation, 5.4 meters. Foundation: Glacial sand over clay.

Instruments: Two Bosch-Omori 100 kg. horizontal pendulums (mechanical registration).

Instrumental constants.. $\frac{V}{T_0}$ $\begin{matrix} E & T_0 & \mu \\ 80 & 23 & 0 \\ N & 50 & 25 & 4.1 \end{matrix}$

1916.		H. m. s.	Sec.	μ	μ	Km.	
Mar. 4	O?	7 39 44				8,130?	P and S heavily masked by microseisms, of 5- to 6- period.
	eP	7 50 48					
	S?	8 00 08	77				
	L	8 08 12					
	eL?	8 15 10					
7	L	8 17 40	20				F in microseisms.
	C	8 22 00					
	F?	8 45 30					
	L _s	19 38 06	17				e to F in microseisms. 3 waves in first L _s and 1 in second.
	L _N	19 38 59	20				Minute local shock.
8	O	3 48 20				0	
	IE	3 46 26	10				
	F	3 46 36					
	O?	7 31 15				3,490?	P & S in microseisms. Record of dubious interpretation; may be much more distant.
	eP _N	7 37 55					
12	S	7 43 11	9				
	eL _s	7 46 31	8				
	L	7 49 35	20				
	L	7 49 68					
	F	8 25 00					
16	O	22 50 00					P and S masked by microseisms. N-S out of commission.
	eL _s	23 02 50	16				
	L	23 04 06	12				
	F?	23 28 30					
	O	21 04 33				280	Local shock; not reported as felt.
20	P	21 05 15					
	L	21 05 47					
	M	21 05 51		62			
	F	21 06 17					
	O?	23 00 00					Day of O undetermined.
26	eL _s	0 50 02					
	L	0 50 49	27				
	L	0 55 43	20				
	F	1 06 00					
	31	O?	11 10 66				4,220?
eP?		11 18 24					
S?		11 24 24					
eL _s ?		11 27 27	11				
L		11 30 38	8				
eP		11 31 07	6				
eL _s		11 31 36	8				
eL _N		11 31 42	8				
M		11 32 28	15				Amplitudes, except for M _s , diminish.
M		11 35 00	13				
F	12 15 00						

O—time at origin.

TABLE 2.—Instrumental seismological reports, March, 1916—Continued.

Date.	Char-acter.	Phase.	Time.	Period. T.	Amplitude.		Dis-tance.	Remarks.
					A _m	A _w		
Missouri. <i>Saint Louis. St. Louis University.</i> Geophysical Observa-tory. J. B. Goesse, S. J.								
Lat., 38° 38' 15" N.; long., 90° 13' 58" W. Elevation, 160.4 meters. Foundation: 12 feet of tough clay over limestone of Mississippi system, about 300 feet thick.								
Instruments: Wiechert 80 kg. astatic, horizontal pendulum.								
Instrumental constants. $\begin{matrix} V & T_2 & \epsilon \\ & 7 & 5:1 \end{matrix}$								
1916.			<i>H. m. s.</i>	<i>Sec.</i>	μ	μ	<i>Km.</i>	
Mar. 12	I _v	oP _N	7 35 00				470	
		S _N	7 36 26					
		M _N	7 37 57					
		F _N	7 40 00					F in microseisms.
12	I	o _N	7 42 00					
		L _N	7 43 30					
		F _N	7 44 00					F in microseisms.
31	II _r	oP	11 24 00					
		S7	11 26 30					
		L7	11 27 15					
		M	11 29 11					
		F	11 38 00					

New York. *Buffalo. Canisius College.* John A. Curtin, S. J.

Lat., 42° 53' 02" N.; long., 78° 52' 40" W. Elevation, 190.5 meters.

Instrument: Wiechert 80 kg. horizontal.

Instrumental constants. $\begin{matrix} V & T_2 & \epsilon \\ & 7 & 5:1 \end{matrix}$

Date.	Char-acter.	Phase.	Time.	Period. T.	Amplitude.		Dis-tance.	Remarks.
					A _m	A _w		
New York. <i>Buffalo. Canisius College.</i> John A. Curtin, S. J.								
Lat., 42° 53' 02" N.; long., 78° 52' 40" W. Elevation, 190.5 meters.								
Instrument: Wiechert 80 kg. horizontal.								
Instrumental constants. $\begin{matrix} V & T_2 & \epsilon \\ & 7 & 5:1 \end{matrix}$								
1916.			<i>H. m. s.</i>	<i>Sec.</i>	μ	μ	<i>Km.</i>	
Mar. 12	III _r	oP _N	7 35 30					P ₂ ?
		S _N	7 38 15					
		S _N	7 38 20					
		L _N	7 41 40					
		L _N	7 42 00					
		M _N	7 44 15	6	7			
		M _N	7 44 20	8		6		
		F _N	7 50 30					
		F _N	7 50 50					
29		M _N ?	19 02 00					No record on N-S, pens not working properly on either component on Mar. 29.
		F _N ?	19 06 00					
31	III _r	IP _N	11 17 45					
		IP _N	11 18 00					
		S _N	11 22 40					
		S _N	11 23 20					
		L _N	11 28 40					
		L _N	11 28 45					
		M _N	11 31 00		24			
		M _N	11 31 10	10		12		
		F _N	11 49 00					
		F _N	11 50 00					Microseisms on 3d, 4th, 5th, 8th, 9th, 8th, 15th, 16th, and 17th, consisting of groups of damped sine waves, period of 6s. About 40 groups per hour. Mild microseisms on 19th, 20th, and 21st.

New York. *Fordham. Fordham University.* W. C. Repetti, S. J.

Lat., 40° 57' 47" N.; long., 73° 53' 08" W. Elevation, 23.9 meters.

Instrument: Wiechert 80 kg.

Instrumental constants. $\begin{matrix} V & T_2 & \epsilon \\ E & 7.2 & 1.5 \\ N & 7.2 & 3.75 \end{matrix}$

(Report for March, 1916, not received.)

Date.	Char-acter.	Phase.	Time.	Period. T.	Amplitude.		Dis-tance.	Remarks.
					A _m	A _w		
New York. <i>Ithaca. Cornell University.</i> Heinrich Ries.								
Lat., 42° 28' 58" N.; long., 76° 29' 09" W. Elevation, 242.6 meters.								
Instruments: Two Bosch-Omori, 25 kgm., horizontal pendulums (mechanical registra-tion.)								
Instrumental constants. $\begin{matrix} V & T_2 & \epsilon \\ E & 13 & 22 & 4:1 \\ N & 14 & 25 & 4:1 \end{matrix}$								
1916.			<i>H. m. s.</i>	<i>Sec.</i>	μ	μ	<i>Km.</i>	
Mar. 16		oL _N	23 00 55					Microseisms.
		oL _N	23 02 01	14-6				
		F _N	23 09 00					
		F _N	23 12 30					
31		o _N	11 28 31	7				
		L _N	11 29 59	6-10				
		L _N	11 30 02	8-15		36		
		F _N	11 42 00					
		F _N	11 50 00					

Panama Canal Zone. *Balboa Heights.* Isthmian Canal Commission.

Lat., 8° 57' 39" N.; long., 79° 33' 29" W. Elevation, 27.6 meters.

Instruments: Two Bosch-Omori 100 kg.

Instrumental constants. $\begin{matrix} V & T_2 \\ & 10 & 20 \end{matrix}$

Date.	Char-acter.	Phase.	Time.	Period. T.	Amplitude.		Dis-tance.	Remarks.
					A _m	A _w		
Panama Canal Zone. <i>Balboa Heights.</i> Isthmian Canal Commission.								
Lat., 8° 57' 39" N.; long., 79° 33' 29" W. Elevation, 27.6 meters.								
Instruments: Two Bosch-Omori 100 kg.								
Instrumental constants. $\begin{matrix} V & T_2 \\ & 10 & 20 \end{matrix}$								
1916.			<i>H. m. s.</i>	<i>Sec.</i>	μ	μ	<i>Km.</i>	
Mar. 1		P _N	19 50 16					Distance and direc-tion unknown.
		P _N	19 50 22					
		F _N	19 56 00					
		F _N	19 57 00					
21		P _N	19 56 56				398	Direction unknown.
		P _N	19 56 58					
		L _N	19 57 44					
		M _N	19 57 50			30		
		M _N	19 57 56		40			
		F _N	19 59 46					
		F _N	19 59 58					
27		P _N	13 43 38				51	Wave moved NE-SW. No record on E-W, clock stopped.
		L _N	13 43 40					
		M _N	13 43 46			180		
		F _N	13 44 14					
29		P _N	10 08 56				103	Direction SW.
		P _N	10 09 00					
		L _N	10 09 05					
		M _N	10 09 06			2180		
		L _N	10 09 09					
		M _N	10 09 10		1600			
		F _N	10 10 50					
		F _N	10 11 28					

Porto Rico. *Vieques. Magnetic Observatory.* U. S. Coast and Geo-detic Survey. H. M. Pease.

Lat., 18° 09' N.; long., 65° 27' W. Elevation, 19.8 meters.

Instruments: Two Bosch-Omori.

Instrumental constants. $\begin{matrix} V & T_2 \\ E & 10 & 21.4 \\ N & 10 & 21.1 \end{matrix}$

(No earthquakes recorded in March, 1916.)

TABLE 2.—Instrumental seismological reports, March, 1916—Continued.

Date.	Char-acter.	Phase.	Time.	Period. T.	Amplitude.		Dis-tance.	Remarks.
					A _N	A _E		
Vermont. <i>Northfield. U. S. Weather Bureau. Wm. A. Shaw.</i>								
Lat., 44° 10' N.; long., 72° 41' W. Elevation, 256 meters.								
Instruments: Two Bosch-Omorl, mechanical registration.								
Instrumental constants: $\begin{matrix} V & T_1 & T_2 \\ E & 10 & 15 \\ N & 10 & 15 \end{matrix}$								
1916.			<i>H. m. s.</i>	<i>Sec.</i>	μ	μ	<i>Km.</i>	
Mar. 12	e		7 38 08					All phases indeter- minable.
	F		8 00 00					
16	L		23 02 48					Microseisms present.
	F		23 15 00					
28	L		7 55 50					
	F		8 05 00					
31	e		11 21 14					Very faint record, most pronounced on N-S.
	M		11 31 15			100		
	F		12 00 00					
31	e		16 56 33					Phases indetermi- nable.
	M		16 57 15			17		
	F		17 15 00					

Canada. *Ottawa. Dominion Astronomical Observatory. Earthquake Station. Otto Klotz.*

Lat., 45° 23' 38" N.; long., 75° 42' 57" W. Elevation, 83 meters.

Instruments: Two Bosch photographic horizontal pendulums, one Spindler & Hoyer 80 kg. vertical seismograph.

Instrumental constants: $\begin{matrix} V & T_1 & T_2 \\ E & 120 & 26 \\ N & 120 & 26 \end{matrix}$

Date.	Char-acter.	Phase.	Time.	Period. T.	Amplitude.		Dis-tance.	Remarks.
					A _N	A _E		
1916.			<i>H. m. s.</i>	<i>Sec.</i>	μ	μ	<i>Km.</i>	
Mar. 1	eL		19 53 12	24				
	L		19 57 00	14				
	F		20 13 00					
12	O		7 31 10				3,900	
	F		7 38 21					
	S		7 44 02					
	eL		7 47 24	20				
	eL		7 48 36	9				
	L		7 49 00					
	F		8 15 00					
16	O?		22 50 40				1,900?	
	eP?		22 54 50					
	S?		22 58 03					
	eL		23 00 42	20				
	M		23 02 00	10				
	F		23 25 00					
26	L		0 46 42	60				
	L		0 53 36	60				
	F		1 12 00					
28	eL		7 56 00	15				Some record precedes but failed to in- terpret it.
	eL		7 56 30	15				
	F		8 10 00					
29	O		18 59 58				3,300	
	P		19 06 22	2				
	PR1		19 07 22					
	L		19 14 18	20				
	L		19 14 24	20				
	L		19 15 00	18				
	F		19 30 00					
31	L		11 19 32					
	e		11 23 06	12				
	e		11 23 24					
	eL		11 29 18	20				
	M		11 29 48		60	30		
	F		12 20 00					
31	e		16 55 00					
	F		17 15 00					

TABLE 3.—Late seismological reports. (Instrumental.)

Date.	Char-acter.	Phase.	Time.	Period. T.	Amplitude.		Dis-tance.	Remarks.
					A _N	A _E		
New York. <i>Ithaca. Cornell University. Heinrich Ries.</i>								
Lat., 42° 28' 58" N.; long., 76° 29' 09" W. Elevation, 242.6 meters.								
Instruments: Two Bosch-Omorl, 25 kg., horizontal pendulums (mechanical registration).								
Instrumental constants: $\begin{matrix} V & T_1 & T_2 \\ E & 13 & 22 & 4:1 \\ N & 14 & 25 & 4:1 \end{matrix}$								
1916.			<i>H. m. s.</i>	<i>Sec.</i>	μ	μ	<i>Km.</i>	
Jan. 1	e		13 53 21	48				
	e		13 53 36	36				
	e		14 07 16	48				
	e		14 07 32	59				
	e		14 19 48	26	231			
	e		14 21 47	23		286		
	e		15 44 00					
	e		15 59 00					
13	eP		6 40 01	5				
	eP		6 41 09	4-7				
	e		6 41 10	5-7				
	e		6 57 31	13				
	e		6 57 40	12				
	eL		7 27 17	21				
	eL		7 27 25	28				
	e		8 02 00					
	e		8 09 00					
13	eP		8 42 29	4				
	eP		8 42 40	4				
	e		8 43 32	4				
	e		8 43 32	4				
	e		8 47 12	12				
	e		8 47 37	8				
	e		8 52 45	7				
	e		9 00 07	46				
	e		9 00 23	52				
	e		10 54 00					
	e		11 00 00					
24	e		7 22 22	6				Microseisms.
	e		7 31 10	40				
	e		7 31 22	41				
	e		7 59 00					
	e		8 06 30					
26	eL		13 20 56	20				
	eL		13 28 44	20				
	e		13 32 00					
	e		13 48 00					
31	e		18 19 20	4				
	e		18 19 22	4				
	e		18 33 43	39				
	e		18 37 04	31				
	e		18 56 30					
	e		18 59 00					
1916.			<i>H. m. s.</i>	<i>Sec.</i>	μ	μ	<i>Km.</i>	
Feb. 1	L		8 34 51	15				
	L		8 36 44	23				
	e		8 58 00					
	e		9 04 00					
3	e		5 16 40	4-9				
	e		5 20 24					
	e		5 28 00					
	e		5 30 00					
6	e		22 11 12	5				
	e		22 11 33	7				
	eL		22 18 50	20				
	eL		22 23 22	18				
	M		22 31 25	20		79		
	e		23 52 00					
7	e		0 05 00					
8	e		15 49 12	7				
	e		15 57 00					
	e		16 16 52	16				
	e		16 19 00					
15	e		11 50 52	5				
	e		11 50 54	4				
	eL		11 53 54	4-11				
	L		11 59 12	10				
	M		11 59 48	9		50		
	e		12 22 00					
	e		12 29 00					

TABLE 3.—Late seismological reports—Continued.

New York. Ithaca. Cornell University—Continued.

Date.	Char-acter.	Phase.	Time.	Period T.	Amplitude.		Dis-tance.	Remarks.			
					A _n	A _w					
1916. Feb. 20			S _n	18 05 38	13						
			S _w	18 07 40	9						
			eL _n	18 17 06	18						
			eL _w	18 17 12	13						
			F _n	19 20 00							
			F _w	19 22 00							
			21			e _w	23 43 22	2			
						e _n	23 43 23	2-4			
						F _n	23 43 00				
						F _w	23 49 30				
27			P _n	20 27 59	4						
			P _w	20 28 18	3-4						
			I _n	20 29 22	4-6						
			I _w	20 29 23	7						
			S _w	20 33 30	10			S _n indistinct.			
			L _w	20 35 49							
			L _n	20 38 09	29						
			M _n	20 41 46	16	757					
			F _n	22 04 00							
			F _w	22 05 00							

Porto Rico. Vieques. Magnetic Observatory. U. S. Coast and Geodetic Survey. H. M. Pease.

Lat. 18° 09' N., long., 65° 27' W. Elevation, 19.8 meters.

Instruments: Two Bosch-Omori.

Instrumental constants. $\begin{matrix} V & T_0 \\ E & 10 & 21.4 \\ N & 10 & 21.1 \end{matrix}$

Date.	Char-acter.	Phase.	H. m. s.	Sec.	μ	μ	Km.	Remarks.
1916. Feb. 6			eL _n	22 36 28	24			
			eL _w	22 41 55	24			
			M _n	22 44 20	24	30		
			M _w	22 45 00	24	10		
			F _w	23 08 00				
27			P _n	20 26 11	2			Apparently two shocks, a short time apart, the second being much heavier than the first.
			S _w	20 30 20	8			
			S _n	20 30 35	10			
			L _w	20 33 49	16	900		
			M _n	20 36 10	16	2,400		
			M _w	20 38 30	16			
			C _w	20 45 00				
			C _n	20 48 00				
			F _w	21 07 00				
			F _n	21 23 00				

Massachusetts. Cambridge. Harvard University Seismographic Station. J. B. Woodworth.

Lat., 42° 22' 36" N.; long., 71° 06' 59" W. Elevation, 5.4 meters. Foundation: Glacial sand over clay.

Instruments: Two Bosch-Omori 100 kg. horizontal pendulums (mechanical registration).

Instrumental constants. $\begin{matrix} V & T_0 & c:1 \\ E & 80 & 23 & 0 \\ N & 50 & 25 & 4:1 \end{matrix}$

Date.	Char-acter.	Phase.	H. m. s.	Sec.	μ	μ	Km.	Remarks.
1916. Feb. 6			i.....	11 14 39	10			e and F uncertain among waves of about 7 ^s period on E-W. Microseisms of 2.6 ^s period on N-S.
			L ₇	11 15 40	15			
8			e _n	15 39 14	13			
			L _w	15 40 14	15			
			L _n	15 40 47				
			i.....	15 52 17				
			L _w	16 14 46	20			
			L _n	16 21 20	13			
			FF _w	16 35 00				
			FF _n	16 35 00				

SEISMOLOGICAL DISPATCHES.¹

Rio de Janeiro, via Galveston, Tex., Mar. 1, 1916.

An earthquake of considerable intensity was registered by the seismograph instruments in the Government observatory here this morning. The disturbance was approximately 5,700 kilometers distant from Rio de Janeiro. (Mexican cable to N. Y. Herald.)

Ambato, Ecuador, Mar. 8, 1916.

Tunguragua volcano, in this Province, has been in eruption for several days. The city of Ambato and the surrounding region are almost in darkness on account of falling ashes. During the night the flames from the volcano are visible at a great distance. The people of Ambato are greatly alarmed, fearing a catastrophe. (Assoc. Press.)

Rome, Mar. 12, 1916, 10:15 p. m.—via Paris, Mar. 13, 1916, 1:40 a. m.

Earthquake shocks, lasting from 10 to 20 seconds, were felt in the region represented by a triangle with sides running between Venice, Ancona, and Florence. The observations made at Florence observatory indicated that the epicenter was about 300 miles distant, probably in the Adriatic Sea. No damage has been reported. (Assoc. Press.)

Calcutta, Mar. 25, 1916.

The first scientific survey of the effects of the destructive earthquake which had its center in Russian Turkestan in 1910, has just been completed by a party under the leadership of Dr. Aurel Stein. The quake produced some very extensive geographical changes, and is believed by many to have been the most violent seismic disturbance which has occurred in several centuries. At one point the fall of a whole mountain completely blocked the Bartang River, converting the Serezpamir gorge into an Alpine lake 15 miles long. (Assoc. Press.)

Panama, Mar. 29, 1916.

Two earthquake shocks occurred to-day, one at 5 o'clock this morning and the other this afternoon. No damage resulted. The earlier shock was the most severe. It lasted 1 minute and 20 seconds and reached the third category of intensity in the seismograph wave motions and showed a width of 22 millimeters. Most of the Isthmian population was awakened by the disturbance. This is the second severe shock in the last 24 months, the first taking place on May 18, 1914, and having an intensity of the sixth category. There were numerous tremors during the day, but, like an extremely slight shock last Monday, these were barely noticeable. (—)

CORRIGENDUM.

Instrumental report, Toronto, Canada, MONTHLY WEATHER REVIEW, February, 1916. Page 94, column 2, Feb. 27, P should be 20^h 29^m 12^s.

¹ Reported by the organization indicated and collected by the seismological station at Georgetown University.

SECTION V.—SEISMOLOGY.

SEISMOLOGICAL REPORTS FOR APRIL, 1916.

W. J. HUMPHREYS, Professor in charge of Seismological Investigations.

[Dated: Weather Bureau, Washington, D. C., June 2, 1916.]

TABLE 1.—Noninstrumental earthquake reports, April, 1916.

Day.	Approximate time, Greenwich Civil.	Station.	Approximate latitude.	Approximate longitude.	Intensity Rossi-Forl.	Number of shocks.	Duration.	Sounds.	Remarks.	Observer.
1916. Apr 13	4 23	CALIFORNIA. Lone Pine.....	36 37	118 01	4	3	M. 5. 10	Rumbling....	Doors rattled.....	G. F. Marsh.
		IDAHO.								
13	2 30	Pyle Creek (near Garden Valley).	44 07	115 56	.....	.....	1 0	.....	Shook house.....	P. V. Smith.
14	3 55	.....	44 07	115 56	.....	.....	5	.....	Shook house.....	P. V. Smith.
14	7 20	.....	45 48	115 25	.....	.....	1 0	.....	Shook house.....	P. V. Smith.
20	1 50	Elk City.....	45 48	115 25	2	1	.....	.....	.....	R. E. Mases.
30	3 15	Boise.....	43 37	116 14	3	1	.....	1	Faint.....	U. S. Weather Bureau.
		NEVADA.								
18	4 50	Francis.....	39 44	119 58	3	2	.....	1	.....	Geo. W. Barnard.
		SOUTH CAROLINA.								
16	11 56	Summerville.....	33 03	80 14	2	1	.....	.....	.....	E. H. Gadsden.
30	6 45	Summerville.....	33 03	80 14	2	.....	.....	.....	Rumbling.....	E. H. Gadsden.
		WASHINGTON.								
24	4 43	Sumner.....	47 12	122 13	2	1	.....	5	Rumbling.....	H. E. Thompson.
		PORTO RICO.								
24	4 27	Aibonito.....	18 08	66 17	4-5	3	.....	.....	Doors moved.....	D. Jordan.
24	4 27	Isabela.....	18 30	67 04	5	1	.....	.....	Walls cracked slightly.....	William M. Orr.
24	4 27	Lares.....	18 33	66 55	5	1	.....	30	Partitions creaked.....	Paul Viella, Jr.
24	4 27	Mayaguez.....	18 13	67 08	5	4	.....	20	Rattling.....	C. A. Iemar, Jr.
24	4 27	San Juan.....	18 30	66 07	4	2	.....	10	Timbers creaked.....	U. S. Weather Bureau.

TABLE 2.—Instrumental reports, April, 1916.

[Time used: Mean Greenwich, midnight to midnight. Nomenclature: International.]

[For significance of symbols see REVIEW for January, 1916, p. 39.]

Date.	Character.	Phase.	Time.	Period T.	Amplitude.		Distance.	Remarks.
					A _m	A _N		

Alaska. Sitka. Magnetic Observatory. U. S. Coast and Geodetic Survey. J. W. Green.

Lat. 57° 03' 00" N.; long., 135° 30' 06" W. Elevation, 15.2 meters.
Instruments: Two Bosch-Omori, 10 and 12 kg.

Instrumental constants: $\begin{cases} V & T_0 \\ E & 10 \text{ 16.7} \\ N & 10 \text{ 15.4} \end{cases}$

1916.		H. m. s.	Sec.	μ	μ	Km.
Apr. 2	eL _m	3 25 29	11	.....	.....	.....
	eL _N	3 25 32	11	.....	.....	.....
	M _m	8 26 12	10	50	.....	.....
	M _N	8 26 34	10	.....	60	.....
	F _m	8 36 09	7	.....	.....	.....
	F _N	8 40 00	8	.....	.....	.....
	18	P.....	3 06 13	4
S _m		3 10 08	10	.....	.....	.....
S _N		3 09 58	10	.....	.....	.....
M _m		3 10 16	10	200	.....	.....
M _N		3 11 12	10	.....	520	.....
L _m		3 12 06	12	.....	.....	.....
L _N		3 12 12	12	190	.....	.....
M _m		3 12 36	13	.....	110	.....
C.....		3 24 00	.....	.....	.....	.....
E.....		4 14 00	7	.....	.....	.....
F _m		4 34 00	.....	.....	.....	.....

Date.	Character.	Phase.	Time.	Period T.	Amplitude.		Distance.	Remarks.
					A _m	A _N		

Alaska. Sitka. Magnetic Observatory—Continued.

1916.		H. m. s.	Sec.	μ	μ	Km.
Apr. 24	eL _m	4 45 00	.....	.....	.....	.....
	eL _N	4 47 20	18	.....	.....	.....
	M _m	5 00 50	16	.....	50	.....
	F _m	5 14 00	.....	.....	.....	.....
	F _N	5 39 00	.....	.....	.....	.....
24	eP _m	8 16 25	.....	.....	.....	.....
	eP _N	8 17 44	.....	.....	.....	.....
	L _m	8 29 00	28	.....	.....	.....
	M _m	8 41 33	20	.....	70	.....
	C _m	8 44 30	13	.....	.....	.....
	M _m	8 47 40	15	20	.....	.....
	F _m	9 18 00	.....	.....	.....	.....
F _N	9 31 00	.....	.....	.....	.....
26	eL _m	2 49 49	40	.....	.....	.....
	M _m	3 00 08	13	.....	60	.....
	C _m	3 06 50	.....	.....	.....	.....
	F _m	3 39 00	.....	.....	.....	.....

Barely perceptible on E.

TABLE 2.—Instrumental reports, April, 1916—Continued.

Arizona. *Tucson. Magnetic Observatory. U. S. Coast and Geodetic Survey. F. P. Ulrich.*
 Lat. 32° 14' 48" N.; long., 110° 50' 06" W. Elevation, 769.6 meters.
 Instruments: Two Bosch-Omori, 10 and 12 kg.
 Instrumental constants: $\begin{matrix} E & V & T_0 \\ N & 10 & 16 \\ & 10 & 19.6 \end{matrix}$

Date	Charac-ter.	Phase	Time	Period T.	Amplitude.		Dis-tance.	Remarks.
					A _N	A _{N'}		
1916. Apr. 2	cL		8 35 00	11				
	M		8 37 00	10	10	10		
	F		8 43 00					
2	cL		18 58 42	3				
	M		18 59 08	10	40			
	M		18 59 19	5		10		
	F		19 08 00	5				
14	cP		20 35 59	4				
	L		20 41 35					
	L		20 42 05					
	M		20 42 30	5	50	40		
	C		20 46 00					
16	F		20 54 00	4				
	P		22 31 27	4				
	S		22 33 57	3				
	L		22 36 27	5				
	M		22 38 37	10	50	150		
	C		22 40 00	8				
	F		22 55 00	8				
18	P		23 05 00	7				
	P		4 10 07	4				N not in operation.
	S		4 17 03					
	M		4 21 10	9	10			
	M		4 32 25					
21	C		4 44 00					
	F		6 56 00	7				
	cP		11 54 48	5				N not in adjustment.
	L		12 14 18					
24	M		12 17 15	20	20			
	C		12 23 00					
	F		12 47 00	16				
	cL		4 36 05	5				
	cL		4 40 14	4				
	M		4 43 42	13	10			
	M		4 45 10	9	10			
24	F		5 07 00	8				
	F		5 14 00	8				
	P		8 08 52	4				
	eL		8 17 12	16				
	eL		8 17 46	34				
26	M		8 28 01	18	60			
	M		8 29 39	18	60			
	C		8 36 00	13				
	F		9 07 00	12				
	F		9 22 00	10				
	P		2 28 24	4				
	cL		2 38 59					
26	M		2 41 55	18	60	40		
	M		2 43 03	18	60			
	F		3 07 00	8				
	F		3 10 00	9				

California. *Berkeley. University of California.*
 Lat., 37° 53' 16" N.; long., 122° 15' 37" W. Elevation, 85.4 meters.
 (See Bulletin of the Seismographic Stations, University of California.)

California. *Mount Hamilton. Lick Observatory.*
 Lat., 37° 20' 24" N.; long., 121° 38' 34" W. Elevation, 1,281.7 meters.
 (See Bulletin of the Seismographic Stations, University of California.)

California. *Point Loma. Raja Yoga Academy. F. J. Dick.*
 Lat., 32° 43' 03" N.; long., 117° 15' 10" W. Elevation, 91.4 meters.
 Instrument: Two-component, C. D. West seismoscope.

1916.	Date	Charac-ter.	Phase	Time	Period T.	Amplitude.		Dis-tance.	Remarks.
						A _N	A _{N'}		
	Apr. 29								Tremors recorded during 24 hours preceding 4 p. m.

* Amplitude on instrument.
 California. *Santa Clara. University of Santa Clara. J. S. Ricard, S. J.*
 Lat., 37° 26' 36" N.; long., 121° 57' 63" W. Elevation, 27.43 meters.
 (See Record of the Seismographic Station, University of Santa Clara.)

Colorado. *Denver. Sacred Heart College. Earthquake Station. A. W. Forstall, S. J.*
 Lat., 39° 40' 38" N.; long., 104° 56' 54" W. Elevation, 1,855 meters.
 Instrument: Wiechert 80 kg., astatic, horizontal pendulum.

1916.	Date	Charac-ter.	Phase	Time	Period T.	Amplitude.		Dis-tance.	Remarks.
						A _N	A _{N'}		
Apr. 6	I _r	P		18 55 00					Second preliminaries doubtful. Visible activity preceded and followed.
		S		19 00 00					
		L		19 07 00					
		M		19 08 00	7-5	12.5			
		F		19 09 00					
13	I _a	L		19 45 00				Small irregular waves more prominent on N-S.	
		F		19 50 00					
14		M		18 54 00		15		Long irregular waves. Thickening of pen-marks.	
		F		19 02 00		15			
15		M		18 40 00		7		Much disturbed by minutes marks.	
		F		19 30 00		5-7			
16	I _r	L		22 38 00		4-7	8	Preliminaries doubtful on account of minutes marks.	
		M		22 40 00		4-7	10		
		C		22 41 00					
		F		22 43 00					
24	I _r	P		9 18 00				1st and specially 2d preliminaries doubtful.	
		L		9 25 00					
		M		9 28 00	15	9			
		M		9 30 00	15	7			
		F		9 34 00					
26	I _r	L		2 44 00				Preliminaries not discernible.	
		M		2 44 00	30	6.2			
		M		2 44 00	30	4.1			
		F		2 48 00					
		F		2 54 00					

District of Columbia. *Washington. U. S. Weather Bureau.*
 Lat., 38° 54' 12" N.; long., 77° 03' 03" W. Elevation, 21 meters.
 Instrument: Marvin (vertical pendulum), undamped. Mechanical registration.
 Instrumental constants: $\begin{matrix} V & T_0 \\ 110 & 6 \end{matrix}$

1916.	Date	Charac-ter.	Phase	Time	Period T.	Amplitude.		Dis-tance.	Remarks.
						A _N	A _{N'}		
Apr. 2		cW		8 36 30					
		S		8 38 47					
		L		8 42 00					
2		F		9 10 00					
		e		18 56 33					
		S		19 01 15					
		L		19 06 30					
6		F		19 20 00					
		L		19 19 36					Beginning lost in microseisms.
		F		19 35 00					

TABLE 2.—Instrumental reports, April, 1916—Continued.

Date.	Charac- ter.	Phase.	Time.	Period T.	Amplitude.		Dis- tance.	Remarks.
					A _m	A _N		
District of Columbia. Washington. U. S. Weather Bureau.—Contd.								
1916.			<i>H. m. s.</i>	<i>Sec.</i>	μ	μ	<i>Km.</i>	
Apr. 7	en		9 45 40					No distinct maxi- mum.
	i		9 48 40					
	L		10 07 10					
	L		10 35 00	35				
	L		10 37 00	20				
	F		10 50 00	16				
	F		12 00 00					
11	SZ		3 58 46					All phases doubtful.
	F		4 15 00					
15	E		12 51 14					Phases uncertain. Lost in micro- seisms.
	L		14 03 20	20				
	F		14 20 00					
16	en		22 45 20					Phases uncertain. Lost in micro- seisms.
	F		23 10 00					
18	III _a		4 11 48				6,750	
	S		4 20 04					
	M		4 21 50		105			
	F		4 29 12	14				
21	III _c		11 49 45				4,460	
	S		11 55 58					
	L		12 04 02	16				
	F		12 20 00	24				
24	III _c		4 31 26				2,375	
	S		4 35 21					
	L		4 39 20	16				
	F		5 50 00					
24	III _c		8 08 13				2,500	
	S		8 12 25					
	L		8 16 30	16				
	F		10 00 00					
26	II _c		2 27 36				3,290	
	S		2 32 40					
	L		2 34 52	12				
	F		2 37 00	20				
	F		3 40 00					
26	II _c		6 31 42				3,450	
	S		6 36 56					
	L		6 42 00	16				
	F		7 10 00					
26	II _c	P?	7 21 56				3,490?	
	S		7 27 12					
	L		7 33 04	16				
	F		8 00 00					
26	e		12 50 00					Phases doubtful.
	F		13 20 00					

District of Columbia. Washington. Georgetown University.

F. L. Tondorf, S. J.

Lat., 38° 54' 25" N.; long., 77° 04' 24" W. Elevation, 42.4 meters. Subsoil: Decayed diorite.

Instruments: Wiechert 200 kg. astatic horizontal pendulums, 80 kg. vertical.

Instrumental constants: $\begin{matrix} V & T_0 & e \\ E & 165 & 5.4 & 2.6 \\ N & 143 & 5.2 & 3.4 \\ Z & 80 & 3.0 & 0 \end{matrix}$

1916.	Charac- ter.	Phase.	Time.	Period T.	Amplitude.	Dis- tance.	Remarks.
			<i>H. m. s.</i>	<i>Sec.</i>	μ	μ	<i>Km.</i>
Apr. 2	en		8 36 27				N-S scarcely discern- ible. Gram on Wiechert lost in mi- croseisms. Bosch- Omori shows L at 2 ^h 41 ^m 35 ^s to 8 ^h 53 ^m 29 ^s .
	F ₁		8 42 06				
	L ₁		8 45 43	30			
	F		9 15 00				

Date.	Charac- ter.	Phase.	Time.	Period T.	Amplitude.		Dis- tance.	Remarks.
					A _m	A _N		
District of Columbia. Washington. Georgetown University.—Contd.								
1916.			<i>H. m. s.</i>	<i>Sec.</i>	μ	μ	<i>Km.</i>	
Apr. 7	en		9 33 20					No distinct main.
	en		9 33 54					
	L		10 22 10					
	L		10 59 30					
	F		12 plus.					
11	en		3 33 17					All phases rather doubtful. Microse- isms. Mainka shows eL ₁ 3 ^h 53 ^m 17 ^s ; eL ₂ 3 ^h 53 ^m 30 ^s . S _w not discernible.
	en		3 33 25					
	S _w		3 37 39					
	eL ₁		3 38 39					
	eL ₂		3 38 57					
16	en		22 45 09					Heavy microseisms. Phases not clear.
	en		22 45 27					
	F		23 14 00					
18	iP ₁		4 11 50					Wind marks. Main- ka shows P at 4 ^h 11 ^m 33 ^s ; S at 4 ^h 20 ^m 4 ^s . No distinct M on N-S component.
	iP ₂		4 11 50					
	S _w		4 20 00					
	S _w		4 20 01					
	eL ₁		4 28 32	9				
	eL ₂		4 28 58	9				
	M ₁		4 34 32	8	8			
	M ₂		4 36 16	8	7			
	F		5 17 00					
21	en		11 50 26					Wiechert shows: e ₁ at 11 ^h 51 ^m 50 ^s ; e ₂ at 11 ^h 51 ^m 56 ^s ; L ₁ at 12 ^h 4 ^m 9 ^s ; L ₂ at 12 ^h 4 ^m 9 ^s . No distinct M ₁ and S _w doubtful.
	en		11 50 39					
	S _w		11 55 58					
	S _w		11 57 00					
	L ₁		12 02 36	15				
	L ₂		12 04 53	20				
	F		13 03 00					
24	iP ₁		4 31 25					No decided main. P-S on Mainka 3 ^h 57 ^s .
	iP ₂		4 31 26					
	iS ₁		4 35 28					
	iS ₂		4 35 28					
	eL ₁		4 36 39	10				
	eL ₂		4 37 00	10				
	F		5 20 00					

VERTICAL

Date.	Charac- ter.	Phase.	Time.	Period T.	Amplitude.		Dis- tance.	Remarks.	
					A _m	A _N			
District of Columbia. Washington. Georgetown University.—Contd.									
1916.			<i>H. m. s.</i>	<i>Sec.</i>	μ	μ	<i>Km.</i>		
Apr. 7	iP		4 31 37					No decided main.	
	iS		4 35 33						
	eL ₁		4 36 34						
24	eP ₁		8 08 11					Mainka shows P at 2 ^h 27 ^m 27 ^s ; S at 2 ^h 32 ^m 40 ^s .	
	iP ₁		8 08 17						
	S _w		8 13 30						
	S _w		8 13 33						
	eL ₁		8 16 03	20					
	eL ₂		8 16 36	15					
	M ₁		8 20 21		25				
	M ₂		8 20 49	15	22				
	F		9 16 00						
26	eP ₁		2 27 28						
	eP ₂		2 27 34						
	eS ₁		2 32 34						
	iS ₁		2 32 37						
	eL ₁		2 34 48	15					
	eL ₂		2 34 51	15					
	F		2 39 05	18	10				
26	en		6 32 34					Microseisms. No dis- tinct main.	
	en		6 32 51						
	eL ₁		6 39 48						
	eL ₂		6 42 29	20					
	L		6 42 29	20					
	F		6 43 34	17					
26	e		7 24 32					Microseisms. No dis- tinct main.	
	L		7 33 34						
	F		8 14 00						

TABLE 2.—Instrumental reports, April, 1916—Continued.

Date.	Charac-ter.	Phase.	Time.	Period T.	Amplitude.		Dis-tance.	Remarks.
					A _m	A _N		

Hawaii. *Honolulu. Magnetic Observatory. U. S. Coast and Geodetic Survey. Wm. W. Merrymon.*

Lat., 21° 19' 12" N.; long., 158° 03' 48" W. Elevation, 15.2 meters.

Instruments: Milne seismograph of the Seismological Committee of the British Association.

Instrumental constant. $\frac{T_0}{T_0}$ 18.9

1916.		H. m. s.	Sec.	μ	μ	Km.	
Apr. 2	L	8 36 54					
	M	8 37 48		*100			
	F	8 44 00					
3	eP	10 35 30					
	L	10 40 00					
	M	10 43 30		*250			
	C	10 49 42					
	F	11 08 48					
7	P	9 46 54					
	S	10 00 06					
	L	10 22 00	22.4				
	M	10 47 42		*3400			
	F	11 07 48					
12	e	9 34 06					
	L	9 43 36	24				
	M	9 48 36		*400			
	C	9 53 48					
	F	10 06 48					
14	L	17 49 42	22.2				P and S doubtful.
	M	17 52 42		*300			Observer taking
	C	17 56 12					time break.
	F	18 20 12					
14	eL	20 57 24	23				
	M	21 01 00		*250			
	F	21 06 36					
14	eL	21 46 18					
	M	21 57 42		*300			
	C	21 57 12					
	F	22 30 30					
15	e	12 56 48					Phases uncertain.
	eL	13 21 00					
	M	13 39 18		*450			
	C	13 57 12					
	F	15 58 18					
18	P	4 07 24					Maximum very ab-
	eL	4 13 42	21.0				rupt.
	M	4 16 06		*3700			
	C	4 45 54					
	F	6 08 00					
21	P	11 41 42					
	S	11 49 48					
	L	11 59 48	23				
	M	12 02 54		*3400			
	F	12 38 36					
24	P	4 39 30					L indeterminate.
	S	4 49 24					
	M	5 16 24		*300			
	C	5 19 36					
	F	6 20 18					
24	P	8 14 00					
	S	8 23 06					
	L	8 30 54	20.5				
	M	8 39 42		*1500			
	F	9 08 18					
26	P	2 33 06					
	S	2 42 36					
	L	2 55 12	23				
	M	2 59 36		*1200			
	F	3 25 06					
26	eP	6 46 42					
	eL	7 00 06	22				
	M	7 02 48		*200			
	C	7 10 24					
	F	8 51 12					

*Trace amplitude.

Date.	Charac-ter.	Phase.	Time.	Period T.	Amplitude.		Dis-tance.	Remarks.
					A _m	A _N		

Kansas. *Lawrence. University of Kansas. Department of Physics and Astronomy. F. E. Kester.*

Lat., 38° 57' 30" N.; long., 95° 14' 58" W. Elevation, 301.1 meters.

Instrument: Wiechert.

Instrumental constants. $\frac{V}{N} \frac{T_0}{205} \frac{e}{3.4} \frac{e}{3.8}$

1916.		H. m. s.	Sec.	μ	μ	Km.	
Apr. 14	P _N	20 36 20					
	P _m	20 36 25					
	P _N	20 36 28			2		
	L _N	20 40 21					
	L _N	20 40 31				4	
16	P _N	22 31 45					
	P _m	22 32 46					
	P _N	22 32 51					
	S	22 36 24					
	L _N	22 39 21					
18	L _N	22 39 23					
	M _N	22 39 43		6			
	M _N	22 40 03	4-5		3		
	F	23 11 --					
	P	4 10 39					
24	L	4 17 44	8-9				
	M	4 18 06			9		
	M	4 18 09		11			
	F	5 35 00					
	P	4 32 49					
24	L	4 37 51					
	M	4 43 19		4			
	M	4 43 22			4		
	F	5 22 --					
	P ₁	8 08 23			1		
24	P ₂	8 09 37	5-6	6	5		
	S	8 11 15			5		
	L	8 13 25	12-20				
	M	8 22 53	20	4			
	F	8 28 47	15		2		
26	P	2 27 48				1	
	SPL	2 32 53					
	L	2 34 41					
	M	2 35 01					
	F	2 35 10	8		2		
26	M	2 35 11	12	5			
	M	2 37 00	40				
	M	2 40 00	30				
	F	3 14 00					

Apparently partially due to N-S motion of pendulum.

Maryland. *Cheltenham. Magnetic Observatory. U. S. Coast and Geodetic Survey. George Hartnell.*

Lat., 38° 44' 00" N.; long., 76° 50' 30" W. Elevation, 71.6 meters.

Instruments: Two Bosch-Omorf, 10 and 12 kg.

Instrumental constants. $\frac{V}{N} \frac{T_0}{10} \frac{e}{31} \frac{e}{29}$

1916.		H. m. s.	Sec.	μ	μ	Km.	
Apr. 18	P	4 11 49	4				
	S	4 20 07	4				
	L	4 32 30	12				
	M	4 40 46	13	50	50		
	F	5 07 00					
21	P _N	11 48 34	8				
	P _m	11 58 52	10				
	L _N	12 03 44	18				
	M _N	12 04 22	16	50	10		
	F _N	13 12 00	12				
24	P	4 31 29	3				
	S	4 35 24	8				
	M	4 35 36	8	350	200		
	L	4 38 06	21				
	M _N	4 39 36	18		80		
	M _N	4 41 50	5	40			
	C _N	4 43 00					
	C _N	4 48 00					
	F _N	5 08 00					
	F _N	5 26 00					

Barely discernible on N.

TABLE 2.—Instrumental reports, April, 1916—Continued.

Date.	Character.	Phase.	Time.	Period T.	Amplitude.		Distance.	Remarks.
					A _m	A _n		
Maryland. Cheltenham. Magnetic Observatory—Continued.								
1916.			<i>H. m. s.</i>	<i>Sec.</i>	μ	μ	<i>Km.</i>	
Apr. 21	P		8 08 17	4				
	Sm		8 13 15	18				
	Lm		8 13 36	18				
	Lm		8 16 30	30				
	elLm		8 18 40	22				
	Mm		8 20 09	20	950			
	Mm		8 20 58	21	2,310			
	Cm		8 26 00	16				
	F		9 20 00	17				
26	Lm		2 27 28	3				
	Lm		2 28 36	3				
	S		2 32 34	8				
	Lm		2 34 52	29				
	elLm		2 35 03	24				
	Mm		2 36 48	29	3,110			
	Mm		2 40 25	18	250			
	Cm		2 42 00	16				
	Cm		2 45 00	14				
	Fm		3 14 00	17				
	Fm		3 32 00	17				
26	ePm		6 30 55	12				
	eLm		6 38 57	20				
	eLm		6 41 25	17	10			
	Mm		6 44 45	17	40			
	Mm		6 45 07	17				
	F		7 04 00	17				
28	ePm		7 28 17	8				
	Lm		7 33 11	16				
	Mm		7 35 25	16	10			
	Mm		7 36 56	16	30			
	F		7 54 00	16				

Massachusetts. Cambridge. Harvard University Seismographic Station.
J. B. Woodworth.

Lat., 42° 22' 36" N.; long., 71° 06' 59" W. Elevation, 5.4 meters. Foundation: Glacial sand over clay.

Instruments: Two Bosch-Omoré 100 kg. horizontal pendulums (mechanical registration).

Instrumental constants. $V T_0 \epsilon:1$
 $E 80 23 0$
 $N 50 25 4:1$

Date.	Character.	Phase.	Time.	Period T.	Amplitude.		Distance.	Remarks.
					A _m	A _n		
1916.			<i>H. m. s.</i>	<i>Sec.</i>	μ	μ	<i>Km.</i>	
Apr. 2	O?		8 24 08				4,940?	Δ and O quite uncertain. Pendulum began to drift E.
	Sm		8 36 09					
	Sm?		8 38 54	7				
	eLm		8 43 11					
	eLm		8 43 14	15				
	Lm		9 04 10	12-15				
	Fm		9 10 24					
2	e?		19 06 07					e earlier? among irregular waves.
	Lm		19 11 15	15-20				
	Lm		19 16 12	10				
	Lm		19 16 16	10				
	F?							F uncertain.
4	e		21 22 50					In microseisms.
	F?		21 25 31	20				
	F?		21 29 43					
5	e		3 24 27					Do.
	F		3 31 51					
6	Lm		19 06 44					N record masked by microseisms.
	Lm		19 21 31					
	F		19 38 —					
7	O		9 45 45				10,500	
	iPm		9 49 11					
	Sm		10 00 31					
	E		10 06 56					
	eLm?		10 21 13					
	iRm		11 18 53	24				
	Fm		12 07 00					
11	e?		3 58 24					Short periods masked by microseisms.
	i		3 58 59	4				Not detectible on damped component.
	eL?		4 00 00	14				
				9				
	F		4 15 25	7				
14	Lm		15 54 05					
	Lm		15 55 07	15				
	Lm		15 58 43	10				
	F		17 01 —					

Date.	Character.	Phase.	Time.	Period T.	Amplitude.		Distance.	Remarks.
					A _m	A _n		
Massachusetts. Cambridge. Harvard University—Continued.								
1916.			<i>H. m. s.</i>	<i>Sec.</i>	μ	μ	<i>Km.</i>	
Apr. 14	Lm?		18 28 44					Between 14 ^h and 20 ^h , nearly continuous vibrations registered on E component, with periods varying from 8 to 12 secs.
	Lm		18 32 04					
	F?							
14	Lm		20 34 56					
	Lm		20 43 15	9				
	Lm		20 48 47	8				
	Lm		20 54 35	12				
	Lm		21 09 18					
	F		21 18 00					
14	Lm		21 41 56					
	Lm		22 04 39	14				
	Lm		22 11 01	18-20				
	F		22 37 —					
15	e?		12 51 17	8				N record in microseisms.
	i		13 02 24	10				
	i		13 07 22	14				
	Lm		13 52 09	20				Changed E record between 13 ^h 37 ^m and 13 ^h 45 ^m .
	Lm		13 54 42	26				
	Lm		14 17 22	15				F later? in microseisms.
	F?		14 23 51					
16	Op		22 40 07				2,400?	In microseisms.
	ePm?		22 45 10					
	ePm?		22 48 12					
	S		22 49 12	6.4				
	eLm?		22 50 14					
	Lm		22 51 25	12				
	Lm		22 55 56	9				
	Fm		23 11 00					
17	O		18 29 18				260	Not heard from.
	Pm		18 30 09					
	M		18 30 38	1				
	F		18 31 20					
18	O		4 01 43				6,700	
	iPm		4 11 54					
	iPm		4 11 57					
	Pm		4 14 25					
	Sm		4 20 07	6				S with A large to 4 ^h 21 ^m 55 ^s .
	Sm		4 20 10					
	Lm		4 21 42					E undamped.
	eLm		4 31 08					
	Lm		4 34 00	11				
	Lm		4 34 32	13				
	Mm		4 35 00					
	Mm		4 37 00					
	Mm		4 40 00					
	F		6 11 00					
18	e		22 40 08					e earlier in microseisms.
	e		22 42 14	8-10				
21	Op		11 plus					Very distant. Undamped component.
	em		11 46 10	10				Periods variable. Followed by L of variable periods up to 39 ^s . Changed records mainly on N components.
	M?		11 56 51	18				
	M		12 04 52	20				
	F?		13 39 00					
22	Op		20 40 00				557	Local shock. Record shows large amplitude on side of indicator unaccounted for by the suspended wheel contact with the main boom, evidently due to motion of the indicator independently of the pendulum.
	ePm		20 40 27					
	M		20 40 34					
	F		20 40 48					
24	O		4 28 28				2,650	
	Pm		4 31 49					
	ePm		4 31 56					
	Sm		4 36 06					
	eLm		4 39 41	15				
	F		5 42 00					
24	O		8 08 20				3,320	
	Pm		8 08 58					
	ePm		8 09 06					
	i		8 10 23					
	Sm		8 10 31					
	Sm?		8 14 03					
	Sm		8 14 38					
	eLm		8 19 30					
	eLm		8 20 08	20				Later 26, 20. Am 175 micro.
	Mm		8 25 52					
	F		10 10 00					

TABLE 2.—Instrumental reports, April, 1916—Continued.

Date.	Charac-ter.	Phaso.	Time.	Period T.	Amplitude.		Dis-tance.	Remarks.
					A _s	A _N		
Massachusetts. Cambridge. Harvard University—Continued.								
1916.			<i>H. m. s.</i>	<i>Sec.</i>	μ	μ	<i>Km.</i>	
Apr. 25	O		2 21 19				3,730	
	P _N		2 28 17	2				P _N strong.
	F _N		2 28 23					
	S _N		2 29 30	4				
	S _W		2 33 43	7				S in microseisms.
	S _E		2 33 50					
	iL _N		2 36 52					Undamped compo-nent.
	eL _N		2 37 40	20				No decided M _N .
	L _N		2 40 53					
	L _W		2 44 50					
	F		3 43 00					
26	O [?]		5 55 00				14,500	Δ from I.-L.R.I.
	iL _N		6 32 27	2.4				
	L		6 33 48	3.4				
	eL _N		6 38 15					E pendulum drifts E.
	eL _W		6 46 08	20				
	L		6 47 11					
	L _N		6 47 42	15				
	L _W		7 33 06					
	L _N		7 41 46	20-16				L=L.R.I?

Missouri. Saint Louis. St. Louis University. Geophysical Observa-tory. J. B. Goesse, S. J.
 Lat., 38° 38' 15" N.; long., 90° 13' 53" W. Elevation, 100.4 meters. Foundation: 12 feet of tough clay over limestone of Mississippi system, about 300 feet thick.
 Instrument: Wiechert 80 kg. astatic, horizontal pendulum.

Instrumental constants. $\frac{V}{N} \frac{T_0}{7} \frac{e}{5:1}$

Date.	Charac-ter.	Phaso.	Time.	Period T.	Amplitude.	Dis-tance.	Remarks.
1916.			<i>H. m. s.</i>	<i>Sec.</i>	μ	μ	<i>Km.</i>
Apr. 18	II		eS..... 4 11 00				6,000?
			L..... 4 18 45				
			F..... 4 50 00				
24	II		eS..... 4 33 00				3,000?
			L..... 4 38 00				
			F..... 4 53 00				
24	II		eS _W 8 09 00				3,000
			L _W 8 14 30				
			M _W 8 18 00	12		12	
			F..... 8 44 00				
27	II		eP..... 2 28 34				3,100
			S..... 2 33 30				
			L..... 2 35 18				
			F..... 2 59 00				

New York. Buffalo. Canisius College. John A. Curtin, S. J.
 Lat., 42° 53' 02" N.; long., 78° 52' 40" W. Elevation, 190.5 meters.
 Instrument: Wiechert 80 kg. horizontal.

Instrumental constants. $\frac{V}{N} \frac{T_0}{7} \frac{e}{5:1}$

Date.	Charac-ter.	Phaso.	Time.	Period T.	Amplitude.	Dis-tance.	Remarks.
1916.			<i>H. m. s.</i>	<i>Sec.</i>	μ	μ	<i>Km.</i>
Apr. 7	III		eP _s 9 49 45				
			M _s 10 42 00	20		7	
			M _s 10 43 00				
			C _s 10 53 00				
			C _s 10 58 00				
			F _s 11 47 00				
17	III		eP _s 4 10 30				
			eP _s 4 10 35				
			S _s 4 18 30	7.5		87	
			S _s 4 19 35	6.5		175	S _s and S _w are of ex-trordinary amplitu-de compared with M _s and M _w .
			M _s 4 30 00	15		25	
			M _w 4 30 15	15		37	
			F _s 5 20 00				
			F _w 5 20 00				
24	III		eP _s 4 31 30				
			iP _s 4 31 35				
			S _s 4 36 00				
			S _w 4 36 00				
			M _s 4 43 00	17		18	
			M _w 4 44 00	16		20	
			C _s 4 47 00				
			C _w 4 48 00				
			F _s 5 08 00				
			F _w 5 10 00				

Reported from Santo Domingo, Haiti.

Date.	Charac-ter.	Phaso.	Time.	Period T.	Amplitude.	Dis-tance.	Remarks.
New York. Buffalo. Canisius College—Continued.							
1916.			<i>H. m. s.</i>	<i>Sec.</i>	μ	μ	<i>Km.</i>
Apr. 24	III		eP _s 8 08 15				
			iP _s 8 08 20				
			S _s 8 13 25				
			S _w 8 13 30				
			L _s 8 16 00				
			L _w 8 16 15				
			M _s 8 20 00	24		50	
			M _w 8 21 00	20		87	
			C _s 8 25 00				
			C _w 8 26 00				
			F _s 9 12 00				
			F _w 9 13 00				
24	II?		M _s 16 10 25			6	
			M _w 16 10 40		2		P and S masked by microseisms.
26	III		iP _s 2 27 15				
			eP _s 2 27 45				
			M _s 2 34 15				
			M _w 2 34 45				
			C _s 2 42 00				
			C _w 2 43 00				
			F _s 3 27 00				
			F _w 3 28 00				
26	III		eP _s 6 39 00				
			eP _s 6 40 15				
			M _s 6 43 15	15		4	
			S _s 6 44 15				
			C _s 6 46 00				
			M _w 6 46 10	20		12	
			C _w 6 47 00				
			F _s 6 50 00				
			F _w 6 52 00				

New York. Fordham. Fordham University. W. C. Repetti, S. J.
 Lat., 40° 51' 47" N.; long., 73° 53' 08" W. Elevation, 23.9 meters.

Instrument: Wiechert, 80 kg.

Instrumental constants. $\frac{V}{N} \frac{T_0}{72} \frac{e}{7.2 \frac{1.5:1}{7.2 \ 3.3:1}}$

Date.	Charac-ter.	Phaso.	Time.	Period T.	Amplitude.	Dis-tance.	Remarks.
1916.			<i>H. m. s.</i>	<i>Sec.</i>	μ	μ	<i>Km.</i>
Apr. 21							Out of service.
24			iP _s 4 27 05				E-W component not working.
			iS _s 4 31 18				
			eL _w 4 34 13	18			
			M _w 4 39 36	14		16	
			F _w 4 59 00				
24			iP _s 8 04 11				E-W component not working.
			PRi _s 8 05 18	4			
			iS _s 8 09 33				
			SRi _s 8 10 37	22		37	
			eL _w 8 13 07				
			M _w 8 18 44	16		75	
			F _w 9 00 00				
26			eP _s 2 23 28				
			eP _s 2 23 36				
			iS _s 2 31 44				
			iS _s 2 31 44				
			L _s 2 34 16				
			L _w 2 35 16				
			M _w 2 37 56	22		33	
			M _s 2 38 13	22		49	
			F _s 2 53 00				
			F _w 2 55 00				
26			L _w 6 40 17	15			
26			iP _s 7 20 17				
			L _w 7 24 53				
			F _w 7 40 00				

TABLE 2.—Instrumental reports, April, 1916—Continued.

Date.	Character.	Phase.	Time.	Period T.	Amplitude.		Distance.	Remarks.
					A _m	A _N		
<p>New York. <i>Ithaca. Cornell University.</i> Heinrich Ries.</p> <p>Lat., 42° 28' 58" N.; long., 76° 29' 09" W. Elevation, 242.6 meters.</p> <p>Instruments: Two Bosch-Omori, 25 kg., horizontal pendulums (mechanical registration).</p> <p>Instrumental constants. $\begin{matrix} V & T_0 & e \\ \sqrt{E} & 13 & 22 & 4.1 \\ \sqrt{N} & 14 & 25 & 4.1 \end{matrix}$</p>								
1916.								
Apr. 7								Microseisms.
	eP _m		9 48 18	4-5				
	eL _m		10 28 00	16-20				
	eL _N		10 37 17	20				
	eN _m		10 58 00					
	F _m		11 44 00					
11	L _m		3 57 40					Microseisms.
	L _N		3 57 47	17-8				
	F _m		4 03 00					
	F _N		4 03 30					
18	eN _m		22 46 51	4-9				
	F _N		22 59 00					
18	F _m		4 11 23					Beginning of L indistinct.
	F _N		4 11 26	3-4				
	S _m		4 19 22	10	100			
	S _N		4 19 24	8	146			
	eL _m		4 29 15	8				
	F _m		5 14 00					
	F _N		5 18 30					
24	F _m		4 31 52					E-W record poor because of badly sooted paper.
	S _m		4 32 13	3-5				
	eL _N		4 36 15	9	71			
	F _N		4 40 02	23-12	107			
24	F _m		8 08 39	5				E-W record poor.
	PRI _N		8 09 49	5-8	64			
	S _m		8 14 05	5-16	107			
	eL _N		8 18 45	30				
	M _m		8 24 19	16	550			
	F _m		9 21 00					
26	F _m		2 27 55	3				
	S _m		2 28 35					
	S _N		2 33 17	8				
	L _m		2 35 20	35-14				
	L _N		2 36 06	23				
	M _m		2 42 26	18	143			
	F _m		3 08 00					
	F _N		3 28 00					
26	eN _m		6 33 08	8				
	L _m		6 38 02	22				
	L _N		6 44 00	21				
	F _m		6 57 00					
	F _N		7 08 00					
26	eN _m		7 23 44	9				
	L _m		7 28 20	24				
	L _N		7 34 34	21				
	M _m		7 38 11	15	21			
	F _m		7 48 00					
	F _N		8 05 00					

Panama Canal Zone. *Balboa Heights.* Isthmian Canal Commission.

Lat., 8° 57' 39" N.; long., 79° 33' 29" W. Elevation, 27.6 meters.

Instruments: Two Bosch-Omori 100 kg.

Instrumental constants. $\begin{matrix} V & T_0 \\ \sqrt{E} & 10 & 20 \end{matrix}$

Date.	Character.	Phase.	Time.	Period T.	Amplitude.		Distance.	Remarks.
					A _m	A _N		
1916.								
Apr. 12								Direction N. W.?
	P		18 45 23					
	L		18 46 52					
	M		18 47 00		50			
	M		18 47 07		80			
	F		18 49 56					
18	L _m		4 24 10					Distance and direction?
	L _N		4 24 14					
	M _m		4 24 26		50			
	M _N		4 24 30		300			

Date.	Character.	Phase.	Time.	Period T.	Amplitude.		Distance.	Remarks.
					A _m	A _N		
<p>Panama Canal Zone. <i>Balboa Heights—Continued.</i></p>								
1916.								
Apr. 24								Direction NW.?
	P		4 30 00					
	L		4 32 28					
	M _N		4 32 50		200			
	M _m		4 32 53		180			
	F		4 38 20					
24	P _m		8 02 30				764	Direction NW.?
	S _m		8 02 51					No record on N-S, pen thrown off recording drum.
	L _m		8 04 10					
	M _m		8 04 30		5600			
	F		8 36 00					
26	P		2 22 36				401	Direction NW.?
	L _N		2 23 24					
	L _m		2 23 28					
	M _m		2 27 51		7500+			Pen went off sheet.
	M _N		2 28 00		7200+			Pen went off sheet.
	F _m		2 44 00					
	F _N		2 50 04					
26	P		5 41 25				473	Direction NW.?
	L		5 42 25					
	M _N		5 42 40		80			
	M _m		5 42 57		50			
	F _m		5 45 50					
	F _N		5 46 00					
26	P		6 26 43				518	Direction NW.?
	L _m		6 27 47					
	L _N		6 27 51					
	M _m		6 28 12		350			
	M _N		6 28 25		500			
	F _m		6 40 00					
	F _N		6 40 20					
26	P		7 17 20				663	Direction NW.?
	L _N		7 18 44					
	L _m		7 18 48					
	M _N		7 19 28		1700			
	M _m		7 20 44		1600			
	F _m		7 34 10					
	F _N		7 35 00					
26	P		12 41 56				489	Direction NW.?
	L _N		12 42 56					
	L _m		12 43 00					
	M _m		12 43 35		400			
	M _N		12 43 50		300			
	F		12 51 55					

Porto Rico. *Vieques. Magnetic Observatory.* U. S. Coast and Geodetic Survey. H. M. Pease.

Lat., 18° 09' N.; long., 65° 27' W. Elevation, 19.8 meters.

Instruments: Two Bosch-Omori.

Instrumental constants. $\begin{matrix} V & T_0 \\ \sqrt{E} & 10 & 21.4 \\ \sqrt{N} & 10 & 21.1 \end{matrix}$

Date.	Character.	Phase.	Time.	Period T.	Amplitude.		Distance.	Remarks.
					A _m	A _N		
1916.								
Apr. 18								No well-defined phases.
	eP _N		4 13 07	6				
	S _N		4 23 37	8				
	M _N		4 24 00		110			
	eS _m		4 24 27	5				
	M _m		4 25 05		120			
	F _m		5 10 00					
24	P _m		4 27 23	2				Reported to have been felt in Vieques, Porto Rico, and San Domingo. Record of N. was accidentally burned.
	L _m		4 27 55	9				
	M _m		4 28 15	8	1,300			
	C _m		4 35 00	5				
	F _m		4 49 00					
24	P _m		8 06 29					Record of N. was accidentally burned.
	S _m		8 10 31	12				
	L _m		8 11 53	24				
	M _m		8 13 01	20	1,340			
	C _m		8 23 00	10				
	F _m		8 40 00					
26	P _m		2 26 18	4				Times uncertain because of defective time of marking device.
	F _m		2 26 38	3				
	L _m		2 29 44	20				
	L _N		2 30 24	20				
	M		2 30 35	12	200	250		
	C		2 35 00	13				
	F		2 50 00					

TABLE 2.—Instrumental reports, April, 1916—Continued.

Date.	Charac-ter.	Phase.	Time.	Period T.	Amplitude.		Dis-tance.	Remarks.
					A _s	A _N		

Vermont. Northfield. U. S. Weather Bureau. Wm. A. Shaw.

Lat., 44° 10' N.; long., 72° 41' W. Elevation, 256 meters.

Instruments: Two Bosch-Omorl, mechanical registration.

Instrumental constants: $\begin{matrix} V & T_1 \\ E & 10 & 15 \\ N & 10 & 16 \end{matrix}$

1916.			H. m. s.	Sec.	μ	μ	Km.	
Apr. 2	e _m		8 36 20	12				
	L		8 42 20					
	F		9 00 00					
2	L?		19 03 20					
	F		19 10 00					
6	L		19 20 10					
	F		19 30 00					
7	e		9 45 42					
	ST		9 45 22					
	L		10 08 25	16				
	L		10 38 30					
	L		10 44 30					
	L		10 50 20					
	F		11 30 00					
eL		3 58 34	10					
F		4 15 00						
15	e		12 51 23	12				
	L		14 05 00					
	F		14 15 00					
16	e _m ?		22 42 06					Phases indetermi- nate.
	F		23 10 00					
18	P		4 11 44			6,225		
	S		4 19 32					
	L		4 28 30	8				
	L		4 38 30					
	F		6 10 00					
P?		11 49 35						
S		11 55 45						
21	L		12 03 33	14				
	F		13 00 00					
	P		4 32 15				2,690	
	S		4 36 35					
24	L		4 41 00	14				
	F		5 30 00					
	P		8 09 10				3,700	
	S		8 14 40					
24	L		8 19 30					
	M		8 26 00		2,300			Undamped pendu- lum.
	F		9 30 00					
	P		2 28 30			3,420		
26	S		2 33 42	24				
	L		2 36 50					
	F		3 30 00					
	P?		6 32 36					
26	ST		6 38 22	14				
	L		6 46 28					
	F		7 10 00					
	P?		7 23 08					
26	ST		7 28 50					
	L		7 36 20					
	F		8 00 00					
	e		12 49 12					Phases uncertain.
F		12 52 00						

Canada. Ottawa. Dominion Astronomical Observatory. Earthquake Station. Otto Klotz.

Lat., 45° 23' 38" N., long., 75° 42' 57" W. Elevation, 83 meters.

Instruments: Two Bosch photographic horizontal pendulums, one Spindler & Hoyer 80 Kg. vertical seismograph.

Instrumental constants: 120 25

1916.			H. m. s.	Sec.	μ	μ	Km.
Apr. 2	e		8 39 43	14			
	L		8 41 00				
	F		9 10 00				

Date.	Charac-ter.	Phase.	Time.	Period T.	Amplitude.		Dis-tance.	Remarks.
					A _s	A _N		

Canada. Ottawa. Dominion Astronomical Observatory—Continued.

1916.			H. m. s.	Sec.	μ	μ	Km.			
Apr. 2	e _m		19 01 19							
	i		19 03 20							
	e _m		19 06 20	10						
	L		19 14 33							
	L		19 14 40							
	L		19 16 00							
	L		19 17 00							
F		19 25 00								
6	L		19 18 36		20					
	L		19 20 00							
	F		19 35 00							
6	eL _m		20 52 24	14						
	L		20 53 00							
	F		21 00 00							
7	e		9 45 40							
	i		9 48 34							
	eL _m ?		10 02 24	40						
	eL _m ?		10 07 30							
	L		10 12 00							
	L		10 32 00							
	L		10 47 00							
	L		10 51 00							
	L		11 01 00							
	L		11 19 00							
	L		11 22 00							
L		11 27 00								
F		11 40 00								
11	eL		3 57 00	14						
	F		4 15 00							
14	e _m		20 33 48	20			6,000?			
	i		20 38 09							
	i		20 43 50							
	L		20 52 00							
	L		20 57 00							
	F		21 10 00							
14	e _m		21 48 10	24			6,000?			
	eL _m		22 03 00							
	L		22 06 00							
	L		22 09 00							
	L		22 18 00							
	L		22 30 00							
	F		22 30 00							
15	i		12 53 34	20			20,000?			
	L		13 05 07							
	L		13 23 00							
	L		13 39 59							
	L		13 44 30							
	L		13 49 00							
	L		13 52 00							
	L		13 56 00							
	L		14 04 00							
	F		14 35 00							
16	e _m		22 42 12	2						
	L		22 47 00							
	L		22 48 00							
	L		22 49 00							
	L		22 50 00							
	F		23 10 00							
	18	O			4 01 38	48			6,250	
		IP			4 11 28					
		IS			4 19 13					
		eL			4 28 06					
M			4 33 42							
L			4 40 00							
L			4 50 00							
L			5 03 00							
21	L		5 19 00	11-12						
	F		6 05 00							
	e		11 49 12		12			10,000?		
	L		11 55 31							
	L		11 55 40							
	L		11 56 13							
	e		12 03 00							
L		12 06 00								
L		12 08 00								
21	eL		12 15 24	40						
	L		12 35 00							
	L		12 41 00							
	L		12 45 00							
	L		12 54 00							
	L		13 02 00							
	L		13 12 00							
	F		13 30 00							

Traces of distur-
bance from 4^h 45^m
on, till merged in
this. No marked
maximum.

TABLE 2.—Instrumental reports, April, 1916—Continued.

Date.	Charac-ter.	Phase.	Time.	Period T.	Amplitude.		Dis-tance.	Remarks.
					A _m	A _n		
Canada. Ottawa. Dominion Astronomical Observatory—Concluded.								
1916.			<i>H. m. s.</i>	<i>Sec.</i>	μ	μ	<i>Km.</i>	
Apr. 24	O		4 26 32				2,930	
	P		4 32 22	2				
	S		4 37 00	6-8				
	L _n		4 40 06	20				
	L _w		4 40 48	20				
	F		5 50 00					
24	O		8 08 08				3,840	
	P		8 09 14					
	S		8 14 52					
	L _n		8 18 30	30				
	L _w		8 18 42	40				
	L _w		8 20 00	40				
	M _n		8 22 00	20	100			
	M _w		8 26 18	16		280		
	L		8 40 00	15				
	L		8 49 00	15				
	L		9 02 00	13				
	F		10 00 00					
VERTICAL.								
	L		8 25 38					
	L		8 25 00	19				
	L		8 27 00	14				
	F		8 30 00					
24	P		16 08 17				220	Local quake.
	S		16 08 41					
	F		16 09 20					
VERTICAL.								
	P		16 08 16					
	S		16 08 40					
	F		16 09 14					
26	i		2 29 18					Record from "De-formation" in-strument whose scale is 17 mm. to hour. No sheet on seismograph for Apr. 25 (Apr. 25-26).
	i		2 30 18					
	i _w		2 33 00					
	i _w		2 34 30					
26	i _w		6 34 00					
	i _w		6 38 21					
26	i _w		7 25 00					
	i _w		7 29 48					

Canada. Toronto. Dominion Meteorological Service.
 Lat., 43° 40' 01" N.; long., 79° 23' 54" W. Elevation, 113.7 meters. Subsoil: Sand and clay.
 Instrument: Milne horizontal pendulum, North. In the meridian.
 Instrumental constant. . 18. Pillar deviation, 1 mm. swing of boom=0.59".

Date.	Charac-ter.	Phase.	Time.	Period T.	Amplitude.		Dis-tance.	Remarks.
					A _m	A _n		
1916.			<i>H. m. s.</i>	<i>Sec.</i>	μ	μ	<i>Km.</i>	
Apr. 2	L		8 40 42					P and S not recorded.
	M		8 41 00		*600			
	FT		8 56 36					
6	L		19 22 06		*50			
	F							
7	P		9 45 36					Dual?
	e		9 49 12					
	i		9 59 36					
	L		10 13 30					
	L		10 36 24					
	L		10 42 30					
	L		10 49 54					
	M		10 51 48		*1200			
	L		11 22 06					
	L		11 30 36					
	M		11 34 54		*1300			
	F		12 46 48					
7	e		15 56 54		*50			
	F		15 59 48					

* Trace amplitude.

Date.	Charac-ter.	Phase.	Time.	Period T.	Amplitude.		Dis-tance.	Remarks.
					A _m	A _n		
Canada. Toronto. Dominion Meteorological Service—Continued.								
1916.			<i>H. m. s.</i>	<i>Sec.</i>	μ	μ	<i>Km.</i>	
Apr. 11	L		3 58 48					
	F		3 58 54					
14								Apr. 14 missed an earthquake. Visitors in seismograph room from 20 ^h 30 ^m to 21 ^h 04 ^m inter-ferred with registra-tion.
14	L		22 06 00					
	F		22 42 48		*200			
			22 43 54					
15	i		13 11 12					Prolonged L waves. Earthquake, Canary Islands.
	i		13 34 48					
	L		13 51 18					
	M		14 05 36		*500			
	L		14 18 06					
	L		14 25 24					
	L		14 35 54					
	F		14 50 18					
16	L		22 52 48					
	L		22 54 18					
	L		23 51 06		*200			
	FT		0 13 48					
18	eP		4 11 24				6,216	Marked quake. Phases well de-fined.
	iP		4 15 18					
	iS		4 19 12					
	iS		4 25 00					
	L		4 29 48					
	M		4 40 42		*1,400			
	L		4 50 00					
	M		4 54 54		*1,200			
	L		5 50 48					
	L		6 32 30					
	F		7 02 00					
21	P?		11 49 48				5,550?	Marked quake.
	iS		11 57 00					
	iS		12 03 06					
	i		12 06 30					
	L		12 14 12					
	M		12 20 36		*1,500			
	L		12 58 00					
	F		13 52 24					
24	iP		4 32 18				2,908	Phases well defined.
	iS		4 36 54					
	L		4 38 24					
	M		4 38 54		*1,800			
	L		4 42 54					
	F		5 24 00					
24	P?		8 00 54				3,710	Marked quake.
	eP		8 12 42					
	iS		8 15 24					
	L		8 17 24					
	L		8 21 00					
	M		8 23 00		*11,000			
	L		8 24 06					
	M		8 25 36		*7,700			
	L		8 26 30					
	M		8 29 36		*6,000			
	i		8 44 54					
	F		11 22 00					
26	iS		2 33 12					
	L		2 35 36					
	L		2 38 36					
	L		2 40 12					
	M		2 41 12		*11,000			
	M		2 43 48		*8,300			
	L		2 46 48					
	L		2 52 36					
	L		2 54 42					
	F		4 43 00					
26	e		6 39 48					Dual.
	L		6 43 06					
	M		6 46 12		*800			
26	e		7 30 24					F and S merged into previous quake.
	iL		7 33 18					
	M		7 39 30		*800			
	F		8 28 30					

* Trace amplitude.

TABLE 2.—Instrumental reports, April, 1916—Concluded.

Date.	Charac-ter.	Phase.	Time.	Period T.	Amplitude.		Dis-tance.	Remarks.
					A _W	A _N		

Canada. Victoria, B. C. Dominion Meteorological Service.

Lat., 48° 24' N.; long., 123° 19' W. Elevation, 67.7 meters. Subsoil: Rock.

Instrument: Wiechert, vertical; Milne horizontal pendulum, North. In the meridian

Instrumental constant. T_0 . Pillar deviation, 1 mm., swing of boom=0.54".

1916.		H. m. s.	Sec.	μ	μ	Km.
Apr. 2	P	8 22 55				830
	S	8 23 25				
	L	8 23 55				
	M	8 24 40		*1,200		
	F	8 31 51				

VERTICAL.

	P	S	L	M	F	Sec.	A _N	Km.
6		8 24 10	8 24 10	8 24 35	8 24 58		8-10	640
		19 03 53	19 04 13	19 04 13	19 04 28		10	180?
		19 04 13	19 04 13	19 04 28	19 06 51			*200
		19 06 53	19 06 53	19 06 53	19 18 51			
		10 04 23	10 10 49	10 10 49	10 10 59			

VERTICAL.

	P	S	L	M	F	Sec.	A _N	Km.
7		10 04 38	10 09 29	10 16 54	10 50 00			3,070
		10 54 57	10 59 25	11 06 22	11 51 29			3,190?
		16 12 06	16 19 36	3 39 27	3 40 57			*2,000
		3 41 27	3 45 27	3 41 27	3 45 27			*50
		20 52 36	20 54 06	21 02 06	21 54 06			*200

VERTICAL.

	P	S	L	M	F	Sec.	A _N	Km.
7		10 04 38	10 09 29	10 16 54	10 50 00			3,070
		10 54 57	10 59 25	11 06 22	11 51 29			3,190?
		16 12 06	16 19 36	3 39 27	3 40 57			*2,000
		3 41 27	3 45 27	3 41 27	3 45 27			*50
		20 52 36	20 54 06	21 02 06	21 54 06			*200

*Trace amplitude.

Date.	Charac-ter.	Phase.	Time.	Period T.	Amplitude.		Dis-tance.	Remarks.
					A _W	A _N		

Canada. Victoria, B. C. Dominion Meteorological Service—Continued.

1916.		H. m. s.	Sec.	μ	μ	Km.
Apr. 15	P	13 33 37				4,220
	S	13 39 37				
	L	13 47 07				
	M	13 51 07		*200		
	F	?				
15	L	14 38 07				
	M	14 40 37				
	F	15 33 07		*300		
16	P	22 45 11				
	L	22 47 11				
	M	22 48 11		*400		
	F	23 00 11				
18	P	4 07 36				530
	S	4 08 34				
	L	4 12 04				
	M	4 16 56		*1500		
	F	4 54 18				

VERTICAL.

	P	S	L	M	F	Sec.	A _N	Km.
21		?	4 12 06	4 18 51	?		2-3	
		11 43 01	11 51 57	11 51 57	13 07 19		7	
		11 51 57	11 51 57	11 51 57	13 07 19		7	
		11 51 57	11 51 57	11 51 57	13 07 19			*1100
		13 07 19	13 07 19	13 07 19	13 07 19			

VERTICAL.

	P	S	L	M	F	Sec.	A _N	Km.
24		11 43 30	11 52 10	4 42 35	4 44 35		2-3	440
		4 42 35	4 44 35	4 46 35	4 48 35		7	1,120
		4 46 35	4 48 35	4 48 35	5 34 35			*400
		5 34 35	5 34 35	5 34 35	5 34 35			
		8 10 54	8 19 45	8 31 35	8 40 53			

VERTICAL.

	P	S	L	M	F	Sec.	A _N	Km.
24		8 10 54	8 19 45	8 31 35	8 40 53			7,425
		8 19 45	8 31 35	8 40 53	9 59 55			*1500
		9 59 55	9 59 55	9 59 55	9 59 55			
		8 11 30	8 30 20	8 52 30	8 42 00			7,600
		8 30 20	8 52 30	8 42 00	8 42 00			7

VERTICAL.

	P	S	L	M	F	Sec.	A _N	Km.
28		2 32 36	2 41 27	2 45 52	2 59 39			7,425
		2 41 27	2 45 52	2 59 39	3 45 23			*1200
		3 45 23	3 45 23	3 45 23	3 45 23			
		6 58 31	7 04 54	7 13 55	7 49 48			*300
		7 04 54	7 13 55	7 49 48	7 53 15			*200

*Trace amplitude.

TABLE 3.—Late seismological reports. (Instrumental.)

Date.	Charac-ter.	Phase.	Time.	Period T.	Amplitude.		Dis-tance.	Remarks.
					A _N	A _W		
Canada. Toronto. Dominion Meteorological Service.								
Lat., 43° 40' 01" N.; long., 79° 23' 54" W. Elevation, 113.7 meters. Subsoil: Sand and clay.								
Instrument: Milne horizontal pendulum, North. In the meridian.								
Instrumental constant. . 18. Pillar deviation, 1 mm. swing of boom=0.59".								
1916.								
Mar. 1		L.	19 52 30					
		M.	19 55 12		*200			
		F.	20 03 24					
4		eP.	8 12 24					
		L.	8 15 36					
		L.	8 21 54					
		M.	8 25 54		*300			
		F.	8 50 30					
12		S?	7 44 30					P not visible, S doubtful.
		L.	7 45 42					
		L.	7 50 18					
		M.	7 53 24		*300			
		F.	8 06 00					
16		L.	23 00 42					
		L.	23 03 00					
		M.	23 03 00		*300			
		F.	23 09 36					
19		eL.	13 08 48					
		L.	13 14 18					
		M.	13 16 18		*200			
		F.	13 26 18					
26								A quake lost, clocks stopped on 25th until 18 ^h of 26th.
28		o.	7 56 12					
		eL.	7 57 42		*200			
		F.	8 12 00					
29		S.	19 09 06					A minute vibration precedes 19 ^h 9 ^m 6 ^s , but impossible to measure.
		L.	19 11 36					
		M.	19 15 30		*200			
		F.	19 31 54					
31		L.	11 28 42					Boom much steadier at 11 ^h 29 ^m 48 ^s .
		L.	11 31 24					
		M.	11 31 24		*900			
		F.	11 58 36					
31		L.	16 35 42		*50			
		F.	16 36 42					
31		L.	16 55 12		*100			
		F.	16 58 12					

* Trace amplitude.

Canada. Victoria, B. C. Dominion Meteorological Service.
 Lat., 48° 24' N.; long., 123° 19' W. Elevation, 67.7 meters. Subsoil: Rock.
 Instrument: Wiechert, vertical; Milne horizontal pendulum, North. In the meridian.
 Instrumental constant. . 18. Pillar deviation, 1 mm. swing of boom=0.54".
 Reports for first half of February published in WEATHER REVIEW for February, 1916.

Date.	Charac-ter.	Phase.	Time.	Period T.	Amplitude.		Dis-tance.	Remarks.
					A _N	A _W		
1916.								
Feb. 15		P.	11 40 06					
		S.	11 43 48					
		L.	11 45 48					
		M.	11 46 48		*6000			
		F.	12 41 48					
20		P.	17 50 36					1,910
		S.	17 53 54					
		L.	17 58 06					
		M.	18 14 54		*1500			
		F.	19 49 12					
22		P.	19 21 36					22d local tremor felt at 4 a. m. in city, not recorded.
		S.	19 22 06					
		M.	19 22 24		*300			
		F.	19 24 18					
27		P.	20 30 24					4,980
		S.	20 37 00					
		L.	20 43 00					
		M.	20 55 30		*8000			
		F.	22 43 00					
VERTICAL.								
		P.	20 51 00					
		S.	20 58 00					
		L.	20 44 10					
		M.	20 58 00		30			
		F.						

Date.	Charac-ter.	Phase.	Time.	Period T.	Amplitude.		Dis-tance.	Remarks.
					A _N	A _W		
Canada. Victoria, B. C. Dominion Meteorological Service—Continued.								
1916.								
Mar. 1								
4		P.	7 39 25					8,210
		S.	7 48 55					
		L.	7 54 22					
		M.	7 57 51		*1,000			
		F.	8 27 36					
12		P.	7 48 28					1,420?
		S.	7 50 57					
		L.	7 54 25					
		M.	7 59 53		*400			
		F.	8 10 54					
15		P.	22 40 06					500
		S.	22 41 06					
		L.	22 42 35					
		M.	22 44 34		*1500			
		F.	22 51 30					
19		P?						
		S.	12 49 05					
		L.	12 52 04					
		M.	13 03 30		*200			
		F.	13 19 50					
26			{ 0 46 30 }					{ There appears a thickening, but impossible to measure.
			{ 0 34 30 }					
28		P.	7 36 25					450
		S.	7 37 15					
		L.	7 38 25					
		M.	7 39 10		*500			
		F.	7 48 55					
29		P.	19 20 58					
		S.	19 22 58					
		L.	19 24 18					
		M.	19 24 28		*200			
		F.	19 27 58					
31		P.	11 11 24					400
		S.	11 12 08					Probably off Vancouver Island.
		L.	11 12 53					
		M.	11 13 23		*4500			
		F.	11 26 17					
VERTICAL.								
		P.	11 11 39		2			460
		S.	11 12 25		5			86
		L.	11 12 50		7-10			
		M.	11 13 25		6			
		F.	11 32 35					
31		P.	16 35 57					500
		S.	16 38 02					
		L.	16 38 41					
		M.	16 39 01		*600			
		F.	16 44 08					
VERTICAL.								
		P.	16 37 45		2			380
		S.	16 38 20		4			
		L.	16 38 45		2-3			
		M.	16 39 00		7-8			17
		F.	16 42 00					

* Trace amplitude.

SEISMOLOGICAL DISPATCHES.¹

Fuerteventura, Canaries, Apr. 15, 1916 (via Paris, Apr. 20, 1916).
 An earthquake lasting 12 seconds rocked the houses of this island to-day. The shock was accompanied by loud grumbings, and terrified the population. The damage was small. (*Assoc. Press.*)
Santo Domingo, Dominican Republic, Apr. 24, 1916.
 A severe earthquake occurred here at 11:30 o'clock last night. No damage was caused. (*Assoc. Press.*)
San Juan, P. R., Apr. 24, 1916.
 An earthquake lasting 10 seconds occurred at 12:30 o'clock this morning. No damage was done. (*Assoc. Press.*)
Boise, Idaho, Apr. 29, 1916.
 A distinct earthquake shock was felt here at 8:18 o'clock to-night. The wave proceeded from east to west. No damage has been reported. (*Assoc. Press.*)
Boise, Idaho, Apr. 30, 1916.
 A slight earthquake shock was felt here to-night at 8:20 p. m. It was especially noticeable to occupants of office buildings. (*United Press.*)

¹ Reported by the

SECTION V.—SEISMOLOGY.

SEISMOLOGICAL REPORTS FOR MAY, 1916.

By W. J. HUMPHREYS, Professor in Charge.

[Dated: Weather Bureau, Washington, D. C., June 30, 1916.]

TABLE 1.—Non-instrumental earthquake reports, May, 1916.

Day.	Approximate time, Greenwich Civil.	Station.	Approximate latitude.	Approximate longitude.	Intensity Rossi-Forel.	Number of shocks.	Duration.	Sounds.	Remarks.	Observer.
CALIFORNIA.										
1916.	<i>H. m.</i>		<i>° ' "</i>	<i>° ' "</i>			<i>M. s.</i>			
2	14 28	Camp Baldy.....	34 15	117 40	.....	1	.....	.....	.....	C. T. McCulloch.
	14 28	Claremont.....	34 07	117 44	.....	2	.....	.....	.....	S. H. Brackett.
	14 28	Los Angeles.....	34 03	118 15	.....	3	0 5	.....	.....	U. S. Weather Bureau.
3	0 30	Salinas.....	36 36	122 40	.....	.....	.....	.....	.....	Ruth Abbott.
25	4 23	Brawley.....	32 59	115 40	.....	1	.....	.....	.....	M. D. Witter.
IDAHO.										
13	1 00	Elk City.....	45 48	115 25	3	1	0 1	.....	A distinct rock.....	Richard E. Moses.
	2 00	Lowman.....	44 08	115 41	2	1	.....	.....	.....	Joseph Robertson.
	2 35	Idaho City.....	43 34	115 58	5	2	.....	.....	.....	A. G. Stocks.
	2 35	Loon Creek.....	44 17	114 42	3	1	10	.....	.....	Alban Williams.
14	5 30	Elk City.....	45 48	115 25	3	1	1	.....	A distinct rock.....	Richard E. Moses.
26	6 36	Boise.....	43 37	116 14	3	2	4	.....	.....	U. S. Weather Bureau.
	6 36	Idaho City.....	43 34	115 58	5	2	2	.....	.....	Jess Cullison.
	6 36	L'ayette.....	44 05	116 56	4	1	2	Rattling.....	.....	E. F. Allen.
ILLINOIS.										
21	18 24	Cairo.....	37 00	89 10	3	1	0 5	.....	.....	J. F. McGruder.
MISSOURI.										
21	18 45	New Madrid.....	36 35	89 32	4	1	0 1	Rumbling.....	.....	Josie G. Smith.
WISCONSIN.										
31	22 45	Madison.....	43 05	89 21	2	2	0 20	.....	.....	Mrs. Eric R. Miller.
PORTO RICO.										
13	6 00	Aibonito.....	18 08	66 17	5	2	.....	.....	.....	D. Jordan.
14	13 25	Aibonito.....	18 08	66 17	5	1	.....	.....	.....	D. Jordan.

TABLE 2.—Instrumental reports, May, 1916.

[Time used: Mean Greenwich, midnight to midnight. Nomenclature: International.]

[For significance of symbols see REVIEW for January, 1916, p. 39.]

Date.	Charac-ter.	Phase.	Time.	Period. T.	Amplitude.		Dis-tance.	Remarks.
					A _m	A _N		
Alaska.	<i>Sitka.</i>	<i>Magnetic Observatory.</i>	U. S. Coast and Geodetic Survey. J. W. Green.					
Lat. 57° 03' 00" N.; long., 135° 30' 06" W. Elevation, 15.2 meters.								
Instruments: Two Bosch-Omori, 10 and 12 kg.								
$\text{Instrumental constants} \begin{cases} E & \frac{V}{N} \\ & \frac{T_0}{10} \end{cases} \begin{matrix} 10 \\ 10 \end{matrix} \begin{matrix} 18.7 \\ 15.4 \end{matrix}$								
(No earthquakes recorded in May, 1916.)								
Arizona.	<i>Tucson.</i>	<i>Magnetic Observatory.</i>	U. S. Coast and Geodetic Survey. F. P. Ulrich.					
Lat. 32° 14' 48" N.; long., 110° 59' 06" W. Elevation, 769.6 meters.								
Instruments: Two Bosch-Omori, 10 and 12 kg.								
$\text{Instrumental constants} \begin{cases} E & \frac{V}{N} \\ & \frac{T_0}{10} \end{cases} \begin{matrix} 10 \\ 10 \end{matrix} \begin{matrix} 16 \\ 19.6 \end{matrix}$								
1916.			<i>H. m. s.</i>	<i>Sec.</i>	<i>μ</i>	<i>μ</i>	<i>Km.</i>	
May 11			P _S	10 07 14	4	.....	.....	Times on N doubtful.
			P _N	10 08 11	3	.....	.....
			L _m	10 08 40	10	.....	.....
			L _N	10 08 58	11	380	.....
			M _m	10 09 20	9	.....	.....
			M _N	10 09 34	10	.....	230	
			C _m	10 17 00	8	.....	.....
			F _m	10 30 00	8	.....	.....
			F _N	10 51 00	6	.....	.....
26			L _m	21 01 50	10	.....	.....	Barely perceptible on N.
			M _m	21 03 43	6	20	.....
			C _m	21 04 27	.....	.....	.....
			F _m	21 08 00	6	.....	.....

Date.	Charac-ter.	Phase.	Time.	Period. T.	Amplitude.		Dis-tance.	Remarks.
					A _m	A _N		
California. <i>Berkeley.</i> <i>University of California.</i>								
Lat. 37° 32' 16" N.; long., 122° 15' 37" W. Elevation, 85.4 meters.								
(See Bulletin of the Seismographic Stations, University of California.)								
California. <i>Mount Hamilton.</i> <i>Lick Observatory.</i>								
Lat., 37° 20' 24" N.; long., 121° 38' 34" W. Elevation, 1,281.7 meters.								
(See Bulletin of the Seismographic Stations, University of California.)								
California. <i>Point Loma.</i> <i>Raja Yoga Academy.</i> F. J. Dick.								
Lat., 32° 43' 03" N.; long., 117° 15' 10" W. Elevation, 91.4 meters.								
Instrument: Two-component, C. D. West seismoscope.								
1916.			<i>H. m. s.</i>	<i>Sec.</i>	<i>μ</i>	<i>μ</i>	<i>Km.</i>	
May 3			*100	*200	.....	Light tremors re-corded during 24 hours preceding 3 p. m. on dates given.
7			*200	*200	.....
9			*100	*100	.....
17			*100	*100	.....
27			*100	*100	.....
*Amplitude on instrument.								
California. <i>Santa Clara.</i> <i>University of.</i> J. S. Ricard, S. J.								
Lat., 37° 26' 30" N.; long., 121° 57' 03" W. Elevation, 27.43 meters.								
(See Record of the Seismographic Station, University of Santa Clara.)								

TABLE 2.—Instrumental reports—Continued.

Date.	Charac- tor.	Phase.	Time.	Period. T.	Amplitude.		Dis- tance.	Remarks.
					A _N	A _S		
Colorado. <i>Denver. Sacred Heart College. Earthquake Station. A. W. Forsfall, S. J.</i>								
Lat., 39° 40' 36" N.; long., 101° 56' 51" W. Elevation, 1,655 meters.								
Instrument: Wiechert 80 kg., astatic, horizontal pendulum.								
1916.			<i>H. m. s.</i>	<i>Sec.</i>	μ	μ	<i>Km.</i>	
May 7		L.....	17 00 00					Wavelets on both components. Doubtful as to being seismic.
		F.....	17 16 00					
		L.....	3 10 00					Small tremors and trailers on both components.
		F.....	3 25 00					
		L.....						Activity and microseisms at intervals during day.
		F.....						
		L _N	2 25 00					Preliminaries not visible. Record very small and indistinct. Time somewhat doubtful—Montana, Idaho, Washington.
		F _N	2 31 00					
		L _N	5 10 00					Faint irregularities and wavelets.
		F _N	7 25 00					
		L _N	18 40 00					Irregular waves.
		M _N	18 43 00					
		F _N	18 47 00					
		L _N	21 28 00					Faint trailers.
		F _N	21 34 00					
		L _N	20 28 00					Activity — microseisms.
		F _N	20 35 00					

District of Columbia. *Washington. U. S. Weather Bureau.*
Lat., 38° 54' 12" N.; long., 77° 03' 03" W.; Elevation, 21 meters.

Instrument: Marvin (vertical pendulum), undamped. Mechanical registration.
Instrumental constants: $\frac{V T_0}{g}$ 110 6

Date.	Charac- tor.	Phase.	Time.	Period. T.	Amplitude.		Dis- tance.	Remarks.
					A _N	A _S		
1916.			<i>H. m. s.</i>	<i>Sec.</i>	μ	μ	<i>Km.</i>	
May 10		P.....	21 43 07					
		S.....	21 48 08					
		L?.....	21 51 05	20				
		F.....	22 40 00					
		P.....	10 10 35					Phases uncertain.
		S.....	10 17 45					
		L.....	10 21 00					
		F.....	11 00 00					
		e.....	21 12 00					Phases uncertain.
		L.....	21 13 50					
		F.....	21 30 00					

District of Columbia. *Washington. Georgetown University.*
F. L. Tondorf, S. J.

Lat., 38° 54' 25" N.; long., 77° 04' 24" W. Elevation, 42.4 meters. Subsoil: Decayed diorite.

Instruments: Wiechert 200 kg. astatic horizontal pendulums, 50 kg. vertical.

Instrumental constants: $\frac{V T_0}{g}$ $\begin{matrix} E & 165 & 5.4 & 2.6 \\ N & 143 & 5.2 & 3.4 \\ Z & 80 & 5.0 & 0 \end{matrix}$

Date.	Charac- tor.	Phase.	Time.	Period. T.	Amplitude.		Dis- tance.	Remarks.
					A _N	A _S		
1916.			<i>H. m. s.</i>	<i>Sec.</i>	μ	μ	<i>Km.</i>	
May 10	III.....	e.....	21 42 25					No distinct M.
		S _N	21 48 08					
		S _S	21 48 11					
		L _N	21 52 42	28				
		L _S	21 53 48	17				
		F.....	22 40 00					
		iP.....	10 16 44					No distinct M. Microseisms. i for P seems quite certain. Vertical shows e _s at 10 ^h 18 ^m 16 ^s .
		S _N	10 21 01					
		S _S	10 21 05					
		eL _N	10 22 23					
		eL _S	10 22 29					
		F.....	10 38 00					
		e _N	2 33 02					Heavy microseisms. Possibly S with P lost.
		e _S	2 33 12					
		e.....	2 41 50					
		F.....	2 58 00					

Date.	Charac- tor.	Phase.	Time.	Period. T.	Amplitude.		Dis- tance.	Remarks.
					A _N	A _S		
Hawaii. <i>Honolulu. Magnetic Observatory. U. S. Coast and Geodetic Survey. Wm. W. Merrymon.</i>								
Lat., 21° 19' 12" N.; long., 158° 03' 48" W. Elevation, 15.2 meters.								
Instruments: Milne seismograph of the Seismological Committee of the British Association.								
Instrumental constant... $\frac{V T_0}{g}$ 18.9								
1916.			<i>H. m. s.</i>	<i>Sec.</i>	μ	μ	<i>Km.</i>	
May 3		eP.....	4 13 00					
		eS.....	4 53 00					
		L.....	5 03 30	23				
		M.....	5 09 00		*500			
		C.....	5 13 48					
		F.....	5 26 21					
			5 57 48					
		e.....	6 08 12					
		L.....	6 10 54		*200			
		C.....	6 15 12					
		F.....	6 18 48					
		eL.....	11 50 06					
		M.....	11 57 23		*200			
		C.....	12 01 00					
		F.....	12 13 24					
		eL.....	15 34 42					
		M.....	15 40 00		*200			
		C.....	15 43 24					
		F.....	16 08 18					
		P.....	21 57 42					
		L.....	22 09 48	21				
		M.....	22 15 30		*250			
		C.....	22 19 30					
		F.....	23 11 12					
		e.....	10 24 06					
		L.....	10 24 51	24				
		M.....	10 28 06		*800			
		C.....	10 31 54					
		F.....	10 46 48					
		P.....	2 10 00					
		L.....	2 18 18	22				
		M.....	2 21 30		*200			
		C.....	2 25 24					
		F.....	2 37 24					

* Trace amplitude.

Kansas. *Lawrence. University of Kansas. Department of Physics and Astronomy. F. E. Kester.*

Lat., 38° 57' 30" N.; long., 95° 14' 58" W. Elevation, 301.1 meters.

Instrument: Wiechert.

Instrumental constants: $\frac{V T_0}{g}$ $\begin{matrix} E & 177 & 3.4 & 4.0 \\ N & 205 & 3.4 & 3.8 \end{matrix}$

Date.	Charac- tor.	Phase.	Time.	Period. T.	Amplitude.		Dis- tance.	Remarks.
					A _N	A _S		
1916.			<i>H. m. s.</i>	<i>Sec.</i>	μ	μ	<i>Km.</i>	
May 11		P.....	10 08 38	2-3				
		S?.....	10 12 15	6-9				
		L _N	10 14 26					
		L _S	10 14 28					
		M _N	10 15 55			20		
		M _S	10 15 39	9-12	23			
		F.....	10 51 00					
		P.....	21 06 32					
		L?.....	21 07 42					
		M.....	21 08 34		1			
		M _N	21 08 39	8-10		1		
		F.....	21 16 00					

Maryland. *Cheltenham. Magnetic Observatory. U. S. Coast and Geodetic Survey. George Hartnell.*

Lat., 38° 44' 00" N.; long., 76° 50' 39" W. Elevation, 71.6 meters.

Instruments: Two Bosch-Omori, 10 and 12 kg.

Instrumental constants: $\frac{V T_0}{g}$ $\begin{matrix} E & 10 & 31 \\ N & 10 & 29 \end{matrix}$

Date.	Charac- tor.	Phase.	Time.	Period. T.	Amplitude.		Dis- tance.	Remarks.
					A _N	A _S		
1916.			<i>H. m. s.</i>	<i>Sec.</i>	μ	μ	<i>Km.</i>	
May 10		S _N	21 48 05	6				Phases uncertain on N.
		eL _N	21 50 55	30				
		M _N	21 54 03	21	120			
		M _S	21 55 13	20		20		
		C _N	21 57 46	18				
		F _N	22 17 00					
		e _N	10 18 20					No well-defined phases.
		e _S	10 19 49					
		S _S	10 21 17					
		S _N	10 21 29					
		M _N	10 21 39	10		20		
		L _N	10 23 50	8				
		M _S	10 24 01	10	10			
		C _N	10 25 00					
		F _N	10 30 00					

TABLE 2.—Instrumental reports—Continued.

Date.	Character.	Phase.	Time.	Period. T.	Amplitude.		Distance.	Remarks.	
					A _m	A _N			
Vermont. Northfield. U. S. Weather Bureau. Wm. A. Shaw.									
Lat., 44° 10' N.; long., 72° 41' W. Elevation, 256 meters.									
Instruments: Two Bosch-Omori, mechanical registration.									
					$\text{Instrumental constants. } \begin{cases} V & T_0 \\ E & 10 \ 15 \\ N & 10 \ 16 \end{cases}$				
1916.			H. m. s.	Sec.	μ	μ	Km.		
May 10	eP?		21 44 16					S and L lost through changing of sheets.	
	F		22 30 00						
11	e?		10 10 00						
	L		10 23 20						
	F		11 00 00						
26	e		2 15 45						
	F		2 30 00						
26	e?		21 12 26						
	L		21 16 30						
	F		21 30 00						

Canada. Ottawa. Dominion Astronomical Observatory. Earthquake Station. Otto Klotz.

Lat., 45° 23' 38" N.; long., 75° 42' 57" W. Elevation, 83 meters.

Instruments: Two Bosch photographic horizontal pendulums, one Spindler & Hoyer 50 kg. vertical seismograph.

Instrumental constants: $\begin{matrix} V & T_0 \\ 120 & 26 \end{matrix}$

1916.		H. m. s.	Sec.	μ	μ	Km.
May 9	(L _m)	15 53 00	18			
	(L)	15 56 00				
	(L)	16 38 00		40		
10	O	21 36 53				3,910
	P _N	21 44 04				
	S _m	21 49 46				
	L _N	21 53 18	20			
	L _m	21 53 42	40			
	L _m	21 57 00	20			
	L	22 00 00	15-16			
	L _m	22 05 00	12			
	L _N	22 11 00	13			
	F	22 45 00				
11	e	10 20 12				
	eL	10 22 12				
	M	10 22 42	6	110	270	
	L	10 30 00	6			
	L _m	10 47 00	8			
	F	11 00 00				
14	L	{ 0 26 00 } { 0 35 00 }	20-14			
17	L	13 18 18	26			
	L	13 21 00	20			
	L	13 26 00	16			
	L	13 28 00	14			
	L	13 31 00	10			
	F	13 40 00				
26	e _N	2 17 00				
	L _m	2 22 30	20			
	F	2 40 00				
26	i	21 13 30				
	L _m	21 14 42				
	L _m	21 15 12	14			
	L _m	21 17 00	10			
	L _m	21 20 00	7			
	F	21 36 00				

Date.	Character.	Phase.	Time.	Period. T.	Amplitude.		Distance.	Remarks.	
					A _m	A _N			
Canada. Toronto. Dominion Meteorological Service.									
Lat., 43° 40' 01" N.; long., 79° 23' 54" W. Elevation, 113.7 meters. Subsoil: Sand and clay.									
Instrument: Milne horizontal pendulum, North. In the meridian.									
					$\text{Instrumental constant. } T_0 = 18. \text{ Pillar deviation, 1 mm. swing of boom} = 0.59''.$				
1916.			H. m. s.	Sec.	μ	μ	Km.		
May 3	L		5 42 12						
	F		6 00 36		*200				
9	L		15 53 24						
	L		15 53 30		*50				
	F		16 21 24						
10	P?		21 44 30					Marked quake.	
	S _m		21 49 36						
	i		21 52 36						
	L		21 53 42						
	i		21 55 18						
	L		21 56 06						
	M		22 00 48		*3400				
	F		22 49 06						
11	i		10 21 36						Very abrupt beginning. Vibrations gradually decreased after the maximum
	L		10 21 54						
	M		10 22 24		*1600				
	F		10 52 24						
14	e		0 32 00						
	L?		0 39 48						
	F?		0 46 00		*50				
17	e		13 22 24						
	L		13 27 42		*100				
	F		13 41 12						
26	L		21 13 30						
	F		21 18 30		*200				

* Trace amplitude.

Canada. Victoria, B. C. Dominion Meteorological Service.

Lat., 48° 24' N.; long., 123° 19' W. Elevation, 67.7 meters. Subsoil: Rock.

Instrument: Wiechert, vertical: Milne horizontal pendulum, North. In the meridian.

Instrumental constant. $T_0 = 18$. Pillar deviation, 1 mm. swing of boom = 0.59''.

1916.		H. m. s.	Sec.	μ	μ	Km.
May 3	P?	5 23 07				4,200?
	S	5 29 06				
	M	5 35 31			*100	
	F	?				
10	P	22 06 53				2,390
	S	22 10 54				
	L	22 13 22				
	M	22 17 08			*200	
	F	22 35 29				
11	P?	10 16 54				870?
	L	10 18 28				
	M	10 20 27			*600	
	F	10 27 07				
VERTICAL.						
	L?	10 18 28	8-10	3		
	M	10 20 08	8-10			
17	L?	13 34 11				
	M	13 35 41			*100	
	F	13 38 11				
26	L	2 19 46				
	M	2 21 45			*100	
	F	?				

* Trace amplitude.

SEISMOLOGICAL DISPATCHES.¹

San Jose, Costa Rica, May 1, 1916.

Twenty distinct shocks occurred here today while the people of the capital were in the midst of the first of May festival. A number of buildings, including churches and schools, were demolished. The people fled to the streets and squares, fearing the city was about to be destroyed. (*Assoc. Press.*)

Los Angeles, Cal., May 2, 1916.

A slight earth shock lasting five seconds occurred here today at 6:30 o'clock, a. m., according to Dr. Ford A. Carpenter, Forecaster of the Weather Bureau. The movement, he said, was from west to east. (*Assoc. Press.*)

New York, May 4, 1916.

Only slight damage was caused by the earthquake shocks of April 30 in Costa Rica, according to wireless reports and private telegrams received here to-day by the United Fruit Co. The subsequent interruption of telegraphic communication between Costa Rica and Salvador, as announced in a cable dispatch received yesterday from San Salvador, was due to static conditions arising from heavy storms, according to the company's advices to-day, and not to the earthshocks. (*Assoc. Press.*)

Boise, Idaho, May 12, 1916.

This city experienced an earthquake at 7:26 o'clock to-night which lasted about three seconds. People rushed in to the streets. Several brick chimneys were wrecked. The tremor was not felt to the east of Boise. Twenty-five miles north, at Emmett, the quake was violent and alarmed the inhabitants. Nanpa, to the south, also felt the shock, as did Idaho City, 36 miles north. At Weiser, 60 miles west, the quake was of exceptional violence. A new gas well, in which a flow was struck 10 days ago, showed remarkable increase of pressure immediately after the shock. From irrigated sections came reports that canals had been damaged, but not beyond repair. An earthquake last fall split a deep seam across the New York Canal, one of the largest in Idaho and it required weeks to repair it. (*Assoc. Press.*)

Reno, Nev., May 12, 1916.

The seismograph at the Mackay Schools of Mines, University of Nevada, registered an earthquake at 6:31 o'clock to-night. The disturbance lasted until 6:36 p. m. (*Assoc. Press.*)

Anaconda, Mont., May 12, 1916.

An earthquake shock was felt here at 7:30 o'clock to-night. Buildings were shaken but no damage was done. (*Assoc. Press.*)

Spokane, Wash., May 12, 1916.

The seismograph at Gonzaga University here registered a pronounced earthquake shock at 6:39 o'clock to-night, followed by several smaller ones, the entire disturbance lasting about 15 minutes. The general direction of the tremble was southeast to northwest, the main shock being unusually severe for this region, it was stated. The quake occurred about 80 miles southeast of Spokane. (*Assoc. Press.*)

Rome, May 17, 1916 (via Paris, May 18, 1916, 11:15 a. m.).

An earthquake of particular violence has occurred along the Adriatic coast between Rimini and Cesena. At the latter town a dozen people were injured by the fall of cornices.

The entire central section of Italy was shaken by repeated earthquakes which lasted through Tuesday and Wednesday. Only the most meager details have as yet been received in this country and it is not known what loss of life occurred, if any. (*Assoc. Press.*)

Rimini, Italy, May 19, 1916, 11:20 a. m.

Serious damage was done here by the earthquake which shocked central Italy during the night of May 16-17. Ten houses collapsed and about a thousand dwellings were damaged. The municipal theater and the underprefecture school buildings were cracked to an alarming extent, and part of the church of Colonnella has fallen. (*Assoc. Press.*)

Honolulu, May 20, 1916.

Mauna Loa in eruption and Kilauea unusually active. (*Honolulu Weather Bureau.*)

Willemstad, Curaçao, May 27, 1916.

A heavy earth shock was felt throughout this island at 2:30 o'clock this afternoon. No damage has been reported. (*Assoc. Press.*)

Baker, Oreg., May 23, 1916.

A slight earthquake which shook eastern Oregon, flooded part of the Baker Country Club golf links with a spring which burst forth within a few hundred yards of a mineral spring. Although the water in the mineral spring is hot, the spring flows ice cold. (*Internat. News Ser.*)

¹ Reported by the organization indicated and collected by the seismological station at Georgetown University, Washington, D. C.

SECTION V.—SEISMOLOGY.

SEISMOLOGICAL REPORTS FOR JUNE, 1916.

W. J. HUMPHREYS, Professor in Charge.

[Dated: Weather Bureau, Washington, D. C., Aug. 3, 1916.]

TABLE 1.—Noninstrumental earthquake reports, June, 1916.

Day.	Approximate time, Greenwich Civil.	Station.	Approximate latitude.	Approximate longitude.	Intensity Ross-Forl.	Number of shocks.	Duration.	Sounds.	Remarks.	Observer.
CALIFORNIA.										
1916.	H. m.		° /	° /			M. s.			
7	22 15	Calexico.....	32 40	115 28	3	1		Rumbling.....		Ivan R. Ralston.
26	13 46	San Luis Obispo.....	35 18	120 39	2	1				U. S. Weather Bureau.
27	13 45	King City.....	36 13	121 06	3	1				F. J. Merritt.
	13 45	Lonoak.....	36 16	120 58	4	1				Martin L. Griffin.
	13 45	Salinas.....	36 36	122 40						Ruth Abbott.
	13 45	Santa Cruz.....	36 56	122 02	3	1				W. R. Springer.
	14 15	Paso Robles.....	35 34	120 40		1	2			Virginia Bartlett.
	14 15	San Jose.....	37 20	121 54	3	1	5			Maurice Connell.
	14 15	Santa Cruz.....	36 56	122 02	1	1	2			W. R. Springer.
NEW YORK.										
8	21 15	Eastchester.....	41 10	73 45	5	1	15	Rumbling.....		Mrs. Fred Kuemmel.
	21 15	Eastchester.....	41 10	73 45	5	2	15	Rumbling.....		Frank Gorman.
	21 15	Eastchester.....	41 10	73 45	5	1	15	Rumbling.....		Alfred Lelash.
	21 15	Eastchester.....	41 10	73 45	3	1	15	Rumbling.....		John Harry Metzler.
	21 15	Mount Vernon.....	41 08	73 46	3	1	5	Rumbling.....		J. N. Redway.
	21 15	Scarsdale.....	41 10	73 45	5	2	15	Rumbling.....		C. H. Wilmarth.
	21 15	Scarsdale.....	41 10	73 45	5	2	15	Rumbling.....		Harold B. Smith.
SOUTH CAROLINA.										
25	12 05	Charleston.....	32 47	79 56	2	1	5			Robert Bee.
	12 05	Summerville.....	33 05	80 14	3	2	2	Rumbling.....		Miss E. H. Gadsden.
SOUTH DAKOTA.										
29	7 45	Winner.....	43 24	99 53	2	1	1	Rumbling.....		Chas. L. Tienken.

TABLE 2.—Instrumental reports, June, 1916.

[Time used: Mean Greenwich, midnight to midnight. Nomenclature: International.]

[For significance of symbols see REVIEW for January, 1916, p. 39.]

Date.	Character.	Phase.	Time.	Period T.	Amplitude.		Distance.	Remarks.
					A _m	A _w		

Alaska. *Sitka. Magnetic Observatory.* U. S. Coast and Geodetic Survey. J. W. Green.

Lat. 57° 03' 00" N.; long. 135° 30' 06" W. Elevation, 15.2 meters.

Instruments: Two Bosch-Omori, 10 and 12 kg.

Instrumental constants: $\begin{matrix} E & V & T_0 \\ N & 10 & 16.7 \\ & 10 & 15.4 \end{matrix}$

1916.		H. m. s.	Sec.	μ	μ	Km.	
June 30	ew.....	3 41 15	10	.....	50	.....	Barely perceptible on E.
	M _w	3 44 36	15	.....	.....	.....
	C _w	3 52 20	12	.....	.....	.....

Arizona. *Tucson. Magnetic Observatory.* U. S. Coast and Geodetic Survey. F. F. Ulrich.

Lat. 32° 14' 48" N.; long. 110° 50' 06" W. Elevation, 769.6 meters.

Instruments: Two Bosch-Omori, 10 and 12 kg.

Instrumental constants: $\begin{matrix} E & V & T_0 \\ N & 10 & 16 \\ & 10 & 19.6 \end{matrix}$

1916.		H. m. s.	Sec.	μ	μ	Km.	
June 2	eP.....	14 03 56	4	.....	.....	.....	End probably occurred while paper was being changed.
	L.....	14 07 46	5	.....	.....	.....
	M.....	14 07 52	5	60	60	.....
	C.....	14 15 00	6	.....	.....	.....
19	ew.....	1 33 36	11	.....	.....	.....
	ew.....	1 34 23	7	.....	.....	.....
	M.....	1 36 08	.....	10	10	.....
	F _w	1 36 08	.....	.....	.....	.....
	F _w	1 41 46	.....	.....	.....	.....

Date.	Character.	Phase.	Time.	Period T.	Amplitude.		Distance.	Remarks.
					A _m	A _w		

Arizona. *Tucson—Continued.*

1916.		H. m. s.	Sec.	μ	μ	Km.
June 21	e.....	21 52 16	6	.....	.....	.....
	M.....	.....	.....	10	10	.....
	F.....	21 58 00	.....	.....	.....	.....
25	L _w	18 25 28	5	.....	.....	.....
	L _w	18 28 39	10	.....	.....	.....
	M _w	18 28 00	10	400	.....	.....
	M _w	18 26 24	8	.....	60	.....
	C _w	18 31 00	6	.....	.....	.....
	F _w	18 35 45	5	.....	.....	.....
30	eP _w	3 12 57	5	.....	.....	.....
	ew.....	3 18 38	10	.....	.....	.....
	L _w	3 21 21	13	.....	.....	.....
	L _w	3 21 30	13	.....	.....	.....
	M _w	3 25 43	13	130	.....	.....
	M _w	3 26 36	12	.....	90	.....
	C.....	3 27 00	12	.....	.....	.....
	F.....	3 49 00	11	.....	.....	.....

California. *Berkeley. University of California.*

Lat. 37° 52' 16" N.; long. 122° 15' 37" W. Elevation, 85.4 meters.

(See Bulletin of the Seismographic Stations, University of California.)

California. *Mount Hamilton. Lick Observatory.*

Lat. 37° 20' 24" N.; long. 121° 38' 34" W. Elevation, 1,281.7 meters.

(See Bulletin of the Seismographic Stations, University of California.)

TABLE 2.—Instrumental reports, June, 1916—Continued.

Date.	Character.	Phase.	Time	Period T.	Amplitude.		Distance.	Remarks.
					A _m	A _N		
California. <i>Point Loma. Raja Yoga Academy.</i> F. J. Dick.								
Lat., 32° 43' 03" N.; long., 117° 15' 10" W. Elevation, 91.4 meters.								
Instrument: Two-component, C. D. West seismoscope.								
1916.			<i>H. m. s.</i>	<i>Sec.</i>	μ	μ	<i>Km.</i>	
June 1					*200	*100		Light tremors during 24 hours preceding 3 p. m. on dates given.
4					*100	*100		

* Amplitude on instrument.

California. *Santa Clara. University of Santa Clara.* J. S. Ricard, S. J.
 Lat., 37° 28' 36" N.; long., 121° 57' 03" W. Elevation, 27.43 meters.
 (See Record of the Seismographic Station, University of Santa Clara.)

Colorado. *Denver. Sacred Heart College. Earthquake Station.* A. W. Forstall, S. J.
 Lat., 39° 40' 36" N.; long., 104° 58' 54" W. Elevation, 1,655 meters.
 Instrument: Wiechert 80 kg., astatic, horizontal pendulum.

1916.			<i>H. m. s.</i>	<i>Sec.</i>	μ	μ	<i>Km.</i>	
June 2	IIr	P	14 05 00					Second prelim. not discernible.
		L _N	14 09 00	4-5		1.2		
		L _m	14 09 00		3.1			
		M _N	14 10 00	7				
		M _m	14 10 00		3.1			
		C	14 11 00	10-12				
		F _N	14 13 00					
		F _m	14 20 00					
16								Visible waves recurring at intervals during day on both comps.
17		L _N	6 30 00					
		F _N	9 15 00					Long-period waves on both comps. More distinct on N-S. Possibly Forli quake, Italy.
19		L _m	3 00 00					
		F _m	11 00 00					Long period irregular waves recurring on E-W.
21		L _m	2 30 00					
		F _m	4 00 00					Long-period sine waves on E-W recurring between hours marked.

District of Columbia. *Washington. U. S. Weather Bureau.*

Lat., 38° 54' 12" N.; long., 77° 03' 03" W. Elevation, 21 meters.

Instrument: Marvin (vertical pendulum), undamped. Mechanical registration.

Instrumental constants. $\frac{V}{T_0}$ 110 6

1916.			<i>H. m. s.</i>	<i>Sec.</i>	μ	μ	<i>Km.</i>	
June 2		P	14 04 54					
		L	14 09 24					
		L	14 14 45					
		F	14 50 00					
19		P	1 23 40					
		L	1 29 40					
		L	1 35 00					
		F	2 00 00	14				
21		P	21 42 38					
		S	21 50 49					
		SR	21 55 25					
		L _T	22 01 30					
		F	22 40 00					
25		P _m	18 27 44					
		S _T	18 34 11					
		SR _T	18 37 04					
		SR _T	18 38 20					
		L	18 40 20					
		F	19 00 00					
30		P	3 07 50					
		S	3 13 20					
		SR	3 16 34					
		L	3 18 82					
		F	5 00 00					

Date.	Character.	Phase.	Time.	Period T.	Amplitude.		Distance.	Remarks.
					A _m	A _N		
District of Columbia. <i>Washington. Georgetown University.</i> F. L. Tondorf, S. J.								
Lat., 38° 54' 25" N.; long., 77° 04' 24" W. Elevation, 42.4 meters. Subsoil: Decayed diorite.								
Instruments: Wiechert 200 kg. astatic horizontal pendulums, 80 kg. vertical.								
			<i>H. m. s.</i>	<i>Sec.</i>	μ	μ	<i>Km.</i>	
1916.								Instrumental constants: $\frac{V}{T_0}$ 165 5.4 2.6 N 143 5.2 3.4 Z 80 5.0 0
June 2	IIIr	e _N	13 59 28					
		e _m	13 59 29					
		e _{P_N}	14 05 13					Microseisms. No distinct M.
		e _{P_m}	14 05 14					
		S	14 10 32					
		L _N	14 13 22		8			
		L _m	14 13 31		9			
		F	14 50 00					
6		e	21 04 12					
		i _m	21 08 19					
		i _N	21 08 21					
		F	21 22 00					
8	IIr	e	21 14 27					Microseisms.
		F	21 20 00					
21	IIIr	e _P	21 42 39					Microseisms. No distinct M.
		S	21 50 48					
		e _{L_N}	21 58 54		15			
		e _{L_m}	21 59 12		15			
		F	22 15 00					
25	IIIr	e _N	18 37 30					S _m and L _m not discernible. No distinct M.
		e _m	18 37 45					
		S _m	18 40 42					
		L _m	18 43 10		12			
		F	18 50 00					
27	IIIr	e _N	13 41 55					E-W simply showed thickening of line.
		S _N	13 45 28					
		F	14 20 00					
30	Lr	e _{P_N}	3 07 49					Microseisms. P _m lost. No distinct M. Mainka shows e _m 3 ^b 7 ^m 18 ^a , S _m 3 ^b 13 ^a 2 ^a .
		S _m	3 13 47					
		S _N	3 13 58					
		e _{L_N}	3 20 42					
		e _{L_m}	3 20 49		15			
		L _N	3 23 51					
		L _m	3 24 05		20			
		F	4 24 00					

Hawaii. *Honolulu. Magnetic Observatory.* U. S. Coast and Geodetic Survey. Wm. W. Merryman.

Lat., 21° 19' 12" N.; long., 158° 03' 48" W. Elevation, 15.2 meters.

Instruments: Milne seismograph of the Seismological Committee of the British Association.

Instrumental constant. $\frac{T_0}{T_1}$ 13.9

1916.			<i>H. m. s.</i>	<i>Sec.</i>	μ	μ	<i>Km.</i>	
June 1		e _L	15 03 42					
		M	15 08 30		*100			
		C	15 10 36					
		F	15 16 42					
1		e _L	23 56 24					
		M	24 01 54		*100			
		F	24 05 12					
2		e _P	14 17 06					Phases not well marked.
		e _L	14 24 12					
		M	14 32 00		*200			
		C	14 35 00					
		F	14 51 00					
2		e _L	16 43 00					
		M	16 46 24		*200			
		F	16 54 54					
3		e _L	5 35 12					
		M	5 41 00		*350			
		C	5 45 36					
		F	5 48 30					
6		P	13 36 18					
		S	13 43 00					
		L	13 46 36					
		M	13 49 18		*280			
		C	13 54 30					
		F	14 27 00					

*Amplitude on instrument.

TABLE 2.—Instrumental reports, June, 1916—Continued.

Date.	Charac-ter.	Phase.	Time.	Period T.	Amplitude.		Dis-tance.	Remarks.
					A _m	A _N		
Hawaii. Honolulu—Continued.								
1916.			H. m. s.	Sec.	μ	μ	Km.	
June 9	L		21 58 48	23				
	M		22 05 24		*500			
	C		22 13 12					
	F		22 35 48					
12	eL		17 15 18					Resembles a local shock.
	M		17 16 24		*200			
	F		17 21 48					
15	P		11 43 30					
	S		11 50 30					
	L		12 10 24	28				
	M		12 17 06		*500			
	C		12 27 48					
	F		13 37 06					
19	L		1 47 18	26				
	C		1 52 00		*500			
	C		1 57 06					
	F		2 33 48					
21	P		21 51 18					
	S		22 07 30					
	L		22 20 12	23				
	M		22 24 36		*800			
	C		22 41 24					
	F		23 33 42					
24	e		7 02 12					Apparently local.
	M		7 03 00		*300			
	F		7 20 12					
30	P		3 22 48					
	S		3 28 24					
	L		3 36 54	22				
	M		3 41 36		*4200			
	C		4 03 30					
	F		5 53 42					

*Amplitude on instrument.

Kansas. Lawrence. University of Kansas. Department of Physics and Astronomy. F. E. Kester.
 Lat., 38° 57' 30" N.; long., 95° 14' 58" W. Elevation, 301.1 meters.
 Instrument: Wiechert.

Instrumental constants. $\begin{cases} E & T_0 & \epsilon \\ 177 & 3.4 & 4.0 \\ N & 205 & 3.4 & 3.3 \end{cases}$

1916.		H. m. s.	Sec.	μ	μ	Km.	
June 2	P	14 04 05	2-3	1	5		S not discernible.
	L	14 07 55					
	M	14 08 02			15		
	M	14 08 51	6-10	8			
	F	14 37 00					
25	P	18 25 46					
	S	18 29 18					
	L	18 31 05					
	L	18 31 07	4-5	9	7		
	M	18 31 29	8-12				
	M	18 32 33					
	F	18 49 00					

Maryland. Cheltenham. Magnetic Observatory. U. S. Coast and Geodetic Survey. George Hartnell.

Lat., 38° 44' 00" N.; long., 76° 50' 30" W. Elevation, 71.6 meters.
 Instruments: Two Bosch-Omori, 10 and 12 kg.

Instrumental constants. $\begin{cases} E & T_0 \\ 10 & 31 \\ N & 10 & 29 \end{cases}$

1916.		H. m. s.	Sec.	μ	μ	Km.	
June 21	e	21 43 02	3				
	S	21 50 50	6				
	M	21 50 55	10	100			
	M	21 51 06	10		20		
	L	21 58 00					
	F	22 06 00					
25	e	18 37 00	10				No distinct phases.
	M			10			
	F	18 45 00			10		
30	e	3 09 06	4				Not shown on N.
	S	3 13 44	12				
	eL	3 16 32	16				
	M	3 27 19	17	90			
	C	3 30 05					
	F	4 10 00					

Date.	Charac-ter.	Phase.	Time.	Period T.	Amplitude.		Dis-tance.	Remarks.
					A _m	A _N		

Massachusetts. Cambridge. Harvard University Scismographic Station. J. B. Woodworth.

Lat., 42° 22' 38" N.; long., 71° 06' 59" W. Elevation, 5.4 meters. Foundation: Glacial sand over clay.

Instruments: Two Bosch-Omori 100 kg. horizontal pendulums (mechanical registration).

Instrumental constants. $\begin{cases} V & T_0 & \epsilon \\ E & 80 & 23 & 0 \\ N & 50 & 25 & 4.1 \end{cases}$

(Report for June, 1916, not received.)

Missouri. Saint Louis. St. Louis University. Geophysical Observatory. J. B. Goesse, S. J.

Lat. 38° 38' 15" N.; long. 90° 13' 58" W. Elevation, 160.4 meters. Foundation: 12 feet of tough clay over limestone of Mississippi system, about 300 feet thick.

Instrument: Wiechert 80 kg. astatic, horizontal pendulum.

Instrumental constants. $\begin{cases} V & T_0 & \epsilon \\ 80 & 7 & 5.1 \end{cases}$

1916.		H. m. s.	Sec.	μ	μ	Km.
June 21	e	21 45 00				
	F	22 07 00				
29	eP	18 09 00				
	S	18 14 00				
	F	18 50 00				

New York. Buffalo. Canisius College. John A. Curtin, S. J.

Lat. 42° 53' 02" N.; long. 78° 52' 40" W. Elevation, 190.5 meters.

Instrument: Wiechert 80 kg. horizontal.

Instrumental constants. $\begin{cases} V & T_0 & \epsilon \\ 80 & 7 & 5.1 \end{cases}$

(Report for June, 1916, not received.)

New York. Fordham. Fordham University. W. C. Repetti, S. J.

Lat. 40° 51' 47" N.; long. 73° 53' 08" W. Elevation, 23.9 meters.

Instrument: Wiechert 80 kg.

Instrumental constants. $\begin{cases} V & T_0 & \epsilon \\ E & 72 & 7.2 & 1.5 \\ N & 73 & 7.2 & 3.75 \end{cases}$

1916.		H. m. s.	Sec.	μ	μ	Km.	
June 2	eP	14 00 44					
	eP	14 00 46					
	S	14 06 44					
	L	14 12 14					
8	eP	21 11 11					Felt at Hastings and vicinity.
	M	21 11 14			36		
	M	21 11 14		18			
	F	21 11 52					
25	eL	18 32 20					
	M	18 35 42	13		6		
	F	18 43 17					

New York. Ithaca. Cornell University. Heinrich Ries.

Lat. 42° 28' 58" N.; long. 76° 28' 09" W. Elevation, 242.5 meters.

Instruments: Two Bosch-Omori, 26 kg., horizontal pendulums (mechanical registration.)

Instrumental constants. $\begin{cases} V & T_0 & \epsilon \\ E & 13 & 22 & 4.1 \\ N & 14 & 25 & 4.1 \end{cases}$

1916.		H. m. s.	Sec.	μ	μ	Km.	
June 2	eP	14 05 24	6				
	eP	14 05 28	6				
	S	14 10 15	7				
	S	14 10 19	8				
	F	14 25 00					
	F	14 27 00					
21	P	21 42 15	6				E-W time recorder out of order.
	F	21 44 10	4				
	S	21 53 40	9				
	eL	21 53 48	10				
	F	22 28 00					

TABLE 2.—Instrumental reports, June, 1916—Continued.

Date.	Charac-ter.	Phase.	Time.	Period T.	Amplitude.		Dis-tance.	Remarks.
					A _B	A _N		
New York. <i>Ithaca</i> —Continued.								
1916.								
June 25	en		H. m. s.	Sec.	μ	μ	Km.	Phases obscure.
	en		18 37 40	25				
	en		18 37 52	4				
	M _N		18 38 33	12		36		
	F _N		18 49 00					
	F _N		18 50 00					
30	en		3 09 07	8				
	en		3 13 49	18				
	?N		3 13 58	13				
	?N		3 16 59	12				
	F _N		4 10 00					
	F _N		4 11 00					

Panama Canal Zone. *Balboa Heights*. Isthmian Canal Commission.
 Lat., 8° 57' 39" N.; long., 79° 33' 29" W. Elevation, 27.6 meters.
 Instruments: Two Bosch-Omori 100 kg.

$$\begin{matrix} V & T_0 \\ \text{Instrumental constants.} & \dots & 10 & 20 \end{matrix}$$
 (Report for June, 1916, not received.)

Porto Rico. *Vieques*. Magnetic Observatory. U. S. Coast and Geodetic Survey. H. M. Pease.
 Lat., 18° 09' N.; long., 65° 27' W. Elevation, 19.8 meters.
 Instruments: Two Bosch-Omori.

$$\begin{matrix} V & T_0 \\ \text{Instrumental constants.} & \dots & \begin{matrix} E & 10 & 21.4 \\ N & 10 & 21.1 \end{matrix} \end{matrix}$$

Date.	Charac-ter.	Phase.	Time.	Period T.	Amplitude.		Dis-tance.	Remarks.
					A _B	A _N		
Vermont. <i>Northfield</i> . U. S. Weather Bureau. Wm. A. Shaw.								
1916.								
June 21	en		H. m. s.	Sec.	μ	μ	Km.	Ending uncertain because of micro-seisms or wind tremors.
	en		21 40 17					
	en		21 45 58					
	en		21 48 06					
	en		21 48 33					
	L _N		21 49 34					Beginning and end uncertain on N.
	M _N		21 49 50		50	20		
	C		21 55 00					
30	en		3 05 42					
	L _N		3 09 25	16				
	L _N		3 09 54	20				
	M _N		3 09 54	16		100		
	M _N		3 10 16	16	120			
	C		3 14 00					
	F _N		3 24 00					
	F _N		3 28 00					

Vermont. *Northfield*. U. S. Weather Bureau. Wm. A. Shaw.
 Lat., 44° 10' N.; long., 72° 41' W. Elevation, 256 meters.
 Instruments: Two Bosch-Omori, mechanical registration.

$$\begin{matrix} V & T_0 \\ \text{Instrumental constants.} & \dots & \begin{matrix} E & 10 & 15 \\ N & 10 & 16 \end{matrix} \end{matrix}$$

Date.	Charac-ter.	Phase.	Time.	Period T.	Amplitude.		Dis-tance.	Remarks.
					A _B	A _N		
Canada. <i>Ottawa</i> . Dominion Astronomical Observatory. Earthquake Station. Otto Klotz.								
1916.								
June 2	P		H. m. s.	Sec.	μ	μ	Km.	
	S		14 05 47					
	S		14 10 27					
	L ₇		14 16 05					
	F		14 35 00					Artificially disturbed.
21	P		21 42 33					
	S		21 51 24					
	SR		21 55 05					
	L ₇		22 59 40					
	FF							
25	SR		18 37 30					
	L		18 40 33					
	F		19 00 00					
30	P		3 07 37					
	SR		3 13 00					
	SR		3 15 08					
	L		3 18 35					
	F		4 20 00					

Canada. *Ottawa*. Dominion Astronomical Observatory. Earthquake Station. Otto Klotz.
 Lat., 45° 23' 38" N.; long., 75° 42' 57" W. Elevation, 83 meters.
 Instruments: Two Bosch photographic horizontal pendulums, one Spindler & Hoyer 80 kg. vertical seismograph.

$$\begin{matrix} V & T_0 \\ \text{Instrumental constants.} & \dots & 120 & 28 \end{matrix}$$
 (Report for June, 1916, received too late.)

Date.	Charac-ter.	Phase.	Time.	Period T.	Amplitude.		Dis-tance.	Remarks.
					A _B	A _N		
Canada. <i>Toronto</i> . Dominion Meteorological Service.								
Lat., 43° 40' 01" N.; long., 79° 23' 54" W. Elevation, 113.7 meters. Subsoil: Sand and clay.								
Instrument: Milne horizontal pendulum, North. In the meridian.								
T_0								
Instrumental constant. . . 18. Pillar deviation, 1 mm. swing of boom=0.59".								
(Report for June, 1916, not received.)								

Date.	Charac-ter.	Phase.	Time.	Period T.	Amplitude.		Dis-tance.	Remarks.
					A _B	A _N		
Canada. <i>Victoria</i> , B. C. Dominion Meteorological Service.								
Lat., 48° 24' N.; long., 123° 19' W. Elevation, 67.7 meters. Subsoil: Rock.								
Instrument: Wiechert, vertical; Milne horizontal pendulum, North. In the meridian.								
T_0								
Instrumental constant. . . 18. Pillar deviation, 1 mm. swing of boom=0.54".								
(Report for June, 1916, not received.)								

TABLE 3.—Late seismological reports. (Instrumental.)

Date.	Charac-ter.	Phase.	Time.	Period T.	Amplitude.		Dis-tance.	Remarks.
					A _B	A _N		
Kansas. <i>Lawrence</i> . University of Kansas. Department of Physics and Astronomy. F. F. Kester.								
Lat., 38° 57' 30" N.; long., 95° 14' 58" W. Elevation, 301.1 meters.								
Instrument: Wiechert.								
$\begin{matrix} V & T_0 & \epsilon \\ \text{Instrumental constants.} & \dots & \begin{matrix} E & 177 & 3.4 & 4.0 \\ N & 205 & 3.4 & 3.8 \end{matrix} \end{matrix}$								
1916.								
Feb. 2	P ₀		H. m. s.	Sec.	μ	μ	Km.	S not discernible.
	L _N		5 05 31					
	L _N		5 10 25					
	M _N		5 10 50		4-5		4	
	M _N		5 13 38		6-7	2		
	F		5 32 00					

SEISMOLOGICAL DISPATCHES.¹

Mobile, Ala., June 3, 1916.
 Earthquake tremors apparently about 900 miles distant were recorded on the seismograph at Spring Hill College here yesterday. (Assoc. Press.)

New York Times, June 9, 1916.
 A seismic disturbance was felt in the Hudson Valley in the vicinity of Hastings for several minutes shortly after 4 o'clock yesterday afternoon.

While imperceptible in Manhattan, the tremor was noticed at many points in Westchester County. It was described as a heavy rumble like the report from an underground explosion. The vibration lasted about two minutes. (Local dispatch.)

Rome, June 16, 1916, via Paris, 2.30 p. m.
 A heavy earthquake was reported at 3.25 o'clock this morning at Forlì, a town of central Italy, having a population of 50,000, and at Rimini, a town with the same number of persons, 28 miles farther east. There were no casualties. (Assoc. Press.)

Rome, June 27, 1916.
 Mount Vesuvius is violently active to-night. Dense columns of smoke are rising from newly formed craters of the historic volcano.

Mount Stromboli, in Sicily, also is active. The mouth of the mountain is emitting streams of incandescent lava. (Assoc. Press.)

¹ Reported by the organization indicated and collected by the seismological station at Georgetown University.

SECTION V.—SEISMOLOGY.

SEISMOLOGICAL REPORTS FOR JULY, 1916.

W. J. HUMPHREYS, Professor in Charge.

[Dated: Weather Bureau, Washington, D. C., Sept. 1, 1916.]

TABLE 1.—Noninstrumental earthquake reports, July, 1916.

Day.	Approximate time, Greenwich Civil.	Station.	Approximate latitude.	Approximate longitude.	Intensity Rossi-Forel.	Number of shocks.	Duration.	Sounds.	Remarks.	Observer.
CALIFORNIA.										
1916. July 1	H. m.	San Jose.....	37 20	121 54		3	1	M. s. 0 6		Maurice Connell.
5	4 41	Eureka.....	40 48	124 11		5	3	1		Cyrl L. Cairns.
	4 41	Rohnerville.....	40 33	124 11						W. D. Gray.
	4 41	Shively.....	40 25	123 56			1	7	One continuous shock.	Frank Essig.
6	19 20	San Jose.....	37 20	121 54		4	1	2		Maurice Connell.
16	11 50	Beaumont.....	33 55	117 00		5	1	4		K. R. Invert.
	11 50	Holcomb Valley.....	34 17	117 05		2	1			J. M. Henry.
	11 50	Los Angeles.....	34 03	118 15		2	1	3		U. S. Weather Bureau.
	11 50	Mount Wilson.....	34 13	118 16		2	1			Wendell P. Hoge.
	11 50	Nellis.....	33 22	116 52		2	2	1		Esther Parnell Hewlett.
	11 50	Redlands.....	34 04	117 12		4	2	3	Rumbling.	Edw. N. Munnis.
	11 50	Redlands.....	34 04	117 12		2	1			Paul W. Moore.
	11 50	Rialto.....	34 12	117 27		2	1	1		J. B. Witte.
	11 50	Riverside.....	33 58	117 21		2	1			J. H. D. Cox.
	11 50	San Bernardino.....	34 06	117 17		4	1			A. D. Frantz.
	11 50	Seven Oaks.....	34 05	117 12		1	1	4		Matthew Lewis.
16	12 30	Barstov.....	34 53	117 12		5	2	3		E. L. White.
	12 30	Beaumont.....	33 55	117 00		5	1	2		K. R. Invert.
	12 30	Holcomb Valley.....	34 17	117 05		1	1			J. M. Henry.
	12 30	Redlands.....	34 04	117 12		2	1			Paul W. Moore.
	12 30	Riverside.....	33 58	117 21		2	1			J. H. D. Cox.
	12 30	San Bernardino.....	34 06	117 17		2	2	15		A. K. Johnson.
	12 30	San Bernardino.....	34 06	117 17		2	1			A. D. Frantz.
	12 30	Seven Oaks.....	34 05	117 12		2	1	3		Matthew Lewis.
28	6 12	Redlands.....	34 04	117 12		2	1	2		Paul W. Moore.
	6 12	Riverside.....	33 58	117 21		2	1			J. H. D. Cox.
NEW MEXICO.										
1	8 05	Socorro.....	34 08	106 48		5	2	20	Rumbling.	J. J. Clarkson.
SOUTH CAROLINA.										
14	18 18	Summersville.....	33 05	80 14			1			Miss E. H. Gadsden.

TABLE 2.—Instrumental seismological reports, July, 1916.

Time used: Mean Greenwich, midnight to midnight. Nomenclature: International.

[For significance of symbols see this REVIEW, January, 1916, p. 39.]

Date.	Charac-ter.	Phase.	Time.	Period. T.	Amplitude.		Dis-tance.	Remarks.
					A _s	A _N		

Alaska. Sitka. Magnetic Observatory. U. S. Coast and Geodetic Survey. J. W. Green.

Lat., 57° 03' 00" N.; long., 135° 20' 06" W. Elevation, 15.2 meters.

Instruments: Two Bosch-Omorci, 10 and 12 kg.

Instrumental constants: $\begin{cases} E & V & T_0 \\ N & 10 & 17.4 \\ & 10 & 15.8 \end{cases}$

(No earthquakes recorded in July, 1916.)

Arizona. Tucson. Magnetic Observatory. U. S. Coast and Geodetic Survey. F. P. Ulrich.

Lat. 32° 14' 48" N.; long., 110° 50' 06" W. Elevation, 769.6 meters.

Instruments: Two Bosch-Omorci, 10 and 12 kg.

Instrumental constants: $\begin{cases} E & V & T_0 \\ N & 10 & 18 \\ & 10 & 19.6 \end{cases}$

(No earthquakes recorded in July, 1916.)

California. Berkeley. University of California.

Lat. 37° 32' 16" N.; long., 122° 15' 37" W. Elevation, 85.4 meters.

(See Bulletin of the Seismographic Stations, University of California.)

Date.	Charac-ter.	Phase.	Time.	Period. T.	Amplitude.		Dis-tance.	Remarks.
					A _s	A _N		

California. Mount Hamilton. Lick Observatory.

Lat., 37° 20' 24" N.; long., 121° 38' 34" W. Elevation, 1,281.7 meters.

(See Bulletin of the Seismographic Stations, University of California.)

California. Point Loma. Raja Yoga Academy. F. J. Dick.

Lat., 32° 43' 03" N.; long., 117° 15' 10" W. Elevation, 91.4 meters.

Instrument: Two-component, C. D. West seismoscope.

1916.	July	Date	H. m. s.	Sec.	μ		K. m.	Remarks.
					*200	*100		
	2							Light tremors recorded during 24 hours preceding 3 p. m. on dates given.
	9							
	10							
	11							
	25							
	26							
	27							
	28							
	29							
	31							

*Amplitude on instrument.

TABLE 2.—Instrumental seismological reports, July, 1916—Continued.

Date.	Charac-ter.	Phase.	Time.	Period. T.	Amplitude.		Dis-tance.	Remarks.
					A _N	A _E		

California. *Santa Clara, University of.* J. S. Ricard, S. J.
 Lat., 37° 26' 38" N.; long., 121° 57' 03" W. Elevation, 27.43 meters.
 (See Record of the Seismographic Station, University of Santa Clara.)

Colorado. *Denver. Sacred Heart College. Earthquake Station.* A. W. Forstall, S. J.
 Lat., 39° 40' 36" N.; long., 104° 56' 54" W. Elevation, 1,655 meters.
 Instrument: Wiechert 80 kg., astatic, horizontal pendulum.
 (Report for July, 1916, not received.)

District of Columbia. *Washington. U. S. Weather Bureau.*
 Lat., 38° 54' 12" N.; long., 77° 03' 03" W.; Elevation, 21 meters.
 Instrument: Marvin (vertical pendulum), undamped. Mechanical

$$\frac{V}{T_0} = 110 \text{ } \mu$$

1916.		H. m. s.	Sec.	μ	μ	Km.	
July 8	e _N ?	9 50 27					Imperceptible on N-S.
	S _N ?	10 00 40					
	F _N	10 50 00					
17	F _N	10 38 08					Phases uncertain.
	S _N ?	10 44 04					
	F _N	10 55 00					
22	eF _N ?	16 51 52					
	F _N	17 00 00					
28	P	17 43 47					
	S	17 48 49					
	L	17 53 45	16				
	L	17 55 00	18				
	F	18 25 00					

District of Columbia. *Washington. Georgetown University.*
 F. L. Tondorf, S. J.
 Lat., 38° 54' 25" N.; long., 77° 04' 24" W. Elevation, 42.4 meters. Subsoil: Decayed doricite.
 Instruments: Wiechert 200 kg. astatic horizontal pendulums, 80 kg. vertical.

$$\frac{V}{T_0} = \begin{matrix} E & 165 & 5.4 & 0 \\ N & 143 & 5.2 & 0 \\ Z & 30 & 3.0 & 0 \end{matrix}$$

Instrumental constants: $\frac{V}{T_0} = \begin{matrix} E & 165 & 5.4 & 0 \\ N & 143 & 5.2 & 0 \\ Z & 30 & 3.0 & 0 \end{matrix}$

1916.		H. m. s.	Sec.	μ	μ	Km.	
July 28	e	17 28 52					Microseisms. These not defined. Mainka shows L at 12 ^h 54 ^m 56 ^s . No distinct M.
	eL _N	17 55 14					
	L	17 56 22					
	F	18 11 00					

Date.	Charac-ter.	Phase.	Time.	Period. T.	Amplitude.		Dis-tance.	Remarks.
					A _N	A _E		

Hawaii. *Honolulu. Magnetic Observatory.* U. S. Coast and Geodetic Survey. Wm. W. Merrymon.
 Lat., 21° 19' 12" N.; long., 158° 03' 48" W. Elevation, 15.2 meters.
 Instruments: Milne seismograph of the Seismological Committee of the British Association.
 Instrumental constant... $\frac{T_0}{19.9}$

1916.		H. m. s.	Sec.	μ	μ	Km.	
July 8	P _N	9 43 54					
	S _N	9 48 08					
	L	9 51 30					
	M	9 51 54	18	*900			
	C	10 00 18					
	F	10 38 00					
14	L _N	23 57 48					
	M	0 02 12	20	*600			
	C	0 06 08					
	F	0 35 00					
16	L _N	18 31 48					
	M	18 32 43	18	*300			
	F	18 54 00					
22	P _N	5 59 12					
	L	6 09 54					
	M	6 17 12	20	*300			
	F	6 21 00					
23	L _N	3 02 00					
	M	3 05 48	20	*200			
	C	3 08 24					
	F	3 12 00					
23	P _N	10 22 24					
	S _N	10 33 12					
	L _N	10 45 00					
	M	10 49 18	20	*300			
	C	10 51 06					
F	10 58 00						

* Trace amplitude.

Kansas. *Lawrence. University of Kansas. Department of Physics and Astronomy.* F. E. Kester.
 Lat., 38° 57' 30" N.; long., 95° 14' 58" W. Elevation, 301.1 meters.
 Instrument: Wiechert.

$$\frac{V}{T_0} = \begin{matrix} E & 177 & 3.4 & 4.0 \\ N & 205 & 3.4 & 3.3 \end{matrix}$$

 (No earthquakes recorded in July, 1916.)

Maryland. *Cheltenham. Magnetic Observatory.* U. S. Coast and Geodetic Survey. George Hartnell.
 Lat., 38° 44' 00" N.; long., 76° 50' 30" W. Elevation, 71.6 meters.
 Instruments: Two Bosch-Omori, 10 and 12 kg.

$$\frac{V}{T_0} = \begin{matrix} E & 10 & 31 \\ N & 10 & 29 \end{matrix}$$

1916.		H. m. s.	Sec.	μ	μ	Km.	
July 28	L _N	17 54 00					
	M	17 57 00	16		10		
	F	18 04 00					

TABLE 2.—*Instrumental seismological reports, July, 1916—Continued.*

Date.	Charac-ter.	Phase.	Time.	Period. T.	Amplitude.		Dis-tance.	Remarks.
					A _E	A _N		
Canada. <i>Ottawa. Dominion Astronomical Observatory. Earthquake Station. Otto Klotz.</i>								
Lat., 45° 23' 38" N.; long., 75° 42' 57" W. Elevation, 83 meters.								
Instruments: Two Bosch photographic horizontal pendulums, one Spindler & Hoyer 80 kg. vertical seismograph.								
$V T_0$ Instrumental constants: 120 26								
1916. July 8			<i>H. m. s.</i>	<i>Sec.</i>	μ	μ	<i>Km.</i>	
			0 _m 9 51 20				3,300?	
			eL _m ? 10 02 18	14				
			F 10 45 00					
16			IP _m 18 38 14				3,000?	
			SP 18 42 57					
			L _m 19 01 00	20				
			L _m 19 07 00	20				
			L _m 19 11 00	16				
			F 19 30 00					
17			iL _m 10 45 31					
			L _m 10 51 00	30				
			L _m 10 54 00	16				
			F 11 00 00					
22			e 6 26 00					
			eL _m 6 31 00	20				
			L _m 6 31 00	15				
			F 6 45 00					
22			L _m 16 54 00	9				
			L _m 16 58 00	6				
			F 17 05 00					
28			e _p 17 41 18	5				
			17 52 00					
			e _m 17 53 18	8				
			eL _m 17 56 48	26				
			L _m 18 01 00	16				
			F 18 10 00					

TABLE 3.—*Late seismological reports. (Instrumental.)*

Date.	Charac-ter.	Phase.	Time.	Period. T.	Amplitude.		Dis-tance.	Remarks.
					A _E	A _N		
Panama Canal Zone. <i>Balboa Heights. Isthmian Canal Commission.</i>								
Lat., 8° 57' 39" N.; long., 79° 33' 29" W. Elevation, 27.6 meters.								
Instruments: Two Bosch-Omori 100 kg.								
$V T_0$ Instrumental constants: 10 20								
1916. June 19			<i>H. m. s.</i>	<i>Sec.</i>	μ	μ	<i>Km.</i>	
			P _N 1 18 48				1,545	Wave movement N-S.
			L _N 1 23 28					Very slight record
			M _N 1 24 12			300		on E-W; too small
			F _N 1 38 30					to measure.
21			P _N 21 38 52				1,770	Wave movement N-S.
			L _N 21 44 12					Very slight record on
			M _N 21 44 17			200		E-W; too small to
			F _N 21 58 56					measure.
27			P 18 56 36				676	Direction probably
			L 18 58 04					NW.
			M 18 58 04			200		
			F 19 00 18			50		
			F _N 19 03 00					
30			P 3 01 48				966	Direction probably
			L 3 04 00					NW.
			L _N 3 04 16					
			M _N 3 04 38			600		
			M 3 05 22			500		
			F 3 23 12					
			F _N 3 23 26					

TABLE 3.—*Late seismological reports. (Instrumental.)—Continued.*

Date.	Charac-ter.	Phase.	Time.	Period. T.	Amplitude.		Dis-tance.	Remarks.
					A _E	A _N		
Canada. <i>Ottawa. Dominion Astronomical Observatory. Earthquake Station. Otto Klotz.</i>								
Lat. 45° 23' 38" N., long., 75° 42' 57" W. Elevation, 83 meters.								
Instruments: Two Bosch photographic horizontal pendulums, one Spindler & Hoyer 80 kg. vertical seismograph.								
$V T_0$ Instrumental constants: 120 26								
1916. June 2			<i>H. m. s.</i>	<i>Sec.</i>	μ	μ	<i>Km.</i>	
			O 13 59 19				3,350	
			P 14 05 44					
			S 14 10 51					
			L 14 13 48	40-28				
			L 14 23 00	14				
			F 14 50 00					
3			eL 6 07 00	40				
			L 6 15 00	24				
			F 6 25 00					
9			eL 22 29 30	24				
			L 22 35 00	24				
			F 22 45 00					
15			e _m 11 39 44				16,000?	
			eL _m ? 12 01 24	14				
			L _m 12 38 00	40				
			L _m 12 44 00	24				
			L _m 12 48 00	20				
			L _m 13 13 00	16				
			F 13 25 00					
19			O 1 15 53				5,100	
			IP _N 1 24 27	2				
			S 1 31 14					
			eL _m 1 38 12	16				
			L _m 1 41 00	16				
			L _m 1 44 00	16				
			L _m 1 51 00	7				
			F 2 10 00					
20			e _m 7 12 30	4				
			L _m 7 25 00	12				
			L _m 7 31 00	16				
			L _m 7 38 00	16				
			F 8 00 00					
21			O 21 32 33				7,270	
			IP 21 43 15	1-2				
			L 21 45 17					
			S 21 51 58					
			eL _m 22 00 42	20				
			L _m 22 06 00	18				
			L _m 22 08 00	14				
			L _m 22 26 00	13				
			F 22 50 00					
24			e _m 7 06 06				4,800?	
			eL 7 18 18	24				
			L _m 7 24 00	12				
			L _m 7 30 00	14				
			L _m 7 41 00	13				
			F 8 00 00					
25			e 18 33 12					
			e 18 37 30					
			L _N 18 39 18					
			eL 18 39 30	18-14				
			L _m 18 45 00	6				
			F 19 20 00					
30			O 3 00 21				4,890	
			P _m 3 08 42					
			S _m 3 15 18					
			eL _m 3 18 42	20				
			L _m 3 21 00	20				
			L _m 3 23 00	16				
			L _m 3 29 00	16				
			L _m 3 37 00	14				
			L _m 3 47 00	12				
			L _m 4 45 00	12				
			L _m 5 16 00	14				
			F 5 40 00					

TABLE 3.—Late seismological reports. (Instrumental).—Continued.

Date.	Charac-ter.	Phase.	Time.	Period. T.	Amplitude.		Dis-tance.	Remarks.
					A _s	A _N		
Canada. Toronto. Dominion Meteorological Service.								
Lat., 43° 40' 01" N.; long., 79° 23' 54" W. Elevation, 113.7 meters. Subsoil: Sand and clay.								
Instrument: Milne horizontal pendulum, North. In the meridian.								
Instrumental constant. . 18. Pillar deviation, 1 mm. swing of boom=0.59".								
1916.								
June 2	L.		0 11 42					
	M.		?		*50			Air currents.
	F.		?					
2	e.		13 50 24					
	e.		14 00 12					
	L.		14 10 00					
	M.		14 12 18		*400			
	F.		?					
3	e?		6 00 00		*50			Air currents.
6	L.		13 53 00					Mixed up with air currents.
	M.		?		*50			
	F.		14 02 30					
7	L.		13 47 12					Very doubtful as to being seismic; may be air currents.
	L.		13 53 12					
	M.		13 55 24		*200			
	F.		?					
15	L.		12 49 24					Air currents going on.
	M.		12 56 42		*300			
	F.		?					
19	P?		1 25 00			6,105		Air currents going on.
	S.		1 32 42					
	L.		1 38 24					
	L.		1 42 00					
	M.		1 44 00		*500			
	F.		?					
20	L.		7 28 54					
	M.		?		*500			
	F.		7 52 24					
21	L.		21 51 54					
	M.		21 52 30		*1,700			
	L.		21 59 06					Air currents.
	F.		?					
24	e.		7 15 48					
	L.		7 20 36					
	M.		?		*200			
	F?		7 47 36					
25	e?		18 30 30					L. W. came in very abrupt and gradually tapered off.
	e?		18 36 06					
	L.		18 37 06					
	M.		18 37 54		*1,200			Air currents.
	F.		?					
30	P.		3 07 12			5,883		Marked disturbance.
	P.R.		3 12 24					
	S.		3 14 42					
	M.		3 31 42		*1,200			
	M.		4 52 12		*200			
	F.		6 18 30					

* Trace amplitude.

SEISMOLOGICAL DISPATCHES.¹

Messina, July 4, 1916.

The volcano of Stromboli has been in eruption since last night. Tug-boats are being rushed to the neighborhood to save the inhabitants. (Assoc. Press.)

Rome, July 4, 1916.

The eruption of Stromboli has become serious. The flow of lava is spreading to the sparse coast settlements, burning and destroying houses, and the population is fleeing to the sea and taking refuge upon relief ships sent from Messina. Telephonic communication with Messina has been interrupted. (Assoc. Press.)

¹ Reported by the organization indicated and collected by the seismological station at Georgetown University, D. C.

Date.	Charac-ter.	Phase.	Time.	Period. T.	Amplitude.		Dis-tance.	Remarks.
					A _s	A _N		
Canada. Victoria, B. C. Dominion Meteorological Service.								
Lat., 48° 24' N.; long., 123° 19' W. Elevation, 67.7 meters. Subsoil: Rock.								
Instrument: Wiechert, vertical; Milne horizontal pendulum, North. In the meridian.								
Instrumental constant. . 18. Pillar deviation, 1 mm. swing of boom=0.59".								
1916.								
June 2	L?		0 11 10					
	M.		0 14 08			*100		
	F.		?					
2	P.		14 11 24					3,070
	S.		14 16 12					
	L.		14 21 39					
	M.		14 26 07			*200		
	F.		14 40 59					
3	M.		6 01 51			*100		
6	L?		13 53 10					
	M.		13 55 39			*200		
	F.		14 00 07					
11	L?		00 51 21					
	M.		00 53 50			*200		
11	L?		1 16 39					
	M.		1 20 07			*200		
15	P.		12 26 37					2,410
	S.		12 30 35					
	L.		12 39 30					
	M.		12 42 59			*500		
	F.		13 16 42					
19	P?		1 38 36					
	M.		1 44 34			*500		
	F.		1 59 56					
21	P?		21 00 00					Paper slipped.
	L?		21 00 00					
	M?		21 00 00			*500		
	F.		22 56 31					
24	P?		6 48 59					
	M.		7 06 56			*200		
	F.		7 16 21					
25	P.		18 32 44					
	S?		18 34 13					
	L.		18 35 12					
	M.		18 37 41			*500		
	F.		18 44 07					
30	P.		3 10 34					8,200
	S.		3 19 04					
	L?		3 36 34					
	M.		3 37 34			*5000		
	F.		6 10 04					
VERTICAL.								
	P.		3 10 34		10			7,730
	S.		3 19 40		16			
	L?		3 36 40		20			
	M.		3 39 20		16			
	F.		?					

* Trace amplitude.

London, July 6, 1916, 2:25 p. m.

A violent earthquake at Caltanissetta, Sicily, causing the deaths of nearly 300 persons, is reported in an Exchange Telegraph despatch from Rome. It is said the victims were in three sulphur mines which the earth shock caused to cave in. (Assoc. Press.)

Following London.

Earth shocks occurred Tuesday at Ancona, Rimini, Belvedere, Marettimo and in other Adriatic districts, but heretofore no loss of life has been reported. (Assoc. Press.)

Amsterdam, July 18, 1916.

Great damage has been caused by an earthquake in the region of Fiume, Austria. In the city of Fiume a terrible panic was caused.

There have been several earth disturbances recently in the region of the Adriatic, principally in lower Italy and Sicily. (Philadelphia Record.)

SECTION V.—SEISMOLOGY.

SEISMOLOGICAL REPORTS FOR AUGUST, 1916.

W. J. HUMPHREYS, Professor in Charge.

[Dated: Weather Bureau, Washington, D. C., Oct. 3, 1916.]

TABLE 1.—Noninstrumental earthquake reports, August, 1916.

Day.	Approximate time, Greenwich Civil.	Station.	Approximate latitude.	Approximate longitude.	Intensity Rossi-Forel.	Number of shocks.	Duration.	Sounds.	Remarks.	Observer.
CALIFORNIA.										
1916.	H. m.		° ' "	° ' "			M. s.			
Aug. 2	0 44	Covelo.....	39 47	123 16	3	1	0 2	Rumbling.....		U. S. Forest Service.
6	19 40	Hollister.....	36 50	121 20	5	1	15	None.....	Rocked buildings.....	J. N. Thompson.
	19 40	Lenoak.....	36 20	120 55	4	1		do.....		M. L. Griffin.
	19 40	Los Gatos.....	37 12	121 58	3	1	5	Faint.....	Recorded on duplex seismograph.	I. H. Snyder.
	19 40	Merced.....	37 21	120 27	4	1	5	None.....	Doors moved.....	A. L. Powell.
	19 40	Paso Robles.....	35 34	120 40	3	1	1	Rumbling.....	Houses trembled.....	Virginia Bartlett.
	19 40	San Francisco.....	37 48	122 26	2	1	2	None.....		U. S. Weather Bureau.
	19 40	Santa Cruz.....	36 57	122 02	4	1	8	do.....	Felt by nearly everyone.....	W. R. Springer.
	19 40	Soledad.....	36 25	121 18	4	1				A. H. Abbott.
	19 40	Spreckels.....	36 35	121 38	5	2		None.....		A. M. Hunt.
6	20 55	Hollister.....	36 50	121 20						J. N. Thompson.
	20 55	Salinas.....	36 40	121 28	3			None.....		J. H. Menke, jr.
	20 55	Spreckels.....	36 35	121 38	5	1		do.....		A. M. Hunt.
7	16 15	Salinas.....	36 40	121 38	3					J. H. Menke, jr.
8	10 45	Salinas.....	36 40	121 38	3					J. H. Menke, jr.
8	11 00	Salinas.....	36 40	121 38	4					J. H. Menke, jr.
8	16 50	Los Gatos.....	37 12	121 58	4	1	10	None.....	Recorded on duplex seismograph.	I. H. Snyder.
	16 50	Santa Cruz.....	36 57	122 02	5	1	5	do.....	Felt by everyone.....	W. R. Springer.
	16 50	Soledad.....	36 25	121 18	4	1				A. H. Abbott.
	16 50	Spreckels.....	36 35	121 38	4	1				A. M. Hunt.
14	7 20	Lone Pine.....	36 37	118 01		2		Rumbling.....		G. F. Marsh.
21	5 00	Yorba Linda.....	33 51	117 50	3	1				W. A. Walker.
21	11 00	Yorba Linda.....	33 51	117 50	3	1				Do.
23	14 55	Eureka.....	40 48	124 11	5	2	30	Rumbling.....	Caused some alarm.....	U. S. Weather Bureau.
	14 55	Rohnerville.....	40 33	124 11	4	3				W. D. Gray.
	14 55	Shiveley.....	40 25	123 56	6	1	1	None.....		Frank Essig.
ILLINOIS.										
24	9 00	Anna.....	37 27	89 18	2	2	8	None.....	See Missouri.....	Jas. I. Hale.
MISSOURI.										
24	9 00	New Madrid.....	36 35	89 32	3	1			Awakened some people.....	Miss Josie Smith.
NEVADA.										
3	13 50	Elko.....	40 51	115 45	4	3	12	None.....		E. M. Stanger.
	13 50	McDermitt.....	41 58	117 45						F. A. Swayze.
	13 50	Rebel Creek.....	41 39	117 45	2	1	1	None.....		F. W. Whitaker.
	13 50	Winnemucca.....	40 58	117 43	3	1	10	do.....		U. S. Weather Bureau.
3	14 22	McDermitt.....	41 58	117 45	2	1				F. A. Swayze.
	14 22	Rebel Creek.....	41 39	117 45	2	1	1	None.....		F. W. Whitaker.
	14 22	Winnemucca.....	40 58	117 43	3	1	10	do.....		U. S. Weather Bureau.
NORTH CAROLINA.										
26	19 35	Harmony.....	35 55	80 48	3	1	1	Rumbling.....		C. H. Smith.
	19 35	Lenoir.....	35 55	81 36	3	1	1	None.....		Mrs. E. C. Ivey.
	19 35	Lincolnton.....	35 27	81 18	2	3		do.....		J. T. McLean.
	19 35	Morganton.....	35 45	81 38	2	1				J. B. P. Massey.
	19 35	Newton.....	35 42	81 14	4	1	2	Rumbling.....		G. L. Cline.
	19 35	North Wilkesboro.....	36 08	81 13	4-5	1		Faint.....	Felt by nearly everyone.....	J. Hackett.
	19 35	Statesville.....	35 45	80 55	5	1			Caused some alarm.....	Press report.
	19 35	Taylorsville.....	35 53	81 12	5	1	2	Rumbling.....		J. L. Galtney.
WYOMING.										
12	4 00	Rongis.....	42 25	107 50	3	1		Rumbling.....		Press report.

TABLE 2.—Instrumental seismological reports, August, 1916.

Time used: Mean Greenwich, midnight to midnight. Nomenclature: International.

[For significance of symbols see this REVIEW, January, 1916, p. 39.]

Date.	Charac-ter.	Phase.	Time.	Period. T.	Amplitude.		Dis-tance.	Remarks.
					A _N	A _M		

Alaska. *Sitka. Magnetic Observatory. U. S. Coast and Geodetic Survey. J. W. Green.*

Lat. 57° 03' 00" N.; long., 135° 30' 06" W. Elevation, 15.2 meters.

Instruments: Two Bosch-Omori, 10 and 12 kg.

Instrumental constants: $\begin{matrix} V & T_0 \\ E & 10 & 16.6 \\ N & 10 & 15.4 \end{matrix}$

1916.			H. m. s.	Sec.	μ	μ	Km.	
Aug. 3	P _N		1 46 56					Paper being changed 2 ^h 05 ^m to 2 ^h 12 ^m .
	S _N		1 53 14					
	S _M		1 53 17		20	10		
	M _N		1 54 41					
	F _N		2 48 00					
3	eL		14 31 11					
	M		14 31 48	10	10	20		
	C		14 35 00					
28	eP _N		6 52 30					
	eP _N		6 52 36					
	S		7 03 01					
	eL _N		7 28 22	20				
	M _N		7 36 21			50		
	M _N		7 37 43		20			
	C _N		7 40 00					
	F		7 59 00					

Arizona. *Tucson. Magnetic Observatory. U. S. Coast and Geodetic Survey. F. P. Ulrich.*

Lat. 32° 14' 48" N.; long., 110° 50' 06" W. Elevation, 789.6 meters.

Instruments: Two Bosch-Omori, 10 and 12 kg.

Instrumental constants: $\begin{matrix} V & T_0 \\ E & 10 & 13.9 \\ N & 10 & 19.1 \end{matrix}$

1916.			H. m. s.	Sec.	μ	μ	Km.	
Aug. 3	P _N		20 36 34	3				
	P _N		20 37 13					
	M		20 42 30	6	5	5		
	F		20 48 00					
3	P _N		9 01 29					P doubtful.
	P _N		9 02 20					
	L		9 04 10	7				
	M _N		9 04 40	6		10		
	M _N		9 05 10	7	10			
	C _N		9 07 11	6				
	F		9 13 00	7				
3	P _N		14 25 03	4				Began while chang- ing paper on N-S.
	M _N		14 25 49	5	40			
	F		14 35 00	4		20		
6	P _N		19 44 13	3				
	P _N		19 44 23	3				
	M _N		19 45 26	3		5		
	F		19 52 00	8	5			
25	P _N		9 55 18					Barely perceptible.
	P _N		9 55 28					
	S		10 04 00					
	M		10 18 28		5	5		
	C _N		10 19 00					
28	e _N		7 45 26	20				Some short period waves earlier than this, probably mi- croseisms.
	e _N		7 51 48	18				
	M _N		7 54 18	18		10		
	M _N		7 55 46	19	10			
	F		8 08 00					

Date.	Charac-ter.	Phase.	Time.	Period. T.	Amplitude.		Dis-tance.	Remarks.
					A _N	A _M		

California. *Berkeley. University of California.*

Lat., 37° 52' 16" N.; long., 122° 15' 37" W. Elevation, 85.4 meters.

(See Bulletin of the Seismographic Stations, University of California.)

California. *Mount Hamilton. Lick Observatory.*

Lat., 37° 20' 24" N.; long., 121° 38' 34" W. Elevation, 1,281.7 meters.

(See Bulletin of the Seismographic Stations, University of California.)

California. *Point Loma. Raja Yoga Academy. F. J. Dick.*

Lat., 37° 43' 03" N.; long., 117° 15' 10" W. Elevation, 91.4 meters.

Instrument: Two-component, C. D. West seismoscope.

1916.			H. m. s.	Sec.	μ	μ	Km.	
Aug. 1	1				*100	*100		Light tremors re- corded during 24 hours preceding 15 ^h on date given.
	2				*150	*150		
	3				*100	*200		
	4				*100	*200		
	5				*100	*200		
	22					*100	*100	

* Amplitude on instrument.

California. *Santa Clara. University of Santa Clara. J. S. Ricard, S. J.*

Lat., 37° 26' 36" N.; long., 121° 57' 63" W. Elevation, 27.43 meters.

(See Record of the Seismographic Station, University of Santa Clara.)

Colorado. *Denver. Sacred Heart College. Earthquake Station. A. W. Forstall, S. J.*

Lat., 33° 40' 38" N.; long., 104° 56' 51" W. Elevation, 1,655 meters.

Instrument: Wiechert 80 kg., astatic, horizontal pendulum.

1916.			H. m. s.	Sec.	μ	μ	Km.	
Aug. 14	L _N		9 20 00					Irregular sinusoid. Almost continual during second part of night. Weaker on E-W.
	M _N		12 30 00					
	F _N		15 00 00					
16	M _N		1 30 00					Irregular sinusoid on both components. Stronger on E-W.
	F _N		10 40 00					
27	P		22 01 00					Phases very irregular and uncertain. Amplitude and period can not be measured.
	L _N		22 10 00					
	L _N		22 12 00					
	M		22 25 00					
	F		22 39 00					

TABLE 2.—Instrumental seismological reports, August, 1916—Continued.

Date.	Charac- ter.	Phase.	Time.	Period. T.	Amplitude.		Dis- tance.	Remarks.	
					A _m	A _w			
District of Columbia. <i>Washington. U. S. Weather Bureau.</i> Lat., 38° 54' 12" N.; long., 77° 03' 03" W. Elevation, 21 meters. Instrument: Marvin (vertical pendulum), undamped. Mechanical registration.									
					V	T_0	e		
					110	6.4			
1916.			<i>H. m. s.</i>	<i>Sec.</i>	μ	μ	<i>Km.</i>		
Aug. 3	P		1 51 42				8,550		
	S?		2 01 30						
	L		2 08 42						
	L		2 29 00	20					
	L		2 36 00						
	L		2 41 00						
	L		3 31 00						
	L		3 36 00						
	F		3 40 00						
3	P?		9 17 30					Phases doubtful.	
	F		9 25 00						
3	S?		14 04 00						
	L?		14 07 25						
	F		14 15 00						
3	P		14 31 30				2,640	Phases not well de- fined.	
	S		14 35 48						
	L		14 39 20						
	F		15 05 00						
6	P		19 57 40						
	L		20 00 40	10					
	F		20 08 00						
18	P		1 20 02				810	Record very faint on E-W.	
	S		1 21 30						
	F		1 50 00						
25	P		9 54 30				6,820		
	S		10 02 50						
	L		10 12 00	40					
	F		10 40 00						
26	P		11 01 15				3,170?	Phases indistinct.	
	S?		11 06 10						
	L		11 10 15	12					
	F		11 20 00						
26	P		19 37 19				520	Earthquake of west- ern North Carolina.	
	S		19 38 10						
	L		19 38 21						
	F		19 45 00						
28	P		6 57 11				5,900		
	S		7 04 42						
	S _n		7 05 30						
	S _n		7 07 55						
	L		7 23 50						
	L		7 32 00	40					
	L		7 41 00	20					
	L		7 48 00	16					
	F		9 06 00						

District of Columbia. *Washington. Georgetown University.*
F. L. Tondorf, S. J.
Lat., 38° 54' 25" N.; long., 77° 04' 24" W. Elevation, 42.4 meters. Subsoil: Decayed
diorite.
Instruments: Wiechert 200 kg., astatic, horizontal pendulums, 80 kg., vertical.

Instrumental constants: $\begin{cases} E & V & T_0 & e \\ N & 143 & 5.2 & 0 \\ Z & 80 & 3.0 & 0 \end{cases}$

Date.	Charac- ter.	Phase.	Time.	Period. T.	μ	μ	<i>Km.</i>	Remarks.
1916.			<i>H. m. s.</i>	<i>Sec.</i>				
Aug. 3	Sw		1 46 16					Malink instrument shows at 1 ^h 46 ^m 24 ^s ; S? at 1 ^h 52 ^m 56 ^s .
	Om		1 46 49					
	eL?		2 03 23					
	F		3 12 00					
25	eP _w		9 53 14					No distinct maxi- mum.
	eP _m		9 53 20					Sheet removed by mistake at 12 ^h 15 ^m ; tremors still on.
	IS _n		10 03 51					
	Sw		10 03 51					
	eL		10 13 24					
	F		(?)					
26	e		19 36 26					Recorded on vertical instrument.
	S		19 38 18					
	F		19 44 00					
27	e		21 07 43					
	P?		21 22 22					
	F		22 04 00					
28	e		6 59 38					Bosch-Omorl instru- ment shows e at 6 ^h 59 ^m 51 ^s .
	IR		7 04 38					S very doubtful.
	S?		7 07 35					
	L _n		7 22 15	18				
	F		9 04 00					

Hawaii. *Honolulu. Magnetic Observatory. U. S. Coast and Geodetic
Survey. Wm. W. Merrymon.*
Lat., 21° 19' 12" N.; long., 158° 03' 48" W. Elevation, 15.2 meters.
Instrument: Milne seismograph of the Seismological Committee of the British Associa-
tion.

Instrumental constant . . . 18.6

Date.	Charac- ter.	Phase.	Time.	Period. T.	μ	μ	<i>Km.</i>	Remarks.
1916.			<i>H. m. s.</i>	<i>Sec.</i>				
Aug. 3	P		1 40 42					
	S?		1 45 12					
	L		1 49 18					
	M		2 04 00	20	*2,200			
	C		2 35 00					
	F		4 36 00					
3	e		21 40 12					
	L		21 44 06					
	M		21 45 36		*200			
	C		21 47 40					
	F		21 50 36					
6	L		22 30 00		*100			
	F		23 45 00					
8	L		4 40 30					Secondary maxima at 4 ^h 42 ^m 12 ^s ; 4 ^h 54 ^m 48 ^s ; 5 ^h 05 ^m 06 ^s ; 5 ^h 18 ^m 00 ^s ; 5 ^h 11 ^m 00 ^s ; 5 ^h 14 ^m 54 ^s .
	M		4 51 48		*200			
	F		5 42 00					
17	L		10 11 18					
	M		10 17 24		*100			
	F		10 24 06					
18	P		1 40 24					
	L		1 45 54					
	M		1 48 24		*100			
	F		1 52 30					
19	L		8 59 00		*100			
	M		9 04 00					
	F		9 07 06					
21	L		5 54 48		*100			
	M		5 57 00					
	F		5 59 00					
23	L		22 12 24		*100			
	M		22 17 36					
	C		22 22 42					
25	P?		10 00 00					
	S		10 09 24					
	L		10 12 36					
	L		10 16 42					
	L		10 29 06					
	M		10 33 24	21	*800			
	C		10 42 30					
	F		13 04 00					
26	e		11 16 00		*100			A series of tremors of very small ampli- tude.
	M		11 42 42					
	F		12 36 00					
27	e		22 57 54					
	L		23 16 18					
	M		23 18 18		*100			
	M		23 24 06		*100			
	C		23 28 06					
	F		23 54 00					
30	P		15 14 18					
	S		15 18 18					
	L		15 21 06					
	M		15 21 36		*400			
	C		15 25 36					
	F		17 12 00					

* Trace amplitude.

Kansas. *Lawrence. University of Kansas. Department of Physics
and Astronomy. F. E. Kester.*
Lat., 38° 57' 30" N.; long., 95° 14' 58" W. Elevation, 301.1 meters.
Instrument: Wiechert.

Instrumental constants: $\begin{cases} E & V & T_0 & e \\ N & 177 & 3.4 & 4.0 \\ Z & 205 & 3.4 & 2.8 \end{cases}$

(No earthquake recorded during August, 1916.)

TABLE 2.—Instrumental seismological reports, August, 1916—Continued.

Date.	Charac-ter.	Phase.	Time.	Period. T.	Amplitude.		Dis-tance.	Remarks.
					A _n	A _m		

Maryland. *Chellenham. Magnetic Observatory. U. S. Coast and Geodetic Survey. George Hartnell.*
 Lat., 38° 44' 00" N.; long., 76° 50' 30" W. Elevation, 71.6 meters.
 Instruments: Two Bosch-Omori, 10 and 12 kg.

Instrumental constants.. $\begin{matrix} V & T_0 & c:1 \\ E & 10 & 32 \\ N & 10 & 27 \end{matrix}$

1916.			H. m. s.	Sec.	μ	μ	Km.	
Aug. 3		P _n	14 35 18	3	
		P _w	14 36 23	3	
		L _w	14 39 29	
		L _n	14 39 40	
		M.....	14 40 16	8	10	5	
25		P _n	10 02 44		
		P _w	10 02 56	.....	.....	.....
		L _w	10 13 27	.....	.....	.....
		L _n	10 13 56	.....	.....	.....
		M.....	10 14 50	29	10	20	
28		P _n	7 26 35	Phases very un-certain.	
		P _w	7 27 05	.....	.....	.....
		L _w	7 35 50	.....	.....	.....
		L _n	7 40 20	.....	.....	.....
		M.....	7 48 45	16	10	.....	
		M _w	7 50 51	16	30		
		M.....	7 50 51	16	.....	30	
		F.....	8 05 00	.....	.....	.....

Massachusetts. *Cambridge. Harvard University Seismographic Station. J. B. Woodworth.*

Lat., 42° 22' 38" N.; long., 71° 06' 59" W. Elevation, 5.4 meters. Foundation: Glacial sand over clay.

Instruments: Two Bosch-Omori 100 kg. horizontal pendulums (mechanical registration).

Instrumental constants.. $\begin{matrix} V & T_0 & c:1 \\ E & 80 & 23 & 0 \\ N & 50 & 25 & 4:1 \end{matrix}$

(Report for August, 1916, not received.)

Missouri. *Saint Louis. St. Louis University. Geophysical Observa-tory. J. B. Goesse, S. J.*

Lat., 38° 38' 15" N.; long., 90° 13' 58" W. Elevation, 100.4 meters. Foundation: 12 feet of tough clay over limestone of Mississippi system, about 300 feet thick.

Instrument: Wiechert 80 kg. astatic, horizontal pendulum.

Instrumental constants.. $\begin{matrix} V & T_0 & c:1 \\ E & 80 & 7 & 5:1 \end{matrix}$

1916.			H. m. s.	Sec.	μ	μ	Km.	
Aug. 3		P _w	13 53 00	.....	.....	.....
		F.....	14 05 00	.....	.....	.....
3		P.....	14 31 00	.....	.....	.....
		F.....	14 42 00	.....	.....	.....

New York. *Buffalo. Canisius College. John A. Curtin, S. J.*

Lat., 42° 53' 02" N.; long., 78° 52' 40" W. Elevation, 190.5 meters.

Instrument: Wiechert 80 kg. horizontal.

Instrumental constants.. $\begin{matrix} V & T_0 & c:1 \\ E & 80 & 7 & 5:1 \end{matrix}$

(Report for August, 1916, not received.)

New York. *Fordham. Fordham University. W. C. Repetti, S. J.*

Lat., 40° 51' 47" N.; long., 73° 53' 08" W. Elevation, 23.9 meters.

Instrument: Wiechert, 80 kg.

Instrumental constants.. $\begin{matrix} V & T_0 & c:1 \\ E & 72 & 7.2 & 1.5:1 \\ N & 72 & 7.2 & 3.5:1 \end{matrix}$

(Report for August, 1916, not received.)

Date.	Charac-ter.	Phase.	Time.	Period. T.	Amplitude.		Dis-tance.	Remarks.
					A _n	A _m		

New York. *Ithaca. Cornell University. Heinrich Ries.*

Lat., 42° 26' 58" N.; long., 76° 29' 09" W. Elevation, 242.6 meters.

Instruments: Two Bosch-Omori, 25 kg., horizontal pendulums (mechanical registration).

Instrumental constants.. $\begin{matrix} V & T_0 & c:1 \\ E & 13 & 22 & 4:1 \\ N & 14 & 25 & 4:1 \end{matrix}$

(Report for August, 1916, not received.)

Panama Canal Zone. *Balboa Heights. Isthmian Canal Commission.*

Lat., 8° 57' 39" N.; long., 79° 33' 29" W. Elevation, 27.6 meters.

Instruments: Two Bosch-Omori 100 kg.

Instrumental constants.. $\begin{matrix} V & T_0 \\ E & 10 & 20 \end{matrix}$

(Report for August, 1916, not received.)

Porto Rico. *Vieques. Magnetic Observatory. U. S. Coast and Geodetic Survey. H. M. Pease.*

Lat., 18° 09' N.; long., 65° 27' W. Elevation, 19.8 meters.

Instruments: Two Bosch-Omori.

Instrumental constants.. $\begin{matrix} V & T_0 \\ E & 10 & 21.4 \\ N & 10 & 21.1 \end{matrix}$

1916.			H. m. s.	Sec.	μ	μ	Km.	
Aug. 11		P.....	8 18 57		
		F.....	8 19 24	.....	.....	.....
28		P.....	7 46 43	Local shock, felt in Vieques. Vertical force variometer disturbed.	
		M.....	7 48 10	23	5	5		
		C.....	7 59 00	.....	.....	.....

Vermont. *Northfield. U. S. Weather Bureau. Wm. A. Shaw.*

Lat., 44° 10' N.; long., 72° 41' W. Elevation, 256 meters.

Instruments: Two Bosch-Omori, mechanical registration.

Instrumental constants.. $\begin{matrix} V & T_0 \\ E & 10 & 15 \\ N & 10 & 16 \end{matrix}$

1916.			H. m. s.	Sec.	μ	μ	Km.	
Aug. 3		P?	1 51 38	Record very faint.	
		S?	2 01 40	.....	.....	.....
		F.....	2 20 00	.....	.....	.....
3		P _w	9 16 50	2,200?	Phases doubtful. No record on E-W.	
		S _w	9 20 38	.....	.....	.....
3		P _w	14 33 20		
		F.....	14 50 00	.....	.....	.....
25		P _w	9 55 00	7,445	Very faint record. Nothing on E-W.	
		S _w	10 03 52	.....	.....	.....
		L _w	10 19 30	30	.....	.....
		F.....	10 40 00	.....	.....	.....
26		S?	11 05 52	Very feeble quake.	
		L.....	11 10 30	.....	.....	.....
		F.....	11 25 00	.....	.....	.....
28		P.....	8 57 47	4,680	Maximum not well defined.	
		S.....	7 04 12	.....	.....	.....
		SR.....	7 06 57	.....	.....	.....
		L.....	7 38 00	.....	.....	.....
		L.....	7 43 00	.....	.....	.....
		M.....	7 46 00	.....	.....	.....
		F.....	8 00 00	.....	.....	.....

TABLE 2.—Instrumental seismological reports, August, 1916—Continued.

Date.	Character.	Phase.	Time.	Period. T.	Amplitude.		Dis- tance.	Remarks.
					A _n	A _w		
Canada. Ottawa. Dominion Astronomical Observatory. Earthquake Station. Otto Klotz.								
Lat., 45° 23' 38" N.; long., 75° 42' 57" W. Elevation, 83 meters.								
Instruments: Two Bosch photographic horizontal pendulums, one Splindler & Hofer, 80 kg. vertical seismograph.								
Instrumental constants: $\frac{V}{T_0}$ 120 $\frac{T_0}{28}$.								
1916.			H. m. s.	Sec.	μ	μ	Km.	
Aug. 2	e.		20 33 16 } 21 00 00 } 21 05 00 }	6-10				
3	O		1 30 00				9,800	Time of O approx- imate.
	L		1 51 31					Velocity of L waves is 257 km. per minute.
	eLw		2 04 32	22				
	Lw		2 13 48	18				
	Lw		2 29 00	32				
	Lw		2 36 00	20				
	Lw		2 39 00	25				
	Lw		2 50 00	18				
	Lw		2 58 00	16				
	LR1w		3 28 00	20				
	F		3 45 00					
3	eLw		9 19 40	14				
	F		9 25 00					
3	e		14 03 30	2-3				
	e		14 08 00	7				
	e		14 10 00	7				
3	e		14 35 44	7				
	e		14 40 00	7				
	F		15 08 00					
6	e		19 59 00 } 20 15 00 }	4-5				
8	e		4 48 30	10				
	Lw		5 15 00	20				
	Lw		5 23 00	18				
	F		5 35 00					
18	Pw		1 20 54					
	e		1 27 30					
	F		1 50 00					
25	P		9 55 13				7,500	
	S		10 04 08					
	Lw		10 15 18	40				
	Lw		10 15 36	40				
	L		10 20 00	30				
	L		10 30 00	20				
	L		10 51 00	16				
	F		11 00 00					
	eLR1w		12 21 36	22				
	eLR1w		12 24 00	20				
	LR1w		12 29 00	20				
	LR1w		12 35 00	20				
	F		12 40 00					
26	P		11 10 38					
	L		11 23 00					
27	e		23 05 28					
	e		23 08 00					
	Lw		23 07 34	24				
	Lw		23 37 00					
	F		23 50 00					
28	O		8 30 00				12,200	Time of O approx- imate.
	SR1		6 57 45					
	eL		7 04 10	28				
	L		7 24 18	20				
	L		7 27 00	20				
	L		7 40 00	20				
	L		7 45 00	16				
	L		7 59 00	14				
	L		8 21 00	14				
	LR1		8 28 12	25				
	LR1		8 33 00	20				
	LR1w		8 36 00	18				
	F		9 30 00					
30	e		15 39 30					
	Lw		15 54 00	16				
	Lw		16 02 00	10				
	F		16 10 00					

O = time at origin.

Date.	Character.	Phase.	Time.	Period. T.	Amplitude.		Dis- tance.	Remarks.
					A _n	A _w		
Canada. Toronto. Dominion Meteorological Service.								
Lat., 43° 40' 01" N.; long., 79° 23' 54" W. Elevation, 113.7 meters. Subsoil: Sand and clay.								
Instrument: Milne horizontal pendulum, North. In the meridian.								
Instrumental constant... 18. Pillar deviation, 1 mm. swing of boom = 0.50".								
1916.			H. m. s.	Sec.	μ	μ	Km.	
Aug. 3	L?		1 47 42					P and S lost in air currents.
	L		1 50 30		*200			
3	L		2 27 03					
	L		2 41 18					
	M		2 41 30		*800			F in air currents.
3	L?		9 14 42					
	L?		9 16 18		*50			F in air currents.
3	e		13 28 18					
	L?		13 30 24		*300			
3	L		14 04 48					
	L		14 10 42		*200			F in air currents.
3	L		22 03 18					
	M?		22 08 03		*300			Preceded and fol- lowed by air cur- rents. F in air currents.
6	L?		19 50 54		*200			F in air currents.
16	L		7 44 24		*100			Brief little quake.
	F		7 48 30					
18	e		1 30 00					
	e		1 33 18		*50			
	F		1 44 18					
25	e		10 03 48					Possibly two quakes, one distant.
	M		10 05 30					
	L		10 14 42					
	L		10 33 48					
	L		10 56 06					
	F		11 40 00					
25	L?		12 29 18		*50			Minute thickenings.
	F		12 36 30					
26	L		11 10 06					No P or S waves re- corded.
	M		11 10 36		*200			
	L		11 24 00					
	L		11 34 18					
	F		11 38 18					
27	L		22 59 00					
	L		23 04 36					
	L		23 38 00		*200			F in air currents.
	L		23 42 54					
28	eP		6 45 48					
	SP		6 57 30					
	IS		7 05 36					
	IS		7 12 54					
	IS		7 18 54					
	e		7 22 54					
	L		7 26 54					
	L		7 28 30					
	M		7 43 54		*1500			
	L		8 58 48					
	L		9 16 48					
	L		10 14 48					
	F		10 21 54					
30	L		15 38 30		*50			F in air currents.

* Trace amplitude.

TABLE 2.—Instrumental seismicological reports, August, 1916—Contd.

Date.	Charac-ter.	Phase.	Time.	Period. T.	Amplitude.		Dis-tance.	Remarks.
					A _n	A _w		
Canada. Victoria, B. C. Dominion Meteorological Service.								
Lat., 48° 24' N.; long., 123° 19' W. Elevation, 67.7 meters. Subsoil: Rock.								
Instrument: Wiechert, vertical; Milne horizontal pendulum, North. In the meridian.								
Instrumental constant.. 18. Pillar deviation, 1 mm.; swing of boom=0.54".								
1916.								
Aug. 3		P?	1 43 30					
		S.	1 47 28					
		L.	1 53 26					
		M.	1 56 54			*1000		
		F?	2 03 18					
3		P?	2 09 22				1,740	
		S.	2 12 22					
		L.	2 13 22			*900		
		M.	2 26 52					
		F.	3 11 22					
3		P.	3 46 29				2,410	
		S.	3 50 27					
		L.	3 57 24					
		M.	3 59 23			*400		
		F.	4 07 49					
3		L?	9 15 45					P?, S?, and F?
		M.	9 16 14					
3		P?	13 46 00				1,730	
		S.	13 48 59					
		L.	13 52 57					
		M.	13 53 56			*100		F?
3		P?	14 25 11					
		L?	14 25 11					
		M.	14 28 10			*400		
		F.	14 33 07					
3		L?	22 08 53			*200		P?, S?
		M.	22 12 23					
		F.	22 17 23					
6		P?	19 44 41					
		S?	19 46 10					
		L?	19 47 40					
		M.	19 48 39			*100		
		F.	19 53 07					
16		P.	7 50 26					
		M.	7 52 56			*200		
		F.	7 55 56					
18		P?	1 37 57				1,740?	
		S?	1 40 57					
		L.	1 42 57					
		M.	1 44 57			*200		
		F.	1 48 57					
25		P?	9 56 20					May be two quakes, one being distant.
		L?	10 04 46					
		M.	10 07 15			*500		
		L.	11 23 36					
		F.	12 18 09					
26		L.	11 13 48			*100		Minute thickening.
		F.	11 18 48					
28		P?	7 02 42					Earthquake in For-mosa.
		S.	7 14 37					
		L?	7 26 01					
		M.	7 44 12			*1500		
		F.	9 26 01					

* Trace amplitude.

TABLE 3.—Late seismicological reports. (Instrumental.)

Date.	Charac-ter.	Phase.	Time.	Period. T.	Amplitude.		Dis-tance.	Remarks.
					A _n	A _w		
Vermont. Northfield. U. S. Weather Bureau. Wm. A. Shaw.								
Lat., 44° 10' N.; long., 72° 41' W. Elevation, 256 meters.								
Instruments: Two Bosch-Omori, mechanical registration.								
Instrumental constants. $\begin{cases} V & T_0 \\ E & 10 \\ & 15 \\ & 10 \\ & 16 \end{cases}$								
1916.								
July 8		sw.	H. m. s. 9 52 30					Phases indistinct.
		P?	10 15 00					
17		P?	10 42 20					
		F?	11 00 00					
22		sw.	16 51 18					Phases uncertain.
		F?	17 00 00					
Canada. Toronto. Dominion Meteorological Service.								
Lat., 43° 40' 01" N.; long., 79° 23' 54" W. Elevation, 113.7 meters. Subsoil: Sand and clay.								
Instrument: Milne horizontal pendulum, North. In the meridian.								
Instrumental constant.. 18. Pillar deviation, 1 mm.; swing of boom=0.50".								
1916.								
July 8		L.	9 01 24			*100		F lost in air currents.
		L.	9 04 54					
22		L?	6 16 30			*50		Very doubtful as to being seismic.
28		P?	17 50 54					P preceded by air currents.
		S.	17 53 36					
		L.	17 56 24					
		M.	17 58 18					
		F.						Light off.
* Trace amplitude.								
Canada. Victoria, B. C. Dominion Meteorological Service.								
Lat., 48° 24' N.; long., 123° 19' W. Elevation, 67.7 meters. Subsoil: Rock.								
Instrument: Wiechert, vertical; Milne horizontal pendulum, North. In the meridian.								
Instrumental constant.. 18. Pillar deviation, 1 mm.; swing of boom=0.54".								
1916.								
July 5		P?	H. m. s. 4 41 17					
		S.	?					
		L.	4 43 45					
		M.	4 44 44			*200		
		F.	4 50 41					
8		P.	9 55 32				2,200	
		S.	9 57 12					
		L.	10 00 10					
		M.	10 01 40			*200		
		F.	10 20 00					
15		P?	0 05 05					
		S.	?					
		L.	?					
		M.	0 07 33			*100		
		F.	0 13 01					
22		L?	6 15 31					
		M.	6 17 31			*100		
		F.	?					
23		M.	11 14 02			*100		P?, S?, L?, and F?
28		P?	18 10 09				1,420	
		S?	18 12 38					
		L.	18 15 36					
		M.	18 24 02			*200		
		F?	18 37 25					
* Trace amplitude.								

SEISMOLOGICAL DISPATCHES.¹

Rome, August 3, 1916.

The volcanoes of Mount *Ætna* and *Stromboli* are in violent eruption, accompanied by underground rumblings. So intense is the heat from the flaming lava that the sea is [boiling?] in the region of the volcanoes. (Assoc. Press.)

London, August 16, 1916.

The cities of *Ancona*, *Pesara*, and *Rimini*, Italy, were shaken by an earthquake early to-day, says a *Stefani* news agency from Rome to-day. No damage was done at *Ancona*, but at *Pesaro* and *Rimini* houses were wrecked, and it is feared that at *Rimini* there has been loss of life. (Assoc. Press.)

Hickory, N. C., August 26, 1916.

At 2:45 this afternoon a sharp earthquake was felt in *Hickory*, *Conover*, *Statesville*, and *Newton*. The shock was vigorous, but not of long duration. No damage was done. The shock seemingly was purely local in character. (Assoc. Press.)

Santiago, Chile, August 26, 1916.

A severe earthquake has rocked northern Chile, according to delayed dispatches received here to-night. The inhabitants of the seaport of *Tocopilla* have fled to the interior. No accurate reports of loss of life or damage are yet available. (Assoc. Press.)

THE NORTH CAROLINA EARTHQUAKE OF AUGUST 26, 1916.

By RUY H. FINCH, Assistant.

[Dated: Division of Seismological Investigations, Weather Bureau, Oct. 2, 1916.]

On August 26, 1916, about 2:35 p. m., an earthquake occurred in western North Carolina with its epicenter at, approximately, latitude 36° N., longitude 81° W., or a

¹ Reported by the organization indicated and collected by the seismological station at Georgetown University, Washington, D. C.

little to the northeast of the epicenter of the earthquake of February 21, 1916.

While the area sensibly affected was very small, 3,800 square miles, and the highest intensity reported but V, *Rossi-Forel*, yet the earthquake is of special interest in view of the fact that fairly good records of it were obtained on the seismographs at the Weather Bureau, Washington, D. C. and Georgetown University. Considerable alarm was experienced in a few cities, but no damage occurred. Detailed reports from some of the places affected by the quake are given in Table 1, noninstrumental earthquake reports, of this REVIEW. The time of the disturbance, as given by the majority of the best reports, was 2^h 35^m p. m., Eastern Time. The time of beginning at the epicenter as determined from the seismograph record of the Weather Bureau, Washington, D. C., by means of the P-O and S-O tables of Dr. *Klotz* was 2^h 36^m 08^s p. m. The estimated distance of the epicenter from Washington, determined from S-P tables, is in close agreement with the measured distance to the approximate epicenter, the former being 323 miles and the latter 320 miles.

CORRIGENDUM.

Instrumental report, Alaska, *Sitka*, MONTHLY WEATHER REVIEW, 43: April, 1916:

Page 218, April 18, hours should be 4 and 5 instead of 3 and 4.

TABLE 2.—Instrumental seismological reports, September, 1916—Continued.

Date.	Character.	Phase.	Time.	Period. T.	Amplitude.		Distance.	Remarks.
					A _s	A _w		

California. Berkeley. University of California.

Lat., 37° 52' 16" N.; long., 122° 15' 37" W. Elevation, 85.4 meters.
(See Bulletin of the Seismographic Stations, University of California.)

California. Mount Hamilton. Lick Observatory.

Lat., 37° 20' 24" N.; long., 121° 38' 34" W. Elevation, 1,281.7 meters.
(See Bulletin of the Seismographic Stations, University of California.)

California. Point Loma. Raja Yoga Academy. F. J. Dick.

Lat., 32° 43' 03" N.; long., 117° 15' 10" W. Elevation, 91.4 meters.
Instrument: Two-component, C. D. West seismoscope.

1916.	Date.	H. m. s.	Sec.	μ	μ	Km.	Remarks.
	Sept. 2			*100	*100		Tremors recorded during 24 hours preceding 15h on dates given.
	11			*50	*100		
	20			*100	*100		
	25			*200	*200		
	30	2 11 00		*300	*300		Light shock lasting about 2 seconds.
	30			*200	*200		Tremors between 2h 30m and 15h.

* Amplitude on instrument.

California. Santa Clara. University of Santa Clara. J. S. Ricard, S. J.

Lat., 37° 28' 36" N.; long., 121° 57' 03" W. Elevation, 27.43 meters.
(See record of the Seismographic Station, University of Santa Clara.)

Colorado. Denver. Sacred Heart College. Earthquake Station.

A. W. Forstall, S. J.

Lat., 39° 40' 36" N.; long., 104° 56' 34" W. Elevation, 1,655 meters.
Instrument: Wiechert 80 kg., astatic, horizontal pendulum.

1916.	Date.	Phase.	H. m. s.	Sec.	μ	μ	Km.	Remarks.
	Sept. 7	L _w	3 46 00					Activity at intervals. More pronounced on N-S.
		F _w	5 10 00					
	17	L _w	19 49 00					Wavelets visible. Doubtful as to being seismic.
		F _w	19 51 00					
	18	L _w	21 58 00					Too small to be analyzed, yet quite discernible.
		M _w	21 59 00					
		F _w	22 01 00					
	18	P _w	22 20 00					Clearer and stronger than preceding.
		L _w	22 23 00					Visible wavelets at intervals during day.
		M _w	22 28 00					
		F _w	22 36 00					
	21	P	18 45 00					Visible activity at intervals during day.
		L	18 46 00	8-9	6-8	6-8		
		F	18 49 00					

District of Columbia. Washington. U. S. Weather Bureau.

Lat., 38° 54' 12" N.; long., 77° 03' 03" W. Elevation, 21 meters.
Instrument: Marvin (vertical pendulum, undamped. Mechanical registration).

Instrumental constants: $\frac{V}{110}$ $\frac{T_0}{6.4}$

1916.	Date.	Phase.	H. m. s.	Sec.	μ	μ	Km.	Remarks.
	Sept. 3	eL	8 18 30	20				Amplitudes very small. Not recorded on E-W.
		L	8 27 15					
		F	8 40 00					
	11	I _u	6 50 12				9,010	
		IS	7 00 23					
		L	7 14 12					
		F	7 30 00					

Date.	Character.	Phase.	Time.	Period. T.	Amplitude.		Distance.	Remarks.
					A _s	A _w		

District of Columbia. Washington. U. S. Weather Bureau—Con.

1916.	Date.	Phase.	H. m. s.	Sec.	μ	μ	Km.	Remarks.
	Sept. 15	eP ₇	7 14 16				2,650?	Record very faint.
		eP ₈	7 18 33					
		eS ₇	7 24 42					
		L	7 38 30					
		L _w	8 00 30	20				
		L _w	8 04 00					
		F	8 20 00					
	21	I _r	19 00 38				2,850?	
		eS ₇	19 05 10					
		L ₇	19 07 06					
		F	19 25 00					
	21	I _r	19 51 46				3,040	
		S	19 56 32					
		L	20 00 00					
		F	20 10 00					
	23	I _r	5 48 56				3,420	Record well defined.
		S	5 54 08					
		L	5 59 12	20				
		F	6 50 00					
	24	I _r	19 54 36				2,250?	
		S	19 58 20					
		L ₇	20 00 16					
		F	20 20 00					
	25	I _r	2 27 10				2,080?	Very faint record.
		S	2 30 40					
		L ₇	2 33 00					
		F	2 55 00					
	29	I _u	19 03 52				5,510	
		S	19 11 02					
		L	19 16 32					
		L	19 26 00	20				
		F	19 40 00					

District of Columbia. Washington. Georgetown University.

F. L. Tondorf, S. J.
Lat., 38° 54' 25" N.; long., 77° 04' 24" W. Elevation, 42.4 meters. Subsoil: decayed dolomite.
Instruments: Wiechert 200 kg. astatic horizontal pendulums, 80 kg. vertical.

Instrumental constants: $\frac{V}{165}$ $\frac{T_0}{5.4}$ $\frac{e}{0}$
 $\frac{N}{143}$ $\frac{S}{5.2}$ $\frac{O}{0}$
 $\frac{Z}{80}$ $\frac{0}{3.0}$ $\frac{0}{0}$

1916.	Date.	Phase.	H. m. s.	Sec.	μ	μ	Km.	Remarks.
	Sept. 21	eP _u	19 01 30					Microseisms present; P difficult to discern.
		eP _m	19 01 36					L doubtful.
		S	19 05 33					
		eL _w	19 07 09					
		L _w	19 08 51	11				
		F	19 45 00					
	23	eP _u	5 48 44					
		eP _m	5 48 49					
		IS _u	5 54 10					
		S _w	5 54 12					
		eL _u	5 58 30	20				
		eL _w	5 58 58	20				
		M _u	6 00 58	1				
		M _w	6 01 22	4				
		F	6 16 00					
	24	e _w	19 54 30					Phases not discernible. Bosch-Omori shows e at 19h 54m 53s.
		e _w	19 54 38					Questionability of seismic origin. Microseisms.
		F	20 18 00					
	28	e _w	15 57 28					
		e _w	15 57 31					
		F	16 18 00					

Hawaii. Honolulu. Magnetic Observatory. U. S. Coast and Geodetic Survey.

Frank Neuman.
Lat., 21° 19' 12" N.; long., 158° 03' 48" W. Elevation, 15.2 meters.
Instrument: Milne seismograph of the Seismological Committee of the British Association.

Instrumental constant: $\frac{T_0}{18.6}$

1916.	Date.	Phase.	H. m. s.	Sec.	μ	μ	Km.	Remarks.
	Sept. 3	P	7 23 06					
		S ₇	7 31 00					
		L	7 42 00	24				
		M	7 46 48				2,800	
		C	7 53 54					
		F	10 48 00					

* Trace amplitude.

TABLE 2.—Instrumental seismological reports, September, 1916—Continued.

Date.	Charac-ter.	Phase.	Time.	Period. T.	Amplitude.		Dis-tance.	Remarks.
					A _m	A _N		
Hawaii. Honolulu.—Magnetic Observatory—Continued.								
1916.			<i>H. m. s.</i>	<i>Sec.</i>	μ	μ	<i>Km.</i>	
Sept. 11	eP		6 53 18					
	S		7 00 42					
	L		7 08 00	18				
	M		7 19 48		*500			
	C		7 23 00					
	F		7 55 30					
14	e		18 38 12	16				
	M		18 39 06		*100			
	F		18 42 12					
15	P		7 11 00					
	S		7 18 12					
	L		7 27 12	17				
	M		7 18 12		*2,500			
	M		7 35 12		*1,500			
	C		7 50 00					
	F		8 15 00					
17	e		8 26 30					
	L		8 34 54	17				
	M		8 38 00		*100			
	F		8 59 30					
23	P		5 54 30					
	S		6 03 30					
	L		6 14 00	20				
	M		6 18 42		*500			
	C		6 27 00					
	F		6 58 00					
28	e		11 16 00					
	F		11 37 00					
29	P		19 18 30					
	L		19 34 06	24				
	M		19 40 30		*500			
	C		19 43 30					
	F		19 45 42					

* Trace amplitude.

Kansas. Lawrence. University of Kansas. Department of Physics and Astronomy. F. E. Kester.

Lat., 38° 57' 30" N.; long., 95° 14' 58" W. Elevation, 301.1 meters.

Instrument: Wiechert.

Instrumental constants. $\begin{cases} V & T_0 & e \\ E & 177 & 3.4 & 4.0 \\ N & 205 & 3.4 & 3.8 \end{cases}$

(No earthquake recorded during September, 1916.)

Maryland. Cheltenham. Magnetic Observatory. U. S. Coast and Geodetic Survey. George Hartnell.

Lat., 38° 44' 00" N.; long., 76° 50' 30" W. Elevation, 71.6 meters.

Instruments: Two Bosch-Omori, 10 and 12 kg.

Instrumental constants. $\begin{cases} V & T_0 & e \\ E & 10 & 32 \\ N & 10 & 27 \end{cases}$

1916.		<i>H. m. s.</i>	<i>Sec.</i>	μ	μ	<i>Km.</i>
Sept. 23.	eM	5 49 02	4			
	SN	5 49 09	4			
	SN	5 53 23	8			
	LW	5 58 59	17			
	M	6 00 15	15	10		
	M	6 01 31	20		90	
	C	6 06 00	16			
	C	6 09 00				
	F	6 23 00				

Massachusetts. Cambridge. Harvard University Seismographic Station. J. B. Woodworth.

Lat., 42° 22' 36" N.; long., 71° 08' 59" W. Elevation, 5.4 meters. Foundation: Glacial sand over clay.

Instruments: Two Bosch-Omori, 100 kg., horizontal pendulums (mechanical registration.)

Instrumental constants. $\begin{cases} V & T_0 & e \\ E & 80 & 23 & 0 \\ N & 50 & 25 & 4.1 \end{cases}$

(Report for September, 1916, not received.)

Date.	Charac-ter.	Phase.	Time.	Period. T.	Amplitude.		Dis-tance.	Remarks.
					A _m	A _N		

Missouri. St. Louis. St. Louis University. Geophysical Observatory. J. B. Goesse, S. J.

Lat., 38° 38' 15" N.; long., 90° 13' 58" W. Elevation, 160.4 meters. Foundation, 12 feet of tough clay over limestone of Mississippi System, about 300 feet thick.

Instrument: Wiechert 80 kg. astatic, horizontal pendulum.

Instrumental constants. $\begin{cases} V & T_0 & e \\ E & 80 & 7 & 5.1 \end{cases}$

(Report for September, 1916, not received, instrument out of order.)

New York. Buffalo. Canisius College. John A. Curtin, S. J.

Lat., 42° 53' 02" N.; long., 78° 52' 40" W. Elevation, 190.5 meters.

Instrument: Wiechert 80 kg. horizontal.

Instrumental constants. $\begin{cases} V & T_0 & e \\ E & 80 & 7 & 5.1 \end{cases}$

(Report for September, 1916, not received.)

New York. Fordham. Fordham University. W. C. Repetti, S. J.

Lat., 40° 51' 47" N.; long., 73° 53' 08" W. Elevation, 23.9 meters.

Instrument: Wiechert, 80 kg.

Instrumental constants. $\begin{cases} V & T_0 & e \\ E & 72 & 6.6 & 1.5:1 \\ N & 72 & 7.1 & 3.8:1 \end{cases}$

1916.		<i>H. m. s.</i>	<i>Sec.</i>	μ	μ	<i>Km.</i>
Sept. 21	LW	19 02 00				
23	eP	5 44 28				
	eP	5 45 55				
	eS	5 50 16				
	S	5 50 19				
	LW	5 53 26				
	LW	5 54 40				
	M	5 57 42	19		18	
	F	6 15 00				
29	eP	18 58 07				
	eP	18 58 29				
	eS	19 04 48				
	LW	19 17 00				
	F	19 35 00				

No decided maximum.

New York. Ithaca. Cornell University. Heinrich Ries.

Lat., 42° 20' 58" N.; long., 76° 29' 09" W. Elevation, 242.6 meters.

Instruments: Two Bosch-Omori, 25 kg., horizontal pendulums (mechanical registration).

Instrumental constants. $\begin{cases} V & T_0 & e \\ E & 13 & 22 & 4:1 \\ N & 14 & 25 & 4:1 \end{cases}$

1916.		<i>H. m. s.</i>	<i>Sec.</i>	μ	μ	<i>Km.</i>
Sept. 3	eL	8 13 23	30			
	F	8 46 00				
5	eL	23 27 05	20			
	F	23 53 00				
23	eP	5 49 42	5			
	eP	5 49 50	4			
	S	5 55 09	6			
	LW	6 00 43	27			
	LW	6 00 48	20			
	F	6 24 00				

TABLE 2.—Instrumental seismological reports, September, 1916—Continued.

Date.	Charac-ter.	Phase.	Time.	Period. T.	Amplitude.		Dis-tance.	Remarks.
					A _m	A _w		

Panama Canal Zone. *Balboa Heights*. Isthmian Canal Commission.
 Lat., 8° 57' 39" N.; long., 79° 33' 29" W. Elevation, 27.6 meters.
 Instruments: Two Bosch-Omori, 100 kg.
 V T₀
 Instrumental constants.. 10 20

1916.		H. m. s.	Sec.	μ	μ	Km.	Remarks.
Sept. 11	P _m	10 18 10				299	Direction NW?
	F _m	10 18 12					
	S _m	10 18 34					
	L _m	10 18 36					
	L _w	10 18 46					
	L _w	10 18 48			450		
	M _m	10 18 50				500	
23	P _m	10 19 52					Probable direction north.
	F _m	10 22 30					
	F _w	10 23 00					
	P _m	5 44 35				966	
	S _w	5 48 15					
	S _w	5 48 23					
	L _w	5 47 00				800	
	L _w	5 47 05					
	M _m	5 47 17					
	M _m	5 49 35			150		
	F _m	6 03 00					
	F _w	6 06 20					

Porto Rico. *Vieques*. *Magnetic Observatory*. U. S. Coast and Geodetic Survey. H. M. Pease.
 Lat., 18° 09' N.; long., 65° 27' W. Elevation, 19.8 meters.
 Instruments: Two Bosch-Omori.
 V T₀
 Instrumental constants. {E 10 21.4
 N 10 21.1
 (Report for September, 1916, not received.)

Vermont. *Northfield*. U. S. Weather Bureau. Wm. A. Shaw.
 Lat., 44° 10' N.; long., 72° 41' W. Elevation, 266 meters.
 Instruments: Two Bosch-Omori, mechanical registration.
 V T₀
 Instrumental constants. {E 10 15
 N 10 16

1916		H. m. s.	Sec.	μ	μ	Km.	Remarks.
Sept. 1	eL.....	3 03 00					Record barely perceptible.
	L.....	3 10 00					
	F.....	3 15 00					
3	e.....	8 29 30					Record very feeble; does not show on E-W.
	F.....	8 33 00					
11	I _m	6 49 51				9,010?	
	P.....	7 00 02					
	S _f	7 14 12					
	F.....	7 25 00					
15	e.....	7 14 47					Record very feeble on N-S and not perceptible on E-W.
	F.....	7 30 00					
21	eP?.....	19 00 34					
	ef.....	19 07 22					
	F.....	19 20 00					
23	L _m	5 49 49				4,150	
	S.....	5 53 45					
	L.....	5 59 15		8			
	L.....	6 01 00		20			
	F.....	6 25 00					
24	e.....	19 55 10					
	S _f	19 59 20					
	L _f	20 01 32					
	F.....	20 15 00					
29	I _m	19 04 18				6,125	
	S.....	19 12 01					
	L _f	19 16 06					
	F.....	19 30 00					

Date.	Charac-ter.	Phase.	Time.	Period. T.	Amplitude.		Dis-tance.	Remarks.
					A _m	A _w		

Canada. *Ottawa*. *Dominion Astronomical Observatory*. Earthquake Station. Otto Klotz.
 Lat., 45° 23' 38" N.; long., 75° 42' 57" W. Elevation, 83 meters.
 Instruments: Two Bosch photographic horizontal pendulums, one Spindler & Hoyer 50 kg. vertical seismograph.
 V T₀
 Instrumental constants.. 120 26

1916.		H. m. s.	Sec.	μ	μ	Km.	Remarks.
Sept. 1	eLw?.....	2 54 24	8				
	Lw.....	2 55 24	14				
	Lw.....	3 03 00	20				
	Lw.....	3 10 00	20				
	F.....	3 17 00					
3	O.....	7 11 00				14,000	O and distance approximate.
	FR2?.....	7 34 21					
	S.....	7 43 51					
	eLw?.....	8 10 00	40				
	Lw.....	8 12 00	28				
	Lw.....	8 15 00	24				
	L.....	8 19 00	20				
	L.....	8 23 00	16				
	L.....	8 42 00	16				
	LRlw?.....	9 03 00	16				
5	LRlw.....	9 20 00	20				Very distant.
	F.....	9 30 00					
	ea.....	22 45 18	14				
	ea.....	22 47 00	13				
	L.....	23 17 18	22				
11	L.....	23 22 00	19				
	L.....	23 24 00	18				
	F.....	23 40 00					
	e.....	6 49 54				14000?	
	i.....	6 53 49					
	IS?.....	6 59 48					
	eLw.....	7 40 00	40				
15	Lw.....	7 42 00	24				
	Lw.....	7 48 00	20				
	Lw.....	7 51 00	20				
	L.....	7 53 00	20				
	L.....	8 12 00					
	F.....	8 30 00					
	O.....	7 08 18				9,120	
21	P _m	7 14 31					
	PR1.....	7 18 12					
	S.....	7 24 48					
	eL.....	7 42 00	36				
	L.....	7 50 00	30-24				
	L.....	7 55 00	24				
	L.....	8 00 00	20-18				
	L.....	8 03 00	18				
	F.....	8 20 00					
	23	e.....	19 06 24				
L.....		19 06 28					
L.....		19 08 32					
M _w		19 07 36	10				
L.....		19 10 00	7-10				
O.....		5 48 30				4,030	
P.....		5 49 50					
PR2.....		5 51 17					
S.....		5 55 39					
eLw.....		6 01 00	40				
29	L.....	6 03 00	22-20				
	Lw.....	6 08 00	17				
	Lw.....	6 10 00	13				
	L.....	6 20 00	13-14				
	F.....	6 45 00					
	O.....	18 54 43				6,250	
	P.....	19 04 28					
S.....	19 12 15						
L.....	19 21 08	20					
L.....	19 31 00	20					
L.....	19 34 00	18					
F.....	19 45 00						

O=time at origin.

TABLE 2.—Instrumental seismological reports, September, 1916—Continued.

Date.	Charac- ter.	Phase.	Time.	Period. T.	Amplitude.		Dis- tance.	Remarks.
					A _m	A _s		
Canada. Toronto. Dominion Meteorological Service.								
Lat., 43° 40' 01" N.; long., 79° 23' 54" W. Elevation, 113.7 meters. Subsoil: Sand and clay.								
Instrument: Milne horizontal pendulum, North. In the meridian.								
Instrumental constant. . 18. Pillar deviation, 1 mm. swing of boom=0.50".								
1916, Sept. 3		e.	8 09 36					During the principal portion a slow gradual increase of movement. Resembles the Victoria one a good deal.
		L.	8 13 18					
		eL.	8 16 42					
		M.	8 21 00					
		L.	8 28 12			*1,500		
		M.	9 23 30					
		F.	9 43 18					
3		L.	10 52 12			*100		
		F.	10 59 00					
5		L?	23 13 54					
		L.	23 18 48					
		eL.	23 22 30			*800		
		M.	23 30 48					
6		F.	23 39 12					Very gradual thickening.
		F.	0 03 00					
6		L?	9 21 00			*50		
		F.	9 35 24					
11		L.	6 59 12					
		L.	7 43 06			*200		
		L.	8 20 24					
		F.	8 27 54					
15		L? or S?	7 25 42					Time very doubtful. No cut-off.
		e.	7 36 00					
		L.	7 48 18					
		L.	7 50 30					
		e.	7 59 24					
		M.	8 00 48			*1,000		
		F.	8 48 48					
21		e.	19 05 18			*50		
23		P?	5 48 42					
		S.	5 55 48					
		eL.	5 58 36					
		L.	6 01 00					
		L?	6 03 48					
		M.	6 05 06			*1,800		
		F.	7 01 30					
24		L.	18 00 00			*50		
		F.	18 05 00					
28		L.	12 08 42			*200		
		F.	12 11 30					
29		e?	18 57 06					May be air currents.
		L.	19 21 24			*100		
		F.	19 50 00					

*Trace amplitude.

Canada. Victoria, B. C. Dominion Meteorological Service.

Lat., 48° 24' N.; long., 123° 19' W. Elevation, 67.7 meters. Subsoil: Rock.

Instruments: Wiechert, vertical. Milne horizontal pendulum, North; in the meridian.

Instrumental constant. . 18. Pillar deviation: 1 mm. swing of boom=0.54".

1916, Sept. 3		H. m. s.	Sec.	μ	μ	Km.	
	P.	7 37 46					
	S.	7 42 44					
	L?	7 50 40					
	M.	8 04 03					
	F.	8 43 43			*1500		
3		P.	9 41 53				May be part of long-distance quake above. S?, L?
	M.	9 43 50			*100		
	F.	9 49 44					
3		P.	10 23 52				May be part of long-distance quake above.
	L?	10 26 50					
	M.	10 31 48			*200		
	F.	10 35 46					
5		P?	21 50 03				S and L not determined.
	M.	21 55 36			*100		
	F.	22 00 59					
5		P.	22 38 39			3,330	
	S.	22 43 37					
	L.	22 56 11					
	M.	23 02 27			*500		
	F.	23 37 10					
6		P.	8 50 32				
	L.	8 55 30					
	M.	8 59 58			*100		
	F.	9 16 20					
11		P.	6 58 21			6,360?	
	S?	7 06 16					
	L.	7 13 43					
	M.	7 33 33			*300		
	F.	8 40 30					
15		P?	7 10 12			7,530?	
	S?	7 19 08					
	L?	7 31 02					
	M.	7 45 55			*200		
	F.	8 32 31					
19		P.	11 05 45			550	
	L.	11 06 45					
	M.	11 07 45			*200		
	F.	11 09 15					
21		P.	18 56 15			820	
	L.	18 57 44					
	M.	18 59 13			*300		
	F.	19 01 12					
23		P.	5 56 42			3,670?	May be off the west coast of Mexico.
	S?	6 02 10					
	L.	6 08 16					
	M.	6 19 31			*1000		
	F.	6 53 44					
24		P?	17 42 00				
	M.	17 43 10			*200		
	F.	17 44 00					
24		P.	19 37 40			550?	
	L.	19 38 40					
	M.	19 39 40			*300		
	F.	19 42 10					
25		P.	2 10 35				
	M.	2 11 34			*200		
	F.	2 13 03					
26		P.	15 52 35				
	M.	15 53 05			*100		
	F.	15 54 35					
26		M?	22 17 35				Doubtful as to being seismic.
28		P or L	11 43 43				
	M.	11 47 11			*200		
	F.	11 53 08					
29		P.	19 29 02			1,810	
	S?	19 32 06					
	L.	19 34 02					
	M.	19 37 02			*500		
	F.	19 43 32					

* Trace amplitude.

SECTION V.—SEISMOLOGY.

SEISMOLOGICAL REPORTS FOR OCTOBER, 1916.

By W. J. HUMPHREYS, Professor in Charge.

[Dated: Weather Bureau, Washington, D. C., Dec. 1, 1916.]

TABLE 1.—Non-instrumental earthquake reports, October, 1916.

Day.	Approximate time, Greenwich Civil.	Station.	Approximate latitude.	Approximate longitude.	Intensity Rossi-Forl.	Number of shocks.	Duration.	Sounds.	Remarks.	Observer.
ALABAMA.										
1916.	11. m.	Anniston.....	33 39	85 50	5	2	M. 4	None.....	Furniture moved.....	U. S. Weather Bureau.
Oct. 18	22 04	Ashville.....	33 50	86 14	5	2	0 4	None.....	Many people alarmed.....	B. B. Cather.
	22 04	Athens.....	34 50	86 59	5	1	3	None.....	.....	R. M. Cowls.
	22 04	Auburn.....	32 34	85 28	3	3	9	.....do.....	.....	James T. Anderson.
	22 04	Benton.....	32 19	86 47	3-4	1	30	Rumbling.....	Dishes rattled.....	S. T. Pruitt.
	22 04	Bessemer.....	33 25	86 58	4-5	1	4	.....do.....	.....	D. W. Houston.
	22 04	Birmingham.....	33 32	86 50	5	3	14	.....do.....	Buildings trembled.....	U. S. Weather Bureau.
	22 04	Bridgeport.....	34 57	85 41	2	1	4	.....do.....	.....	R. L. Moore.
	22 04	Calera.....	33 06	86 45	4	1	1	.....do.....	.....	D. W. Loyd.
	22 04	Camden.....	32 00	87 16	.....	.....	.....	Rumbling.....	.....	W. B. Jones.
	22 04	Camp Hill.....	32 46	85 37	5	1	20	Rumbling.....	.....	Lyman Ward.
	22 04	Clanton.....	32 49	85 39	4	1	3	None.....	.....	J. B. Downs.
	22 04	Cordova.....	33 44	87 08	2	3	3	None.....	.....	Scott Maxwell.
	22 04	Dadeville.....	32 48	85 44	2	2	30	.....do.....	.....	W. B. Fulton.
	22 04	Decatur.....	34 36	87 00	5	2	10	Rumbling.....	Tops of chimneys fell.....	Mrs. A. H. Iron.
	22 04	Easonville.....	33 32	86 16	7	1	10	.....do.....	.....	W. N. Maddox.
	22 04	Enfala.....	31 52	85 06	3	1	1	None.....	Shook some buildings.....	Dr. J. B. Whitlock.
	22 04	Florence.....	34 48	87 40	4	1	1	.....do.....	.....	O'Pella O. Coburn.
	22 04	Port Deposit.....	31 59	86 36	2-3	1	1	.....do.....	.....	J. F. Haltemer.
	22 01	Gadsden.....	33 59	86 00	3-4	1	1	.....do.....	Buildings shaken.....	D. P. Goodhue.
	22 04	Geneva.....	31 02	85 50	4	2	1	.....do.....	.....	Postmaster.
	22 04	Goodwater.....	33 04	86 03	5	1	1	Rumbling.....	.....	Miss Daisy Buice.
	22 04	Guntersville.....	34 22	86 18	5	1	8	.....do.....	Many frightened.....	L. S. Long.
	22 04	Hamilton.....	34 07	87 58	4	1	1	None.....	.....	H. D. Sargent.
	22 04	Insola.....	33 30	86 03	4	1	1	.....do.....	.....	R. W. Tuck.
	22 04	Madison.....	34 41	86 43	4	1	1	.....do.....	.....	J. H. Gandors.
	22 04	Maple Grove.....	34 00	85 49	5	1	1	Rumbling.....	.....	Mrs. A. L. Aubrey.
	22 04	Mentone.....	34 32	85 33	.....	.....	.....	.....do.....	.....	E. Mason.
	22 04	Milstead.....	32 27	85 51	4	2	1	.....do.....	.....	W. U. Wall.
	22 04	Montgomery.....	32 23	86 18	4	1	3	None.....	A few persons nauseated.....	U. S. Weather Bureau.
	22 04	Moulton.....	34 30	87 18	3-4	2	10	Rumbling.....	.....	O. L. Judy.
	22 04	Oneonta.....	33 55	86 29	4-5	2	9	.....do.....	Furniture moved.....	A. J. Ketchum.
	22 04	Opelika.....	32 38	85 21	.....	.....	.....	.....do.....	.....	A. H. Read.
	22 04	Ozark.....	31 28	85 37	2	1	2	.....do.....	.....	Nettie Scott.
	22 04	St. Bernard.....	34 11	86 48	4	1	1	.....do.....	Buildings shaken.....	Rev. Wm. Gais.
	22 04	Scottsboro.....	34 40	86 02	4-5	3	3	Rumbling.....	.....	Eva Caldwell.
	22 04	Selma.....	32 05	87 01	3-4	1	1	.....do.....	.....	C. F. Brislin.
	22 04	Talladega.....	33 26	86 05	5	3	30	Rumbling.....	Some plaster fell.....	J. W. Vandiver.
	22 04	Valley Head.....	34 32	85 54	2-3	1	1	.....do.....	.....	M. F. Floyd.
	22 04	Vernon.....	33 46	86 06	.....	.....	.....	None.....	Windows rattled.....	Mrs. V. Livingston.
	22 04	Wedowee.....	33 18	85 29	5	1	30	Rumbling.....	Doors and furniture moved.....	R. L. Adcock.
10	4 54	Birmingham.....	33 32	86 50	.....	.....	.....	.....do.....	.....	U. S. Weather Bureau.
	4 54	Easonville.....	33 32	86 16	.....	.....	.....	.....do.....	.....	W. N. Maddox.
CALIFORNIA.										
9	4 50	Round Valley.....	37 24	118 37	3	3	5	Rumbling.....	.....	Glen H. Crow.
10	11 30	Cahuilla.....	33 32	116 43	2	1	5	Rumbling.....	.....	Dr. Wm. L. Shawk.
23	2 44	Bakersfield.....	35 22	119 00	5	4	6	Rattling.....	.....	Santa Fe Railway.
	2 44	Bakersfield.....	35 22	119 00	4	2	4	None.....	.....	Frank W. Wathout.
	2 44	Claremont.....	34 06	117 42	4	1	10	.....do.....	.....	Prof. F. P. Brackett.
	2 44	Edison.....	35 21	118 53	3	3	20	None.....	Dishes rattled.....	L. R. Talbott.
	2 44	Fairmont.....	34 45	118 25	4	1	1	Rumbling.....	.....	W. F. Lowe.
	2 44	Fresno.....	36 43	119 49	3	1	5	None.....	.....	U. S. Weather Bureau.
	2 44	Gray Mountain.....	34 38	116 15	3	3	15	None.....	.....	E. J. Cloos.
	2 44	Los Angeles.....	34 03	118 15	4	1	5	None.....	.....	U. S. Weather Bureau.
	2 44	Maricopa.....	35 05	119 08	4	2	9	None.....	.....	F. B. Tough.
	2 44	Mount Wilson.....	34 13	113 03	2	2	4	None.....	.....	Wendell P. Hoge.
	2 44	Newhall.....	34 22	118 30	5	2	6	.....do.....	.....	F. J. Coyne.
	2 44	Northhoff.....	34 35	119 14	5	3	6	.....do.....	Dishes rattled.....	Wm. H. Duncan.
	2 44	Pasadena.....	34 06	118 11	5	2	30	None.....	Rattled windows.....	H. W. Hall.
	2 44	Ozama.....	34 53	119 16	5	2	40	Rumbling.....	.....	J. D. Reyes.
	2 44	Redlands.....	34 04	117 12	3	1	1	None.....	.....	Paul W. Moore.
	2 44	Riverside.....	33 58	117 21	3	2	2	.....do.....	.....	Riverside Press.
	2 44	Santa Monica.....	34 00	118 30	5	1	10	None.....	.....	F. E. Hill.
	2 44	Surrey.....	35 23	118 32	3	3	3	.....do.....	.....	George Swanson.
	2 44	Taft.....	35 07	119 26	5-6	1	13	None.....	Caused waves on adjacent lake.....	R. D. Bush.
	2 44	Venice.....	34 00	118 30	3	1	1	None.....	.....	Dr. J. T. Brown.
	2 44	Ventura.....	34 16	119 17	5	3	3	.....do.....	.....	J. C. Hansen.
23	2 55	Avilon.....	33 27	118 22	.....	1	1	.....do.....	.....	T. S. Manning.
	2 55	Beaumont.....	33 55	117 00	4-5	2	10	None.....	.....	K. R. Smoot.
	2 55	Bakersfield.....	35 22	119 00	4	1	1	.....do.....	Shook buildings.....	W. B. de Biller.
	2 55	Claremont.....	34 06	117 42	.....	1	10	.....do.....	.....	Prof. F. P. Brackett.
	2 55	Fairmont.....	34 45	118 25	.....	2	1	.....do.....	.....	W. F. Lowe.
	2 55	Gray Mountain.....	34 38	116 15	4	1	1	.....do.....	Buildings trembled.....	B. J. Cloos.
	2 55	Los Angeles.....	34 03	118 15	4	1	5	None.....	.....	U. S. Weather Bureau.
	2 55	Maricopa.....	35 05	119 08	.....	.....	.....	.....do.....	.....	V. C. Conkling.
	2 55	Newhall.....	34 22	118 30	5	2	55	.....do.....	.....	H. W. Hall.
	2 55	Pasadena.....	34 06	118 11	5	1	1	None.....	.....	U. S. Weather Bureau.
	2 55	San Luis Obispo.....	35 18	120 39	2	1	4	None.....	.....	E. D. Seward.
	2 55	San Pedro.....	33 44	118 16	5	2	35	Faint.....	.....	G. W. Russell.
	2 55	Santa Barbara.....	34 23	119 40	.....	.....	.....	.....do.....	.....	F. E. Hill.
	2 55	Santa Monica.....	34 00	118 30	4	1	4	None.....	.....	R. D. Bush.
	2 55	Taft.....	35 07	119 26	5	2	10	None.....	.....	Dr. J. T. Brown.
	2 55	Venice.....	34 00	118 30	3	1	1	None.....	.....	.....

TABLE 1.—Non-instrumental earthquake reports, October, 1916—Continued.

Day.	Ap- proximate time Gree- wich Civil.	Station.	Approximate latitude.	Approximate longitude.	Intensity Rassi- Forel.	Number of shocks	Duration.	Sounds.	Remarks.	Observer.	
1916.		CALIFORNIA—CON.									
Oct. 23	7. m. 5 20	Brawley	32 59	115 40	4	1	M. s.	Rumbling.		M. D. Wither.	
24	13 03	Kine City	36 14	121 06	5	1		None.		F. J. Merrill.	
	13 03	Lonak	36 20	120 35	3	1		None.		M. L. Griffin.	
	13 03	San Luis Obispo	35 18	120 39	2	2		6	None.	U. S. Weather Bureau.	
		COLORADO.									
12	5 40	Frances	40 03	105 32	3-4	1		5	None.	Awakened some people.	C. W. Barry.
	5 40	Grandlake	40 15	105 50	4	1			Rumbling.		Belle Kaufman.
		GEORGIA.									
18	22 01	Atlanta	33 45	84 23	5	2		5	None.	Shook buildings.	U. S. Weather Bureau.
	22 01	Augusta	33 28	81 51	2	1			None.	Windows rattled.	Mrs. E. D. Emigh.
	22 04	Blairstown	34 54	83 58	2	2		10	None.		C. J. Wellborn.
	22 04	Blue Ridge	34 52	84 21	1	1				Some objects upset.	A. B. Mosby.
	22 01	Carters	34 14	84 24	1	1		30	None.		Ada Mills.
	22 04	Clayton	34 54	83 23	3	1		30	None.		B. L. Bingham.
	22 01	Cleveland	34 36	83 45	5	2			Rumbling.		Tressia Carroll.
	22 04	Columbus	32 28	85 00	3	2		30	None.		A. J. Land.
	22 01	Concord	33 05	84 26	4-5	1		10	Rumbling.		C. T. Smith.
	22 04	Covington	33 36	83 48	1	1			Rumbling.		Mrs. Sarah Cruse.
	22 04	Dahlonega	34 32	83 59	2	3			None.		Prof. B. P. Gaillard.
	22 04	Dalton	34 46	84 58	3	2		10	None.	Windows rattled.	B. L. Heartsill.
	22 04	Duluth	34 00	84 08	5	1		23	None.		W. O. Medlock.
	22 04	Forsyth	33 02	83 55	3-4	2		13	None.	Buildings trembled.	A. M. Zeltner.
	22 04	Gainesville	34 17	83 46	5	2		23	None.		W. C. Walker.
	22 01	Griffin	33 16	84 18	2	1		15	Faint.		J. M. Mathews.
	22 04	La Fayette	34 42	85 18	1	1		30	Rumbling.		A. S. Sharp.
	22 04	La Grange	33 01	85 01	5	1		10	None.		W. L. Fernet.
	22 04	Hiwassee	34 56	83 41	3-4	1		15	None.		G. C. Benson.
	22 04	Macon	32 50	83 38	3-4	2			Rumbling.		U. S. Weather Bureau.
	22 04	Madison	33 32	83 28	4-5	2		5	Faint.	Pictures swayed.	J. W. Owen.
	22 01	Marietta	33 56	84 32	2	2					A. N. Mayes.
	22 04	Marshallville	32 27	83 55	3	1					E. C. Bryan.
	22 01	Monticello	33 16	83 38	3	2			Rumbling.		Miss Maud Penn.
	22 04	Rome	34 15	85 10	3	1				Windows rattled.	W. M. Towers.
	22 04	Sandersville	32 56	82 48	3	1				Dishes rattled.	Dr. P. Stone.
	22 01	Summerville	34 28	85 20	2	1					J. V. Wheeler, Jr.
	22 04	Tallapoosa	33 45	85 18	4	1		10	None.		C. C. Sigman.
	22 04	Thomson	33 27	82 28	3	1		5	None.		J. L. West.
	22 04	Thunder	32 56	84 30	1	1		53	None.		E. T. Higgins.
	22 04	Warrenton	33 21	82 37	1	1					J. C. Evans.
		INDIANA.									
18	22 04	Evansville	37 58	87 33	3	1		4	None.		U. S. Weather Bureau.
		KENTUCKY.									
18	22 04	Beaver Dam	37 23	86 53	2	1				Buildings shook slightly.	W. T. Austin.
	22 04	Chilton	37 34	87 16	3	1				Windows rattled.	W. A. Taylor.
	22 04	Louisville	38 15	85 45	3	2			None.		U. S. Weather Bureau.
	22 04	Taylorsville	38 02	85 21	1	1				Windows rattled.	E. D. Bourne.
19	8 00	Mayfield	36 45	88 38	1	1		50			J. N. Davis.
		MISSISSIPPI.									
18	22 04	Aberdeen	33 50	88 26	2	1			Faint.	Slight rattling of dishes.	J. E. Spratt.
	22 04	Booneville	34 42	88 28	2	1			None.	Windows rattled.	Dr. D. P. Price.
	22 04	Carroll	34 56	88 25	2	1		10	None.		H. E. Meeks.
	22 04	Fulton	34 17	88 20	2	1		30	None.		A. D. Graham.
	22 04	Porterville	32 42	88 22	2-3	1		2	None.	Windows rattled.	R. H. Clegg.
	22 04	Toombs	32 23	88 22	4	1		5	None.	Buildings trembled.	R. E. Thompson.
		NEVADA.									
11	5 47	McDermitt	41 58	117 45	2	1					E. D. Hamel.
23	0 20	Millett	39 01	117 15	2	3		6			Ida Jones.
		NORTH CAROLINA.									
18	22 04	Highlands	35 01	83 15	2-3	1		15	None.		B. C. Hawkins.
	22 04	Murphy	35 06	84 00	1	1					Victoria Mingus.
	22 04	Nantahala	35 17	83 43	3	1		10	Rumbling.	Cans fell off shelves.	J. Z. Wright.
		SOUTH CAROLINA.									
18	22 04	Columbia	34 00	81 03	2	2			None.		Prof. Stephen Taber.
	22 04	Liberty	34 47	82 42	3	2		15	None.		John T. Boggs.
		TENNESSEE.									
18	22 04	Carthage	36 16	85 56	3	3					J. R. Pickering.
	22 04	Charleston	35 16	84 45	2	1		25	None.		J. T. Weeks.
	22 04	Chattanooga	35 04	85 14	4-5	1		50	None.		U. S. Weather Bureau.
	22 04	Clinton	36 05	84 07	2	1		5	None.		H. C. Slover.
	22 04	Copperhill	35 00	84 22	3	1			None.	Shook some buildings.	Tennessee Copper Co.
	22 04	Lewisburg	35 27	86 48	4-5	1		15	None.	Alarmed some people.	R. D. Crutcher.
	22 04	Lynchville	35 24	87 02	3-4	1		4	None.	Dishes and windows rattled.	J. H. Burrow.
	22 04	McMinnville	35 40	85 43	5	3		3	Rumbling.		H. H. Stiles.
	22 04	Murfreesboro	35 53	86 26	3-4	1			Rumbling.		E. F. Wright.
	22 04	Nashville	36 10	86 47	4	1		15	None.	Windows rattled.	U. S. Weather Bureau.
	22 04	Sewanee	35 13	85 53	5	1			Faint.		University of the South.
	22 04	Sparta	35 56	85 27	3-4	2		50	Rumbling.		E. H. Hull.
	22 04	Tullahoma	35 23	86 14	2	1			None.		E. T. Moore.
	22 04	Walling	35 48	86 35	2	1			Rumbling.		I. K. Roberts.
	22 04	Waynesboro	35 18	87 45	3	2		4	Rumbling.		H. C. Boyd.

TABLE 2.—Instrumental seismological reports, October, 1916.

Time used: Mean Greenwich, midnight to midnight. Nomenclature: International.

[For significance of symbols see this REVIEW, January, 1916, p. 39.]

Date.	Charac- ter.	Phase.	Time.	Period. T.	Amplitude.		Dis- tance.	Remarks.
					A _E	A _N		

Alaska. *Sitka. Magnetic Observatory.* U. S. Coast and Geodetic Survey. J. W. Green.

Lat., 57° 03' 00" N.; long., 135° 20' 06" W. Elevation, 15.2 meters.
Instruments: Two Bosch-Omori, 10 and 12 kg.

Instrumental constants: $\begin{matrix} V & T_0 \\ E & 10 & 15.5 \\ N & 10 & 15.4 \end{matrix}$

1916.		H. m. s.	Sec.	μ	μ	Km.	
Oct. 31	eP _N ...	15 38 43	3				No long waves discernible on N. S.
	S _N ...	15 44 40	4				
	S _E ...	15 44 45	6				
	L _N ...	15 47 30	20				
	M _N ...	15 56 10	20	30			
	F _N ...	16 30 00					

Arizona. *Tucson. Magnetic Observatory.* U. S. Coast and Geodetic Survey. F. P. Ulrich.

Lat., 32° 14' 48" N.; long., 110° 50' 06" W. Elevation, 769.6 meters.
Instruments: Two Bosch-Omori, 10 and 12 kg.

Instrumental constants: $\begin{matrix} V & T_0 \\ E & 10 & 15.9 \\ N & 10 & 19.1 \end{matrix}$

1916.		H. m. s.	Sec.	μ	μ	Km.	
Oct. 3	eL _N ...	1 55 00	25				
	eL _N ...	1 56 00	20				
	M _N ...	2 01 00	16		20		
	F _N ...	2 09 30					
	F _N ...	2 12 42					
3	eL...	4 49 04	5				
	M...	4 50 12	8	100	40		
	F...	5 03 00					
23	eL...	2 47 30	3				
	M...	2 48 22	8	20			
	C _N ...	2 50 00	4				
	F _N ...	2 59 00					

California. *Berkeley. University of California.*

Lat., 37° 52' 16" N.; long., 122° 15' 37" W. Elevation, 95.4 meters.

(See Bulletin of the Seismographic Stations, University of California.)

California. *Mount Hamilton. Lick Observatory.*

Lat., 37° 20' 24" N.; long., 121° 38' 34" W. Elevation, 1,281.7 meters.

(See Bulletin of the Seismographic Stations, University of California.)

California. *Point Loma. Raja Yoga Academy.* F. J. Dick.

Lat., 32° 43' 03" N.; long., 117° 15' 10" W. Elevation, 91.4 meters.

Instrument: Two-component, C. D. West seismoscope.

1916.		H. m. s.	Sec.	μ	μ	Km.	
Oct. 5				*400	*700		Tremors recorded during 24 hours preceding 15 ^h on dates given.
6				*150	*150		
11				*350	*400		
13				*200	*200		
14				*100	*150		

* Amplitudes on instrument.

Date.	Charac- ter.	Phase.	Time.	Period. T.	Amplitude.		Dis- tance.	Remarks.
					A _E	A _N		

California. *Point Loma. Raja Yoga Academy*—Continued.

1916.		H. m. s.	Sec.	μ	μ	Km.	
Oct. 15				*100	*100		Very light local shock.
19				*50	*100		
22				*100	*50		
22		2 55 00		*150	*500		
24				*300	*300		
26		3 53 00		*200	*250		
27				*200	*300		Tremors recorded during 24 hours preceding 15 ^h on dates given.
28				*250	*250		
29				*450	*350		
30				*200	*200		

* Amplitudes on instrument.

California. *Santa Clara. University of Santa Clara.* J. S. Ricard, S. J.

Lat., 37° 28' 36" N.; long., 121° 57' 63" W. Elevation, 27.43 meters.

(See record of the Seismographic Station, University of Santa Clara.)

Colorado. *Denver. Sacred Heart College. Earthquake Station.* A. W. Forstal, S. J.

Lat., 39° 40' 36" N.; long., 104° 56' 54" W. Elevation, 1,655 meters.

Instrument: Wiechert 30 kg., astatic, horizontal pendulum.

Instrumental constants

1915.			H. m. s.	Sec.	μ	μ	Km.	
Oct. 12	II _d	L	5 41 00					Felt and heard by many persons in Boulder Co., 25 mi. N. W. of Denver. Apparently merely local.
		M	5 41 20		*12000	*12000		
		F	5 41 30					
13		L	23 15 00					Small irregular waves.
		F	23 27 00					
13		L	23 35 00					Small waves recurring; activity visible at intervals during day.
		F	23 42 00					
22-23								Irregular waves at intervals during day. More noticeable on E-W.
30								
31	I _u	L	16 58 00					Record superimposed on that caused by heavy machinery in motion near-by.
		M	17 06 00					
		F	17 52 00	20	*6000	*6000		

* Trace amplitude.

TABLE 2.—Instrumental seismological reports, October, 1916—Continued.

Date.	Character.	Phase.	Time.	Period. T.	Amplitude.		Dis- tance.	Remarks.
					A _B	A _N		

District of Columbia. *Washington. Georgetown University.*

F. A. Tondorf, S. J.

Lat., 38° 54' 25" N.; long., 77° 04' 24" W. Elevation, 42.4 meters. Subsoil: decayed diorite.

Instruments: Wiechert 200 kg., astatic, horizontal pendulums; 80 kg., vertical. Astatic pendulums after Mainka, 130 kg.

Instrumental constants: $\frac{V}{T_0} = \frac{e}{s}$
 E 165 5.4 0
 N 143 5.2 0
 Z 80 5.0 0

1916.	Date.	Character.	Phase.	Time.	Period. T.	Amplitude. A _B A _N	Dis- tance. Km.	Remarks.				
Oct. 3		eP.	S _N	1 35 39				P possibly sooner. Heavy microseisms. No distinct maximum.				
				1 43 13								
				1 43 24								
				eL _N	1 51 41							
				L _N	1 55 14	30						
				L _N	1 55 25	30						
				L _N	2 02 02	30						
				L _N	2 03 00	30						
				F	2 40 00							
				3		S _N	eL _N		5 04 00			P lost in microseisms. eL difficult.
									5 04 03			
									5 07 27			
5 07 35												
5 16 00												
18		eP.	S _N	22 05 26			P very doubtful. Microseisms present.					
				22 07 51								
				22 07 52								
				22 08 24								
20		eL _N	L _N	17 55 48	30		End lost in microseisms. Heavy microseisms. N-S hardly shows.					
				17 58 12	30							
				18 02 18	20	1						
				18 05 00								
31		eP _N	S _N	15 43 02			Microseisms present. No distinct maximum.					
				15 43 04								
				iS _N	15 52 57							
				S _N	15 53 00							
				eL _N	16 09 24	30						
				eL _N	16 09 24	24						
				F	17 32 00							

District of Columbia. *Washington. U. S. Weather Bureau.*

Lat., 38° 54' 12" N.; long., 77° 03' 03" W. Elevation, 21 meters.

Instrument: Marvin (vertical pendulum), undamped. Mechanical registration.

Instrumental constants: $\frac{V}{T_0} = \frac{e}{s}$
 110 6.4

1916.	Date.	Character.	Phase.	Time.	Period. T.	Amplitude. A _B A _N	Dis- tance. Km.	Remarks.						
Oct. 3	I _a	P	S _N	1 35 39			6,200							
				1 43 26										
				L	1 51 38	40								
				L	1 58 00	22								
				L	2 01 15	16								
				F	3 00 00									
				3	I _r	P			S _N	5 00 24			1,750	
										5 03 24				
										5 04 18				
				11	I _r	P			S _N	11 08 54			3,150	Very faint record.
										11 13 48				
										L	11 23 15	14		
F	11 40 00													
11		S _N	L	18 30 00			P lost in microseisms.							
				18 38 45										
				19 02 30	16									
				19 25 00										
18	II _r	P	S _N	22 05 52			1,020	Alabama earthquake.						
				22 07 42										
				22 08 07										
				22 15 00										
20	I _r	P	S _N	17 23 10			4,660							
				17 29 34										
				L	17 38 00									
				L	17 51 20	20								
26	I _r	P	S _N	3 30 50			2,640							
				3 35 08										
				L	3 36 03									
				F	3 60 00									

Date.	Character.	Phase.	Time.	Period. T.	Amplitude.		Dis- tance.	Remarks.
					A _B	A _N		

District of Columbia. *Washington—Continued.*

1916.	Date.	Character.	Phase.	Time.	Period. T.	Amplitude. A _B A _N	Dis- tance. Km.	Remarks.	
Oct. 31	II _a	P	S _N	15 43 03			5,700	Amplitudes small but phases fairly well defined.	
				15 52 58					
				SR17	15 58 06				
				SR27	16 01 40				
				L	16 09 18	28			
				L	16 16 20	20			
				L	16 22 40	20			
				L	16 30 00	16			
				F	18 00 00				

Hawaii. *Honolulu. Magnetic Observatory. U. S. Coast and Geodetic Survey. Frank Neumann.*

Lat., 21° 19' 12" N.; long., 158° 03' 48" W. Elevation, 15.2 meters.

Instrument: Milne seismograph of the Seismological Committee of the British Association.

Instrumental constant: $\frac{V}{T_0} = \frac{e}{s}$
 18.6

1916.	Date.	Character.	Phase.	Time.	Period. T.	Amplitude. A _B A _N	Dis- tance. Km.	Remarks.							
Oct. 1		L	M	2 31 06			5,700								
				2 32 00											
				C	2 42 12										
				F	3 28 00										
				3		P			S _N	1 40 00					
										1 51 00					
										2 08 00	20				
										M	2 13 48				*2300
										C	2 27 18				
				11		eL			M	11 09 00	20				
										11 14 48		*100			
										11 19 00					
11		L	M	18 19 30	20			Beginning and end obscured by air tremors.							
				18 24 00		*1300									
				18 38 38											
20		L	M	17 21 12	21			Time of end doubtful.							
				17 22 00		*2000									
				17 46 48											
20		eL	M	19 44 18	20										
				19 48 12		*200									
				19 57 12											
21		eL	F	20 16 12				Merely a broadening of the line.							
				20 35 00											
21		P	L	22 01 30											
				22 18 12	20										
				M	22 30 30				*100						
				F	23 19 00										
22		P	L	7 38 00											
				7 42 54	21										
				M	7 47 30				*100						
				F	7 54 48										
23		eL	M	10 41 24	18										
				10 44 30		*100									
				10 47 30											
26		eL	M	2 46 36	19										
				2 51 12		*200									
				3 02 00											
26		P	S _N	5 58 00				Phases uncertain.							
				6 02 06											
				M	6 11 12				*200						
				C	6 14 00										
26		L	M	18 45 06	20										
				18 52 18		*100									
				18 55 36											
				19 33 00											
30		eL	M	2 28 30	19										
				2 32 00		*100									
				2 44 00											
30		eL	M	11 35 30	18										
				11 37 54		*100									
				11 40 30											
31		P	S _N	15 39 18				Paper changed at 17 ^h 23 ^m before end of quake.							
				15 46 12											
				eL	15 53 36	20									
				M	16 00 00				*3900						

* Trace amplitude.

TABLE 2.—Instrumental seismological reports, October, 1916—Continued.

Date.	Charac- tor.	Phase.	Time.	Period. T.	Amplitude.		Dis- tance.	Remarks.
					A _m	A _n		

Panama Canal Zone. *Balboa Heights*. Isthmian Canal Commission.

Lat., 8° 57' 39" N.; long., 79° 33' 29" W. Elevation, 27.6 meters.

Instruments: Two Bosch-Omori, 100 kg.

V T₀
Instrumental constants.. 10 20

1916.			H. m. s.	Sec.	μ	μ	Km.	
Oct. 3	P	1 31 55	1,770	Direction N?
			S _N	1 35 25	.....	.....	.....
			L _N	1 37 00	.....	.....	.....
			M _N	1 37 05	.....	.....	.....
			M _N	1 38 20	.....	150	.....
			F _N	1 39 35	.....	50	.....
15	P	1 25 10	260	Direction?
			L _N	1 25 39	.....	.....	.....
			L _N	1 25 40	.....	.....	.....
			M _N	1 25 44	.....	50	.....
			M _N	1 25 47	.....	.....	.....
			F _N	1 28 40	.....	.....	.....

Porto Rico. *Vieques*. Magnetic Observatory. U. S. Coast and Geodetic Survey. F. L. Adams.

Lat., 18° 08' 48" N.; long., 65° 28' 54" W. Elevation, 19.3 meters.

Instruments: Two Bosch-Omori.

V T₀
Instrumental constants. {E 10 21.4
N 10 21.1

1916.			H. m. s.	Sec.	μ	μ	Km.	
Oct. 3	eP	1 33 09	4	Phases uncertain.
			M _N	1 43 30	24	20	.....
			M _N	1 50 40	16	20	.....
			F _N	2 17 00	.....	.....	.....
			F _N	2 28 00	.....	.....	.....

Vermont. *Northfield*. U. S. Weather Bureau. Wm. A. Shaw.

Lat., 44° 10' N.; long., 72° 41' W. Elevation, 256 meters.

Instruments: Two Bosch-Omori, mechanical registration.

V T₀
Instrumental constants. {E 10 15
N 10 16

1916.			H. m. s.	Sec.	μ	μ	Km.	
Oct. 3	I ₀	P.....	1 36 12	6,960	Record feeble; does not show on E-W.
			S.....	1 44 40	.....	.....	.....
			L.....	1 59 30	20	.....	.....
			F.....	2 15 00	.....	.....	.....
3	e _N	.....	5 05 00	.....	.....	.....	Phases indistinguishable. Does not show on E-W.
			F.....	5 20 00
11	e	.....	11 08 22	.....	.....	.....
			F.....	11 15 00
11	e	.....	18 20 10	.....	.....	.....
			F.....	18 40 00
31	I ₀	P.....	15 42 39	8,820	
			S.....	15 52 40	.....	.....	.....
			L _N	16 06 00	.....	.....	.....
			L.....	16 13 00	20	.....	.....
			L.....	16 19 00	18	.....	.....
			F.....	17 00 00	.....	.....	.....

Date.	Charac- tor.	Phase.	Time.	Period. T.	Amplitude.		Dis- tance.	Remarks.
					A _m	A _n		

Canada. *Ottawa*. Dominion Astronomical Observatory. Earthquake Station. Otto Klotz.

Lat., 45° 23' 38" N.; long. 75° 42' 57" W. Elevation, 83 meters.

Instruments: Two Bosch photographic horizontal pendulums, one Spindler & Hoyer 80 kg. vertical seismograph.

1916.			H. m. s.	Sec.	μ	μ	Km.	
Oct. 3	O	1 29 19	6,630	
			eP _N	1 36 26	.....	.....	.....
			L _N	1 36 32	.....	.....	.....
			eS _N	1 44 36	.....	.....	.....
			iS _N	1 44 42	.....	.....	.....
			eL.....	1 54 36	36	.....	.....
			L.....	1 59 00	32	.....	.....
			L.....	2 01 00	28-26	.....	.....
			L.....	2 05 00	18-16	.....	.....
			L.....	2 12 00	17	.....	.....
			L.....	2 23 00	15-14	.....	.....
			F.....	3 00 00	14	.....	.....
3	O?	4 58 48	4,000?	
			eP.....	4 59 00	.....	.....	.....
			eN.....	5 04 17	.....	.....	.....
			iN.....	5 04 46	.....	.....	.....
			eL _N ?	5 08 00	10	.....	.....
			F.....	5 23 00	.....	.....	.....
11	iS?	11 11 14	6,000?	
			iSR17.	11 15 21	.....	.....	.....
			eL?	11 22 00	.....	.....	.....
			L.....	11 25 24	16	.....	.....
			F.....	11 45 00	.....	.....	.....
11	O?	18 15 30	5,500?	
			e.....	18 31 23	.....	.....	.....
			iS?	18 31 38	.....	.....	.....
			L.....	18 39 30	20	.....	.....
			L.....	18 44 00	27	.....	.....
			F.....	19 07 00	17	.....	.....
13	L	.....	1 34 00	20	.....	.....	Only a trace.
				
20	e _N	17 16 17	9,700?	
			e _N	17 16 22	.....	.....	.....
			L _N	17 46 30	20	.....	.....
			L _N	17 51 24	40	.....	.....
			LRI?	19 20 48	10	.....	.....
			F.....	19 40 00	.....	.....	.....
21	L _N	.....	20 35 00	30-20	.....	.....
			F.....	21 00 00
21	eL	.....	22 35 00	24?	.....	.....
			L.....	22 45 00	20
			L.....	22 56 00	18
			F.....	23 10 00
31	eL	.....	16 09 12	24	.....	.....	First phases lost in changing sheets.
			L.....	16 17 00	24
			L.....	16 24 00	15
			F.....	17 30 00

O—time at origin.

TABLE 2.—Instrumental seismological reports, October, 1916—Continued.

Date.	Charac-ter.	Phase.	Time.	Period T.	Amplitude.		Dis-tance.	Remarks.
					A _N	A _W		
Canada. Toronto. Dominion Meteorological Service.								
Lat., 43° 40' 01" N.; long., 79° 23' 54" W. Elevation, 113.7 meters. Subsoil: Sand and clay.								
Instrument: Milne horizontal pendulum, North. In the meridian.								
T ₀ Instrumental constant.. 18. Pillar deviation: 1 mm. swing of boom = 0.50".								
1916. Oct. 1		L	2 10 30					Preceded and fol-lowed by air cur-rents.
		F	2 14 42					
3		iP	1 36 48				6,735	Possibly off the coast of Peru.
		iS	1 45 08					
		L	1 52 30					F in air currents.
		L	1 56 42					
		L	2 00 13					F in air currents.
		M	2 03 18			*1,500		
		L	2 09 38					F in air currents.
		L	2 14 38					
		L	2 19 38					F in air currents.
		L	2 42 13					
3		iL?	5 01 13					Air currents going on.
3		L	14 01 48			*300		Doubtful as to being seismic. F in air currents.
6		e?	16 28 48			*100		Doubtful as to being seismic. F in air currents.
11		L	10 48 24					Doubtful as to being seismic. F in air currents.
		L	11 04 54			*100		
		L	11 19 18					F in air currents.
		e?	18 24 36					
		e	18 28 00					F in air currents.
		L	18 40 00					
		eL	19 04 00					F in air currents.
		M	19 05 48			*300		
13		L	1 14 18					F in air currents.
20		L?	17 33 18					F lost in air currents.
		M	17 34 48			*200		
21		e	20 42 36			*50		Minute thickening.
		F	20 45 06					Air currents going on, phases rather doubtful.
		e?	22 23 06					
		L	22 40 06					F lost in air currents.
		eL	22 53 24					
		M	22 54 24			*300		Gradual thickening.
		eL	8 29 00			*100		
		F	8 36 30					Phases well defined. P and S strongly marked at commencement.
31		iP	15 52 18				7,000	
		eS	16 01 18					Phases well defined. P and S strongly marked at commencement.
		L?	16 08 00					
		iL	16 11 00					Phases well defined. P and S strongly marked at commencement.
		L	16 18 36					
		eL	16 18 30					Phases well defined. P and S strongly marked at commencement.
		M	16 24 24			*2,800		
		L	17 03 24					Phases well defined. P and S strongly marked at commencement.
		F	18 54 12					

* Trace amplitude.

Date.	Charac-ter.	Phase.	Time.	Period T.	Amplitude.		Dis-tance.	Remarks.
					A _N	A _W		
Canada. Victoria, B. C. Dominion Meteorological Service.								
Lat., 48° 24' N.; long., 123° 19' W. Elevation, 67.7 meters. Subsoil: Rock.								
Instrument: Wiechert, vertical; Milne horizontal pendulum, North. In the meridian.								
T ₀ Instrumental constant.. 18. Pillar deviation: 1 mm. swing of boom = 0.54".								
1916. Oct. 1		P or L?	2 54 32					F may be reflected waves.
		M	2 56 31			*50		
		F	2 58 00					
3		P	1 38 31				9,400	F may be reflected waves.
		S	1 49 01					
		L	1 58 31					
		M	2 13 31			*2,500		F may be reflected waves.
		F?	4 22 48					
3		eL	4 56 30			*300		F may be reflected waves.
		F	4 59 31					
3		P	13 40 41					F may be reflected waves.
		L	13 43 50					
		M	13 44 51			*200		F may be reflected waves.
		F	13 48 22					
6		P or L	16 24 58					F may be reflected waves.
		M	16 27 57			*200		
		F	16 30 26					F may be reflected waves.
		P?	11 31 34			*100		
11		M	11 32 34					F may be reflected waves.
		F	11 38 01					
11		L	18 27 36			*500		Probably another quake, separate from above.
		M	18 28 08					
		F	18 34 03					Probably another quake, separate from above.
		L	18 46 56					
		M	18 56 22			*200		Probably another quake, separate from above.
		F	19 26 07					
13		P?	1 13 08					Probably another quake, separate from above.
		L	1 14 48					
		M	1 16 17			*200		Probably another quake, separate from above.
		F	1 18 16					
19		P or L	11 57 16					Probably another quake, separate from above.
		M	11 58 16			*50		
		F	12 00 46					Probably another quake, separate from above.
		P	17 27 20				2,440	
20		S	17 31 20					Probably another quake, separate from above.
		L	17 37 50					
		M	17 46 50			*750		Probably another quake, separate from above.
		F	18 36 20					
21		P?	22 35 37					Probably another quake, separate from above.
		S?	22 37 35					
		L	22 40 34					Probably another quake, separate from above.
		M	22 44 02			*400		
		F	23 08 49					Probably another quake, separate from above.
		P?	8 02 59					
22		M	8 06 29			*100		Probably another quake, separate from above.
		F	8 10 59					
23		P?	10 58 03					Probably another quake, separate from above.
		S?	11 00 32					
		L	11 05 00					Probably another quake, separate from above.
		M	11 07 29			*100		
		F	11 10 27					Probably another quake, separate from above.
		P?	8 56 34					
25		L?	8 58 34					Probably another quake, separate from above.
		M	9 00 04			*100		
		F	9 05 04					Probably another quake, separate from above.
		L?	19 05 11					
30		P?	11 33 37					Probably another quake, separate from above.
		M	11 35 06			*100		
		F	11 39 35					Probably another quake, separate from above.
		P?	15 37 40					
31		S	15 40 08					Probably another quake, separate from above.
		L	15 46 35					
		M	15 52 32			1,000		Probably another quake, separate from above.
		F?	17 40 08					
		Reflect	18 38 39					Probably another quake, separate from above.

*Trace amplitude.

TABLE 3.—Late seismological reports. (Instrumental.)

Date.	Charac-ter.	Phase.	Time.	Period. T.	Amplitude.		Dis- tance.	Remarks.
					A _m	A _n		
Porto Rico. Vieques. Magnetic Observatory. U. S. Coast and Geodetic Survey. F. L. Adams.								
Lat., 18° 08' 48" N.; long., 65° 26' 54" W. Elevation, 19.8 meters.								
Instruments: Two Bosch-Omori.								
Instrumental constants $\begin{cases} E & 10 & 21.4 \\ N & 10 & 21.1 \end{cases}$								
1916.								
Sept. 23	P.		5 48 00	4				
	S _m		5 52 20	10				
	S _n		5 52 31	7				
	L _m		5 54 00	18				
	L _n		5 54 47	15				
	M _m		5 57 30	18	39			
	M _n		5 58 50	14		20		
	C.		6 05 00	13				
	F.		6 18 00					

SEISMOLOGICAL DISPATCHES.¹

Reading, Cal., Oct. 5, 1916.

Lassen Peak was in eruption two hours to-day, spouting steam and smoke from the northern part of the crater. [See above, p. 571.—C. A. jr.] (Assoc. Press.)

Denver, Colo., Oct. 12, 1916.

A fault in the earth's crust which occurred in the mountains near Boulder, last night, was registered on the seismograph of the Sacred Heart College, here. The registration, similar to that of an earthquake, occurred at 10:41 p. m. There were fifteen distinct shocks, lasting 30 seconds. (Assoc. Press.)

Atlanta, Ga., Oct. 18, 1916.

Two distinct earthquake shocks, that in some instances shook frame buildings and knocked chimneys down, were felt throughout Georgia and eastern Alabama and Tennessee shortly after 4 o'clock to-day. From all points damage was reported as negligible except around Birmingham and Montgomery, where it appeared to consist of damage

¹ Reported by the organization indicated and collected by the seismological station of Georgetown University, Washington, D. C.

to chimneys. The tremor was not felt at any point east of a suburb of Augusta, Ga., according to press reports to-night, some of which said the first shock was heavier than the second, while others reversed the description. Two distinct shocks were felt in Macon and Columbus, Ga. (Assoc. Press.)

Birmingham, Ala., Oct. 18, 1916.

Birmingham had the severest earthquake in her history this afternoon at 2 minutes past 4 o'clock. There were three sharp and distinct shocks separated by brief intervals. Little property damage was caused other than broken windows and toppled chimneys. (Assoc. Press.)

Louisville, Ky., Oct. 18, 1916.

A slight earthquake shock was felt over a wide area in Louisville at 4:05 o'clock to-day. Police reported that down town tall buildings noticeably were rocked, while in the outlying districts pictures swayed and chinaware rattled. (Assoc. Press.)

Los Angeles, Cal., Oct. 22, 1916.

Two slight earthquake shocks were felt here and in neighboring towns early to-night. Chandeliers and pictures on walls were shaken and crockery was tumbled from shelves. No material damage reported. The first shock was felt at 6:45 p. m., the second 10 minutes later. Each lasted several seconds. Reports from Santa Ana, where the shocks seemed to be felt more perceptibly, said that residents rushed into the streets considerably alarmed. (Assoc. Press.)

Fresno, Cal., Oct. 22, 1916.

According to reports received here two earth shocks that were felt throughout southern California early to-night were severe at Bakersfield and in the oil fields in that district. (Assoc. Press.)

Birmingham, Ala., Oct. 22, 1916.

What was thought to have been a slight earth tremor was felt by persons in various sections of Birmingham to-day. No damage reported. (Assoc. Press.)

Unionville, Nev.

Mr. George Rice, of Unionville, Nev., reports that earthquake shocks were felt in this vicinity at 9:40 and 9:45 p. m. on Oct. 20 and at 8:50 and 11:10 a. m. on Oct. 21, Pacific time. (?clipping?)

The Alabama earthquake of October 18, 1916, detailed reports of which are given in Table 1, above, was so widespread in its effects that it warrants some investigation and discussion. The United States Geological Survey has examined the supposed epicenter and a short article on this disturbance will appear in an early number of the REVIEW.—W. J. H.

SECTION V.—SEISMOLOGY.

SEISMOLOGICAL REPORTS FOR NOVEMBER, 1916.

W. J. HUMPHREYS, Professor in Charge of Seismological Investigations.

[Dated: Weather Bureau, Washington, D. C., Jan. 2, 1917.]

TABLE 1.—Noninstrumental earthquake reports, November, 1916.

Day.	Approximate time, Greenwich Civil.	Station.	Approximate latitude.	Approximate longitude.	Intensity Rossi-Forel.	Number of shocks.	Duration.	Sounds.	Remarks.	Observer.
4	H. m. 12 15	ALABAMA.								
		Birmingham.....	33 32	86 50	3	1	M. s. 0 2	Rumbling....	Possibly due to explosion....	U. S. Weather Bureau.
3	5 55	CALIFORNIA.								
		Calexico.....	32 40	115 28	5	1	30	None.....		F. R. Spencer.
3	10 05 10 05	Los Gatos.....	37 12	121 58	2	1	5	.....do.....		Irving H. Snyder.
		Santa Cruz.....	36 57	122 02	5	1	1	.....do.....		W. E. Springer.
9	9 10	Lone Pine.....	36 37	118 01	4				Windows rattled.....	G. F. Marsh.
26	17 05	Cahuilla.....	33 32	116 43	5	2	5	Rumbling....		Dr. W. L. Shawk.
28	7 11	Spreckels.....	36 35	121 38	4	3		None.....		Spreckels Sugar Co.
9	11 00	NEVADA.								
		Sharp.....	38 07	115 28	2	1	Few.....	None.....		F. A. Sears.
10	9 13 9 13	Las Vegas.....	36 09	115 09	3	1	5	.....do.....		C. P. Squires.
		Rhyolite.....	36 52	116 50	4	1				C. E. Bulette.
10	10 15	.....do.....	36 52	116 50	4	1	45			Do.
10	18 00	Pahrump.....	38 51	114 22	2	2	30			F. A. Buel.
2	2 32	NEW YORK.								
		Caldwell.....	43 24	73 43	5	1		Loud.....		Charles Forsell.
21	19 30	WASHINGTON.								
		Silverton.....	48 00	121 52	4	1	10	Rumbling....	Shook buildings.....	C. M. Mackintosh.

TABLE 2.—Instrumental reports, November, 1916.

[Time used: Mean Greenwich, midnight to midnight. Nomenclature: International.]

[For significance of symbols see Review for January, 1916, p. 39.]

Date.	Character.	Phase.	Time.	Period. T.	Amplitude.		Distance.	Remarks.	
					A _m	A _w			
Alaska.	Sitka.	Magnetic Observatory.	U. S. Coast and Geodetic Survey.	J. W. Green.					
Lat. 57° 03' 00" N.; long., 135° 30' 00" W. Elevation, 15.2 meters.									
Instruments: Two Bosch-Omorl, 10 and 12 kg.									
Instrumental constants:					$\frac{V}{N}$	$\frac{T_0}{10}$	$\frac{E}{10}$	$\frac{L_0}{15.4}$	
Arizona.	Tucson.	Magnetic Observatory.	U. S. Coast and Geodetic Survey.	F. P. Ulrich.					
Lat. 32° 14' 48" N.; long., 110° 50' 09" W. Elevation, 769.6 meters.									
Instruments: Two Bosch-Omorl, 10 and 12 kg.									
Instrumental constants:					$\frac{V}{N}$	$\frac{T_0}{10}$	$\frac{E}{10}$	$\frac{L_0}{14}$	

1916.		H. m. s.	Sec.	μ	μ	Km.	
Nov. 10	L _w	9 25 37	12				Microseisms on 4, 16, 17, 20, and 24-28.
	M _w	9 26 15	10		40		
	C _w	9 28 00	10				
	F _w	9 32 00					
21	eL _w	6 53 30	16				
	eL _w	6 53 38	18				
	M _w	6 54 10	14	100			
	M _w	6 54 33	16		90		
	C _w	6 55 20					
	F _w	7 02 10	12				
	F _w	7 04 00					
	F _w	7 11 00					

1916.		H. m. s.	Sec.	μ	μ	Km.	
Nov. 10	F _w	9 14 01					
	F _w	9 14 04					
	L _w	9 15 29		8			
	L _w	9 15 30		7	350		
	M _w	9 15 38		9			
	M _w	9 16 05		6	270		
	C _w	9 16 22					
	C _w	9 16 45					
	F _w	9 34					
		F _w	9 34				
12	eL _w	11 09 30					
	M _w	11 10 13		5	10	20	
	F _w	11 24 00					
19	eL _w	20 15 23		6			Very faint. N phases.
	eL _w	20 55 42		6			
	F _w	21 00 00		6			
21	eF _w	6 30 41					
	eF _w	6 30 49					
	S _w	6 34 30					
	S _w	6 34 44					
	L _w	6 37 28					
	L _w	6 37 45					
	M _w	6 38 06		18	700		
	M _w	6 40 18		13	730		
C _w	6 41 30						
F _w	7 10 00						

TABLE 2.—Instrumental reports, November, 1916—Continued.

Date.	Char-acter.	Phase.	Time.	Period. T.	Amplitude.		Dis-tance.	Remarks.
					A _m	A _w		

California. Berkeley. University of California.

Lat., 37° 52' 18" N.; long., 122° 15' 37" W. Elevation, 85.4 meters.

(See Bulletin of the Seismographic Stations, University of California.)

California. Mount Hamilton. Lick Observatory.

Lat., 37° 20' 24" N.; long., 121° 38' 34" W. Elevation, 1,281.7 meters.

(See Bulletin of the Seismographic Stations, University of California.)

California. Point Loma. Raja Yoga Academy. F. J. Dick.

Lat., 32° 43' 03" N.; long., 117° 15' 10" W. Elevation, 91.4 meters.

Instrument: Two-component, C. D. West seismoscope.

1916.		H. m. s.	Sec.	μ	μ	Km.	
Nov. 1				*400	*300		Tremors recorded during 24 hours preceding 15 ^h on dates given; but most of these are due to firing of heavy guns at neighboring forts and on battleships.
2				*200	*200		
3				*400	*400		
4				*400	*500		
6				*400	*300		
7				*350	*300		
8				*400	*400		
10				*450	*450		
11				*500	*500		
13				*300	*200		
16				*100	*200		
18				*400	*400		
20				*300	*300		
22				*150	*150		
23				*400	*600		
24				*300	*300		
25				*200	*200		
29				*200	*200		
30				*100	*100		

*Amplitude on instrument.

California. Santa Clara. University of Santa Clara. J. S. Ricard, S. J.

Lat., 37° 28' 36" N.; long., 121° 57' 53" W. Elevation, 27.43 meters.

(See Record of the Seismographic Station, University of Santa Clara.)

Colorado. Denver. Sacred Heart College. Earthquake Station. A. W. Forstall, S. J.

Lat., 39° 40' 36" N.; long., 104° 56' 54" W. Elevation, 1,655 meters.

Instrument: Wiechert 80 kg., astatic, horizontal pendulum.

1916.		H. m. s.	Sec.	μ	μ	Km.	
Nov. 5-6							Visible activity at intervals during day.
10	P _m	9 14 00					
	L _m	9 16 00					
	M _m	9 17 00	8-9	50			
	C _m	9 19 00					S _m
	F _m	9 21 00					
21	P	6 35 00					S _T not discernible. Maximum rather doubtful.
	L	6 42 00	10-12				
	M	6 43 00	20-25	5-6	5-6		
	F _m	6 48 00					
25-26							Visible activity at intervals during day.
30	L	3 40 00					
	F	4 50 00					

Date.	Char-acter.	Phase.	Time.	Period. T.	Amplitude.		Dis-tance.	Remarks.
					A _m	A _w		

District of Columbia. Washington. U. S. Weather Bureau.

Lat., 38° 54' 12" N.; long., 77° 03' 03" W. Elevation 21 meters.

Instrument: Marvin (vertical pendulum), undamped. Mechanical registration.

Instrumental constants: V T₀
110 6.4

1916.		H. m. s.	Sec.	μ	μ	Km.	
Nov. 10	e	9 24 30					Preliminary phases uncertain.
	L _w	9 27 54					
	M _w	9 32 00		68			
	F	9 50 00					
13	L _w	12 26 45					Other phases lost in microseisms. Barely perceptible on N-S.
	F	12 50 00	20				
21	P	6 31 59				2,690	Phases well defined. S _S at 3 ^h 26 ^m 06 ^s possibly Y. see British Association report, 1915. On Seismological Investigations.
	S	6 36 19					
	L	6 39 41					
	F	7 40 00					
30	iP	3 22 40				2,290	
	S	3 26 23					
	L	3 27 30	18				
	F	4 30 00					

District of Columbia. Washington. Georgetown University.

F. L. Tondorf, S. J.

Lat., 38° 54' 25" N.; long., 77° 04' 24" W. Elevation, 42.4 meters. Subsoil: Decayed diorite.

Instruments: Wiechert 200 kg. astatic horizontal pendulums, 80 kg. vertical.

Instrumental constants: E 185 5.4 0
N 143 5.2 0
Z 80 5.0 0

1916.		H. m. s.	Sec.	μ	μ	Km.	
Nov. 10	e _m	9 24 19					Heavy wind markings; P and S very doubtful.
	e _L	9 28 35					
	e _L	9 28 43					
	M _w	9 29 40	9		8		
	M _w	9 30 37	9		6		
	M _w	9 31 18	8		4		
	M _w	9 31 54	9	8			
	M _w	9 33 45	9	4			
	F	9 50 00					
13	L _T	12 26 42					
	F	12 41 00					
18	eL _T	12 26 24					Heavy microseisms. N-S not well defined. Mainka instrument shows what appears to be e at 12 ^h 28 ^m 05 ^s .
	L _w	12 29 12					
	F	12 50 00					
21	eP _m	6 31 32					Heavy microseisms. Sheet changed by mistake at 7 ^h 32 ^m at which time traces were still apparent; F?
	eP _m	6 31 33					
	S _m	6 36 24					
	S _m	6 36 27					
	eL _w	6 39 30					
	eL _w	6 39 35					
	L _w	6 43 21					
	L _w	6 44 15					
							VERTICAL.
	e	6 31 27					
	eL	6 39 35					
	F	6 45 00	9				
30	e	3 22 41					Vertical shows e at 3 ^h 23 ^m 33 ^s .
	S _m	3 26 29					
	S _m	3 26 31					
	eL _w	3 27 24	8				
	eL _w	3 27 25	8				
	M _w	3 33 45			4		
	M _w	3 33 59			5		
	F	4 40 00					

TABLE 2.—Instrumental reports, November, 1916—Continued.

Date.	Char-acter.	Phase.	Time.	Period. T.	Amplitude.		Dis-tance.	Remarks.
					A _m	A _n		
Hawaii. <i>Honolulu. Magnetic Observatory.</i> U. S. Coast and Geodetic Survey. Frank Neuman.								
Lat., 21° 19' 12" N.; long., 153° 03' 48" W. Elevation, 15.2 meters.								
Instruments: Milne seismograph of the Seismological Committee of the British Association.								
$\frac{V T_0}{N} = 18.9$ Instrumental constant...								
(Report for November, 1916, not received.)								

Kansas. <i>Lawrence. University of Kansas.</i> Department of Physics and Astronomy. F. E. Kester.								
Lat., 38° 57' 30" N.; long., 95° 14' 58" W. Elevation, 301.1 meters.								
Instrument: Wiechert.								
$\frac{V T_0}{N} = \begin{matrix} E & T_0 & \mu \\ 177 & 3.4 & 4.0 \\ 205 & 3.4 & 3.8 \end{matrix}$ Instrumental constants...								
(Report for November, 1916, not received.)								

Maryland. <i>Cheltenham. Magnetic Observatory.</i> U. S. Coast and Geodetic Survey. George Hartnell.								
Lat., 38° 44' 00" N.; long., 76° 50' 30" W. Elevation, 71.6 meters.								
Instruments: Two Bosch-Omori, 10 and 12 kg.								
$\frac{V T_0}{N} = \begin{matrix} E & T_0 \\ 10 & 32 \\ 10 & 27 \end{matrix}$ Instrumental constants...								

1916.	Date.	Char-acter.	Phase.	Time.	Period. T.	Amplitude. A _m A _n	Dis-tance.	Remarks.	
Nov. 10	eL _n	9 23 07	
				9 23 30					
				9 29 10					
				9 31 53					
				9 32 ..					
				9 40 ..					
	21	eP _n	6 31 13
					6 36 16				
					6 41 20				
					6 42 31				
					6 45 16				
					6 45 56				
30	eP _n	3 22 32	
				3 22 43					
				3 26 27					
				3 27 30					
				3 27 44					
				3 22 40					

Massachusetts. <i>Cambridge. Harvard University Seismographic Station.</i> J. B. Woodworth.								
Lat., 42° 22' 36" N.; long., 71° 06' 59" W. Elevation, 5.4 meters. Foundation: Glacial sand over clay.								
Instruments: Two Bosch-Omori 100 kg. horizontal pendulums (mechanical registration).								
$\frac{V T_0}{N} = \begin{matrix} E & T_0 & \mu \\ 80 & 23 & 0 \\ 50 & 25 & 4.1 \end{matrix}$ Instrumental constants...								
(Report for November, 1916, not received.)								

Missouri. <i>Saint Louis. St. Louis University.</i> Geophysical Observatory. J. B. Goesse, S. J.								
Lat., 38° 38' 15" N.; long., 90° 13' 53" W. Elevation, 160.4 meters. Foundation: 12 feet of tough clay over limestone of Mississippi system, about 300 feet thick.								
Instrument: Wiechert 80 kg. astatic, horizontal pendulum.								
$\frac{V T_0}{N} = 80 \ 7 \ 5.1$ Instrumental constants...								

1916.	Date.	Char-acter.	Phase.	Time.	Period. T.	Amplitude. A _m A _n	Dis-tance.	Remarks.
Nov. 10	II _r	P _n 9 15 45	3,200	E-W not well defined.
				S _n 9 20 42				
				L _n 9 22 21				
				F _n 9 36 00				
21	II _r	P _n 13 31 00	E-W not well defined.
				M _n ? 13 35 06				
				F _n 19 00 00				
30	II _r	P _n 3 23 00
				S _n 3 28 30				
				L _n 3 33 00				
				F _n 4 04 00				

New York. <i>Buffalo. Canisius College.</i> John A. Curtin, S. J.								
Lat., 42° 53' 02" N.; long., 78° 52' 40" W. Elevation, 190.5 meters.								
Instrument: Wiechert 80 kg. horizontal.								
$\frac{V T_0}{N} = 80 \ 7 \ 5.1$ Instrumental constants...								

1916.	Date.	Char-acter.	Phase.	Time.	Period. T.	Amplitude. A _m A _n	Dis-tance.	Remarks.
Nov. 10	e _n	9 23 45
				9 24 00				
				9 28 00				
				9 28 30				
				9 29 00				
				9 29 30				
12	e _n	13 02 15	2 sharp shocks—E-W.
				13 02 30				
				13 07 00				
				13 07 10				
				13 09 00				
21	eP _n	6 32 30
				6 37 30				
				6 45 00				
				6 47 00				
				6 48 00				
				6 51 00				
30	eP _n	3 29 20
				3 33 40				
				3 39 00				
				3 41 00				
				4 08 00				

New York. <i>Fordham. Fordham University.</i> W. C. Repetti, S. J.								
Lat., 40° 51' 47" N.; long., 73° 53' 08" W. Elevation, 23.9 meters.								
Instrument: Wiechert, 80 kg.								
$\frac{V T_0}{N} = \begin{matrix} E & T_0 & \mu \\ 72 & 6.6 & 1.5:1 \\ 72 & 7.1 & 3.8:1 \end{matrix}$ Instrumental constants...								

1916.	Date.	Char-acter.	Phase.	Time.	Period. T.	Amplitude. A _m A _n	Dis-tance.	Remarks.
Nov. 10	eL _n	9 23 10	More trace on E-W. P and S both lost in microseisms.
				9 25 39				
				9 37 00				
12	eP _n ? eL _n	12 17 54	F lost in microseisms
				12 20 48				
21	eP _n ? S _n ? eL _n ? L _n	6 30 49	E-W lost through defective smoking of record. All phases doubtful because of heavy microseisms.
				6 33 48				
				6 35 50				
30	IP _n P _n S _n L _n M _n F _n F _n	3 18 19
				3 18 21				
				3 21 54				
				3 22 10				
				3 23 30				
				3 23 37				

New York. <i>Ithaca. Cornell University.</i> Heinrich Ries.								
Lat., 42° 26' 58" N.; long., 76° 29' 09" W. Elevation, 242.6 meters.								
Instruments: Two Bosch-Omori, 25 kg. horizontal pendulums (mechanical registration).								
$\frac{V T_0}{N} = \begin{matrix} E & T_0 & \mu \\ 13 & 22 & 4.1 \\ 14 & 25 & 4.1 \end{matrix}$ Instrumental constants...								

1916.	Date.	Char-acter.	Phase.	Time.	Period. T.	Amplitude. A _m A _n	Dis-tance.	Remarks.
Nov. 10	e _n	9 28 34
				9 29 35				
				9 30 16				
				9 45 00				
				9 48 00				
21	e _n	6 34 12	Phases not differentiated.
				6 36 14				
				6 51 02				
24	e _n	12 34 41	Obscured by irregular microseisms.
				13 21 00				
30	P _n P _n S _n L _n L _n L _n F _n F _n	3 23 52
				3 24 01				
				3 28 05				
				3 28 11				
				3 30 09				
				3 30 31				
				4 20 00				
				4 21 00				

TABLE 2.—Instrumental reports, November, 1916—Continued.

Date.	Char-acter.	Phase.	Time.	Period. T.	Amplitude.		Dis-tance.	Remarks.
					A _μ	A _N		

Panama Canal Zone. *Balboa Heights*. Isthmian Canal Commission.

Lat., 8° 57' 39" N.; long., 79° 33' 29" W. Elevation, 27.6 meters.

Instruments: Two Bosch-Omori 100 kg.

Instrumental constants. $\begin{matrix} V & T_0 \\ E & 10 & 15 \\ N & 10 & 16 \end{matrix}$

1916.		H. m. s.	Sec.	μ	μ	Km.	Direction?
Nov. 20	P	18 16 02					
	L	18 16 40			50		
	M	18 16 48					
	M _w	18 16 50		40			
	F _w	18 20 00					
21	P _w	6 29 18				2,010	Movement barely perceptible on E-W.
	S _w	6 33 00					
	L _w	6 35 18					
	M _w	6 38 34			100		
	F _w	7 04 00					

Porto Rico. *Vieques*. *Magnetic Observatory*. U. S. Coast and Geodetic Survey. F. L. Adams.

Lat., 18° 08' 48" N.; long., 65° 28' 54" W. Elevation, 19.8 meters.

Instruments: Two Bosch-Omori.

Instrumental constants. $\begin{matrix} V & T_0 \\ E & 10 & 18 \\ N & 10 & 19.5 \end{matrix}$

1916.		H. m. s.	Sec.	μ	μ	Km.	
Nov. 12	L	13 10 03	2				The shock was distinctly felt in Vieques. Doors rattled, and there was a faint rumbling.
	M	13 10 08		650	400		
	C	13 11 00	2				
	F	13 14 00					
25	P	13 14 38					Slight shocks, resembling microseismic tremors, occurred during the 48 hours following this quake.
	L	13 14 51	2				
	M	13 15 08	2	30	40		
	F _w	13 18					
25	P	13 46 30					Phases and periods not well defined.
	L	13 46 44	3				
	M _w	13 46 57	4	40			
	F _w	13 47 02	2		40		
30	P _w	3 18 46	3				
	L _w	3 19 03	6				
	L _w	3 19 03	8				
	M _w	3 20 15	18		900		
	M _w	3 20 52	14	300			
	C _w	3 25 00	12				
	C _w	3 26 00	8				
	F _w	3 37 00					
F _w	3 46 00						

Date.	Char-acter.	Phase.	Time.	Period. T.	Amplitude.		Dis-tance.	Remarks.
					A _μ	A _N		

Vermont. *Northfield*. U. S. Weather Bureau. Wm. A. Shaw.

Lat., 44° 10' N.; long., 72° 41' W. Elevation, 256 meters.

Instruments: Two Bosch-Omori, mechanical registration.

Instrumental constants. $\begin{matrix} V & T_0 \\ E & 10 & 15 \\ N & 10 & 16 \end{matrix}$

1916.		H. m. s.	Sec.	μ	μ	Km.	
Nov. 10	e _w	9 24 17					Phases indeterminate.
	e _w	9 25 54					
	M _w	9 30 42			200		
	F _w	10 00 00					
21	S	6 37 42					P uncertain.
	L	6 40 40					
	F	7 30 00					
24	L _w	12 38 40					Record faint, not discernible on E-W.
	F _w	12 50 00					
30	P	3 23 21					
	S	3 26 46					
	L	3 27 49					
	F	4 11 00					

Canada. *Ottawa*. *Dominion Astronomical Observatory*. Earthquake Station. Otto Klotz.

Lat., 45° 23' 38" N.; long., 76° 42' 57" W. Elevation, 83 meters.

Instruments: Two Bosch photographic horizontal pendulums, one Spindler & Hoyer 80 kg. vertical seismograph.

Instrumental constants: 120 26 $\begin{matrix} V & T_0 \\ E & 10 & 15 \\ N & 10 & 16 \end{matrix}$

1916.		H. m. s.	Sec.	μ	μ	Km.	
Nov. 10	e _f	9 19 00					Microseisms mask first phases.
	e _f	9 24 07					
	e _f	9 24 40					
	e _L	9 27 48					
	M	9 29 30	14	8	70		
	L	9 32 00	6				
	F	10 00 00					
18	e _{L_w}	12 31 36	20				Microseisms completely mask N-S component.
	F	12 45 00					
21	O	6 25 39				3,580	
	P	6 32 26	1-2				
	S	6 37 48					
	e _L	6 40 24	12-14				
	L _w	6 45 00	20				
	L _w	6 45 00	18				
	F	7 01 00	12				
24	e _{L_w}	12 36 18	26				Microseisms mask other phases.
	L _w	12 42 00	28				
	F	13					
30	O	3 17 58				2,870	
	e _{F_w}	3 23 40					
	S	3 28 14					
	e _{L_w}	3 30 18	20				
	L	3 34 00	18-17				
	L	3 37 00	12-11				
	L	3 45 00	15				
	L	3 53 00	14				
	L	4 02 00	12-11				
	L	4 06 00	13				
F	4 10 00	11					

O—time at origin.

TABLE 2.—Instrumental reports, November, 1916—Continued.

Date.	Char-acter.	Phase.	Time.	Period. T.	Amplitude.		Dis-tance.	Remarks.
					A _m	A _w		
Canada. Toronto. Dominion Meteorological Service.								
Lat., 43° 40' 01" N.; long., 78° 23' 54" W. Elevation, 113.7 meters. Subsoil: Sand and clay.								
Instrument: Milne horizontal pendulum, North. In the meridian.								
T ₀ Instrumental constant... 18. Pillar deviation, 1 mm. swing of boom=0.50".								
1916.								
Nov. 3	e		22 31 48					Gradual thickening.
	L		22 40 48		*200			
	F		22 52 06					
10	iL		9 29 06					P and S not recorded.
	M		9 29 30		*300			
	F		9 39 00					
11	L		14 18 06					Gradual thickening at principal portions. P and S not recorded.
	eL		14 20 00					
	M		14 23 30		*400			
	F?		14 51 42					
11	L		16 03 00					P and S lost in changing paper.
	eL		16 08 06					
	M		16 11 30		*300			
	F?		16 58 48					
11	L		17 26 06		*50			Very doubtful as to being seismic. Thickening at intervals.
	F?		17 45 12					
13	L		12 40 48					P and S not recorded.
	eL		12 44 18					
	M		12 49 48					
	F		12 52 36		*300			
	F		13 36 12					
14	L?		23 15 06		*50			Doubtful as to being seismic.
18	L?		12 28 54					Slight thickening. Phases masked by air currents.
	L?		12 54 24					
21	e		6 35 42					Real P waves may not have been recorded. Possibly off the coast of Mexico.
	P-IS		6 36 30					
	iS		6 38 48					
	iL		6 44 06					
	M		6 45 42		*2,800			
	eL		6 47 48					
	M		6 50 12		*2,300			
	L		6 51 54					
	Repeat		7 53 18					
	F		8 08 00					
24	eL?		0 13 06					Air currents going on. F in air currents.
	eL?		0 17 24					
24	L		12 43 18					Thickenings. P and S not recorded. F in air currents.
	eL		12 46 12					
	M		12 48 36					
	M		12 51 30		*200			
30	P?		3 24 12			2,500		A marked quake. P not well defined. Possibly in West Indies.
	iS		3 28 24					
	iL		3 31 00		24			
	L		3 33 30					
	M		3 35 24		*2,400			
	eL		3 52 06					
	eL		3 53 36					
	eL		3 55 24					
	eL		3 57 06					
	F		4 50 48					

*Trace amplitude.

Date.	Char-acter.	Phase.	Time.	Period. T.	Amplitude.		Dis-tance.	Remarks.
					A _m	A _w		
Canada. Victoria, B. C. Dominion Meteorological Service.								
Lat., 48° 24' N.; long., 123° 19' W. Elevation, 67.7 meters. Subsoil: Rock.								
Instrument: Wiechert, vertical; Milne horizontal pendulum, North. In the meridian.								
T ₀ Instrumental constant... 18. Pillar deviation, 1 mm., swing of boom=0.54".								
1916.								
Nov. 3	L?		22 23 36					
10	P		9 17 46				260?	Probably in eastern Washington.
	L		9 18 15					
	M		9 19 05		*2000			
	F		9 31 08					
11	S		14 01 00					
	L		14 04 00					
	M		14 07 30		*300			
	F		14 46 30					
11	S		15 47 30					
	L		15 51 30					
	M		15 55 30		*300			
	F		16 15 30					
13	L		12 31 20					P?
	M		12 38 17		*100			
	F		12 52 10					
14	L		23 25 03			*50		
18	P?		11 57 05					
	L		12 09 58			*200		
	M		12 14 56					
18	L		12 39 14			*200		May be part of preceding quake.
20	L		21 47 19			*100		
	M		21 53 18					
20	P?		22 58 43					
	L		22 59 43					
	M		23 01 42		*200			
	F		23 05 40					
21	P		6 39 26				2,050	
	S		6 42 54					
	L		6 47 22					
	M		6 52 19		*4500			
	F		7 53 18					
VERTICAL.								
	S		6 43 18		6			P?
	L		6 47 00		18-20			
	M		6 50 18		17			True earth movement.
	F?		7 09 00					
24	P?		0 09 17					
	L		0 14 17					
	M		0 18 47			*200		
	F		0 27 47					
24	L?		13 03 53					P?
	M		13 06 51			*400		
	F?		13 14 47					
25	P?		21 06 34					May not be seismic. L?
	M		21 09 18			*100		
	F		21 11 11					
27	P?		7 17 32					
	L		7 21 00					
	M		7 24 28			*200		
	F		7 30 55					
30	P		3 34 00				6,000	Beginning of P not defined. Trace thick. Distance, from S-L.
	iS		3 39 00					
	L		3 48 12					
	eL		3 49 54					
	M		3 51 36			*1000		
	eL		4 02 00					
	F		4 24 04					

*Trace amplitude.

TABLE 3.—Late seismological reports. (Instrumental.)

Date.	Character.	Phase.	Time.	Period. T.	Amplitude.		Dis- tance.	Remarks.
					A _m	A _w		
New York. Buffalo. Canisius College. John A. Curtin, S. J. Lat., 42° 53' 02" N.; long., 78° 52' 40" W. Elevation, 190.5 meters. Instrument: Wiechert 80 kg. horizontal. Instrumental constants... $\frac{V}{80}$ $\frac{T_0}{7}$ $\frac{e}{5.1}$								
1916, Sept. 21								
			<i>H. m. s.</i>	<i>Sec.</i>	μ	μ	<i>Km.</i>	
23	oP _N ...		5 49 00					Microseisms during day and night.
	S _N ...		5 53 00					
	M _N ...		6 01 00					E-W indistinct.
	F _N ...		6 06 00					
25	I _N ...		15 58 00					Heavy microseisms.
	I _w ...		15 58 10					Very short period.
	F		16 00 40					
Oct. 3	oP		1 36 00					
	S _N		1 44 00					
	S _w		1 44 15					
	I _N		1 57 20					
	L _N		1 57 20					
	F		2 15 00					
3	S _N		5 03 30					
	M _N		5 06 00					
	F _N		5 10 00					
22			16 14 00					Severe microseisms.
			16 15 00					

SEISMOLOGICAL DISPATCHES.¹

Glens Falls, N. Y., Nov. 1, 1916.

An earthquake shock which lasted several seconds was felt in sections of northern New York to-night. At this place, which apparently was the center of the disturbance, houses were shaken so severely that dishes were thrown from shelves and pictures from walls. No serious damage reported. (Assoc. Press.)

San Salvador, Republic of Salvador, Nov. 2, 1916.

Reports received here from Nicaragua say the volcano Santiago there is throwing out lava and ashes. (Assoc. Press.)

Redding, Cal., Nov. 2, 1916.

Lassen Peak began belching mighty balls of black smoke to-day at intervals of from 5 to 10 minutes. The most violent eruption of the year took place yesterday afternoon according to observers reaching here to-day. (Assoc. Press.)

Birmingham, Ala., Nov. 4, 1916.

A distinct earthquake tremor was felt here at 6:15 o'clock this morning, the local Weather Bureau announced. Windows were rattled and china knocked from the cupboards of several homes. (Assoc. Press.)

Birmingham, Ala., Nov. 4, 1916.

The explosion which occurred about 3 o'clock this morning caused an earth shock which was distinctly felt in Birmingham, and persons in this city at first believed the tremor to be an earthquake. It lasted but a few seconds. (Assoc. Press.)

Tokyo, Japan, Nov. 29, 1916.

Considerable damage has been caused by an earthquake in middle Japan. Many houses have been destroyed in Kobe, Osaka, and Kyoto. The railway station at Kyoto was damaged, and several pedestrians were hurt by falling walls and roofs in that town and in Kobe. (Assoc. Press.)

¹ Reported by the organization indicated and collected by the seismological station at Georgetown University, Washington, D. C.

SECTION V.—SEISMOLOGY.

THE ALABAMA EARTHQUAKE OF OCTOBER 18, 1916.

By RUY HERBERT FINCH, Assistant.

[Dated: Seismological Investigations, Weather Bureau, Jan. 30, 1917.]

An earthquake occurred on October 18, 1916, a little to the northeast of Birmingham, Ala., that has been reported from eight different States: Alabama, Georgia, Indiana, Kentucky, Mississippi, North Carolina, South Carolina, and Tennessee. Undoubtedly it was felt in Florida also, as Geneva on the Alabama-Florida line reported it with an intensity of II, Rossi-Forel.

The occurrence of this earthquake was unnoticed in many places owing to the high winds and heavy rain incident to a hurricane then passing over the east Gulf States. Several persons, in fact, mistook the earthquake disturbance for wind effects. Thus, the observer at Marshallville, Ga., remarked to his wife, "We are having some wind to-day," to which she replied that there was just one strong gust and that it had died down.

The data used in this note, given in some detail on pages 589-590 in the MONTHLY WEATHER REVIEW for October, 1916, were obtained from some 200 card reports rendered by Weather Bureau cooperative observers, United States postmasters, and others. Thanks are specially due to Mr. W. N. Maddox, of Easonville, Ala., who furnished much valuable information.

The influence of the geologic structure on the propagation of the earthquake waves is shown by the fact that the earthquake was felt 340 miles to the north and to the east, 190 miles to the south, and only 130 miles to the west, where the waves encountered the unconsolidated material of the Mississippi Delta. To the northeast along the continuation of the ridge in which the epicenter is situated, the quake was not felt as far as it was to the north and east. (See fig. 1.) An interesting account of the difference in effects of an earthquake on dry hilly land and moist sandy land was furnished by Hon. R. E. Thompson, of Toomsaba, Miss. Mr. Thompson, whose house is located on a damp sandy foundation, felt and could give a good description of the earthquake, while his neighbors whose houses are on higher and drier land did not know that anything unusual had occurred.

Instrumental records of the earthquake were made by the seismographs of the University of Kansas at Lawrence, Kans., Georgetown University, and the Weather Bureau at Washington, D. C.

The highest intensity reported was VII-VIII (Rossi-Forel) at Easonville and Irondale, Ala. The different intensities as reported are shown on the accompanying chart. The isoseismals are, of course, only relatively accurate and are drawn for average values. The inaccuracy of isoseismals based upon a few reports is well illustrated by the fact that Lewisburg, Tenn., reported the quake with an intensity of IV-V, while a small hamlet on a rural free mail delivery route from Lewisburg reported that it was not felt.

The time of the shock as given by a majority of reports was 4:03-4:04 p. m., 90th meridian time. Mr. C. F. von Hermann, in charge of the Weather Bureau office at Atlanta, Ga., reported two shocks and gave the time

very accurately, reporting the first shock at 4^h 04^m 05^s and the second at 4^h 05^m 25^s p. m. But as Atlanta is about 130 miles from the epicenter it may be that these two shocks were only different phases of the same quake. The average time of the occurrence at the epicenter, as determined from the seismograph records of the University of Kansas, Georgetown University, and the Weather Bureau at Washington by means of the P-O table of Dr. Klotz, is 4^h 03^m 14^s p. m.

As is usual, the main shock of October 18 was followed by several weaker ones. At 10:54 p. m. October 18 a shock was felt over most of the territory bounded by the VII isoseismal. A few people felt shocks at about 9 p. m., October 22, and on the morning of October 28. Birmingham was shaken by a light tremor at 6:15 a. m. November 4, but there is some doubt as to whether this was seismic or due to a mine explosion.

The Geological Survey detailed a trained geologist, Mr. Oliver B. Hopkins, to make a study of the epicenter region, and his interesting report follows.

NOTES RELATING TO THE EARTHQUAKE OF OCTOBER 18, 1916, IN NORTH-CENTRAL ALABAMA.¹

By OLIVER B. HOPKINS, Associate Geologist.

[Dated: U. S. Geological Survey, Washington, D. C., Jan. 8, 1917.]

Observations.

Time.—According to Mr. C. J. Yow, train dispatcher of the Southern Railway at Pell City, Ala., the most intense shock occurred at 4:03 p. m. (90th meridian time), October 18, and smaller, but distinct, shocks at 8:53 p. m. and 9:11 p. m. on October 22. Other shocks are reported by a number of people as having occurred at about 11 p. m. October 18 and about 6 a. m. October 28. The first shock at 4:03 p. m. on October 18 is the only one which was sufficiently severe to be generally felt from Birmingham eastward beyond Pell City.

Duration.—The duration of the first shock has been variously estimated from less than one-half minute to more than a minute. No close estimate of the actual time during which the movement could be felt can be given because few people realized that any disturbance was taking place until it had reached its maximum intensity. An observer near Easonville was certain from his action during the shock that it could be distinctly felt for more than a minute; on the other hand another observer at Irondale stated that it could be felt probably less than one-half minute, since he rushed out of doors as soon as he was conscious of the shaking and when he got outside the shaking had ceased.

The subsequent shocks were less severe and were experienced by few people.

Direction of vibration.—The examination of a number of fallen objects, principally chimneys, near Easonville, Pell City, and Irondale, suggests that the direction of

¹ Published by permission of the Director of the U. S. Geological Survey, as conveyed in his letter of Jan. 8, 1917.

vibration was from east to west. At Easonville a small water keg, resting on an east-west shelf was overturned to the west and did not roll off the shelf. Three-fourths of a mile east of Easonville about 30 bricks from a chimney fell in an easterly direction. Near Pell City a farmer, who was standing on the southwest side of a fence during the shock, clearly felt the fence being heaved toward him (or himself being heaved toward the fence). The examination of 14 chimneys in Irondale which were partially destroyed, showed that 10 of them fell either to the east or west.

On the other hand, half a dozen bricks, which were dislodged from a chimney on the south side of the courthouse at Pell City, fell to the south, and several of the chimneys in Irondale fell as if they had been rocked in no particular direction, the bricks falling in all directions.

Noises.—The noises reported consisted of two kinds—those due to the earthquake itself and those caused by the disturbance of objects. Simultaneously with the shock came a low rumbling noise, which has been likened to the rumble of heavy distant thunder or to the hum of a distant motor. Some likened the noise and shaking to the sudden gust of wind on a still day. This noise was clearly heard by many people from Irondale to Pell City.

The principal noise, which caused the people to be frightened was due to the disturbance of objects, such as the creaking of the houses, the rattling of dishes, and the falling of bricks, etc.

Effect on people.—From the eastern edge of Birmingham to Pell City most of the people within doors at the time of the severe shock were so frightened that they rushed outdoors for fear their houses would fall; on the other hand, probably one-half of those who were out of doors at that time were entirely unconscious of the earthquake. Only one case of personal injury has been heard of, and that was caused by a falling brick. In the central part of Birmingham the effects of the earthquake were much less pronounced, and many people, who were indoors were either barely conscious of the earthquake or not conscious of it at all. Two persons who were asleep in the hotel at Pell City were suddenly awakened by the shock and so badly frightened that they rushed from the building.

The subsequent shocks were so mild that only a few people experienced them, and few persons, if any, were alarmed.

In Selma the first shock was distinctly felt by many, but it was not sufficiently intense to cause alarm. In general, people on the upper floors of buildings felt the shock, whereas those on the ground or on the lower floors were unconscious of it.

Effect on objects.—Judging from the number of chimneys partially destroyed, the shock was more severe in Irondale than in any other part of the region between Easonville and Birmingham. Here 14 chimneys were partially destroyed within an area of two blocks. Six chimneys on a brick store were practically leveled to the roof. Many others were either leveled to the house roofs, or so badly cracked that they had to be rebuilt. Much less damage was done to chimneys in the surrounding area and farther west, toward Birmingham, although many poorly built chimneys were partially destroyed in the eastern edge of town. In Pell City a few bricks were dislocated from one of the chimneys of the courthouse. Near Easonville slight damage was done to a few chimneys and a few objects were upset. Effects of a similar nature near Vincent are reported, but were not verified.

Disturbance of the earth surface.—A fissure and a landslide were reported to have been caused by the earth-

quake near Easonville. An investigation of these and other reported surface effects in that vicinity failed to reveal any evidence of surface dislocation of importance or to yield exact information as to the location of the readjustments which produced the earthquake shock. The fissure reported was relatively insignificant, and may or may not have had any connection with the earthquake. The landslide unquestionably antedated the earthquake by a month or two, and was in itself of little significance. The result of greatest geologic significance, so far as could be learned, was the effect upon the underground water, particularly in Irondale; a number of wells either went dry after the shock or the water in them was lowered.

The fissure referred to was developed in the back yard of J. M. Farley, on the property of L. C. Davis on Kelly Creek, 6 miles north of Vincent. Mr. Farley is positive that he saw the crack at least an hour before the earthquake occurred, although he states that it was larger after the earthquake than it was before. In maximum size the fissure was 12 feet long, 1 inch wide, and 18 inches deep. It extended in an east-west direction. At the time of the writer's visit only indistinct traces of the fissure could be seen. Although the origin of the fissure is obscure, it may be connected with the solution of limestone which underlies that area. This supposition is supported by the presence of limestone sinks near by, and by the presence of a bold spring of strong limewater which issues from the base of the hill.

No other fissures could be found and no reports of any others could be obtained with the exception of a crack in the bottom of a well near Irondale, which is probably due to the earthquake movement.

The landslide, which is referred to above, unquestionably antedated the earthquake by a month or more, according to the unanimous opinion of the people who live in the vicinity. It consisted of a tree, some large rocks, and other debris sliding from a steep bluff into the road after a prolonged rainy season.

The most interesting effect of the earthquake was the drying up of a number of heretofore unfailing wells and the lowering of the water level in others. The elevation of the water in a well in Pell City was lowered 2 feet by the earthquake. This lowering of the water level was definitely determined since the rope on the windlass was too short to reach the water after the earthquake. A small "dry weather" branch north of Dykes mill is reported to have begun running immediately after the earthquake, whereas it had been dry for months before. This report could not be verified. In Irondale² five wells within a single block went dry immediately after the earthquake, and in many of the surrounding ones the water level was materially lowered. The wells that went dry in Irondale after the earthquake are on the southern edge of the town and on slightly higher ground than the rest of the town, whereas the chimneys most affected are in the central and northern part of town on low ground.

Relation of earthquake effects near Irondale to Red Gap fault.

A careful study of the Red Gap fault, which extends from near Gate City to beyond Irondale, failed to reveal any direct evidence of recent movement. If the readjustments which caused the earthquake produced any surface cracks or showed in any way in the surf material, these results were very slight and all traces

² Population was 572 in 1910.

of them had been obliterated at the time of the writer's visit.

On the other hand, the effect on the underground water conditions proves that there was movement in the rocks of this area attending the earthquake, and strongly suggests that there was movement along this old fault plane. As shown in the Birmingham geologic folio, published by the United States Geological Survey, this fault passes approximately through the center of Irondale. Practically all the wells along the eastern end of the fault, as shown on that map, either went dry or the water level in them was materially lowered. Most of the wells which went dry are located one block south of the fault line on a slight elevation, as compared with the others in town. Within a block five wells, ranging from 35 to 40 feet deep, went dry, whereas the sixth in the row which was only 14 feet deep did not. Two other wells, probably along the eastern extension of this fault or near it went dry. One is a few hundred yards east of the center SE. $\frac{1}{4}$ sec. 29, T. 17 S., R. 1 W., 4 miles east of Irondale; it was 28 feet deep and had 7 feet of water in it before the earthquake. The second well is 200 yards east of center of W. line of SW. $\frac{1}{4}$ sec. 19, T. 17

S., R. 1 W.; it was 47 $\frac{1}{2}$ feet deep and had produced water for two years before the earthquake. After the well went dry it was found to have a crack $1\frac{1}{2}$ inches wide crossing its bottom in the direction N. 33° E. This crack, which did not show at the surface or in the upper part of the well, has been followed downward in deepening the well about 30 feet. The well is still dry in spite of its increased depth and the crack still shows in the bottom of the well.

Conclusions.—The direction of movement, the intensity of the shock, and the effect upon the underground water near Irondale, suggest that the locus of the disturbance which produced the earthquake was along the Red Gap fault, which runs through Irondale; and that the movement along this fault was horizontal rather than vertical. Had the movement along this fault been vertical the direction of the resultant vibrations would have been at right angles to the line of fault, or approximately north and south, instead of east and west as it was found to be. The occurrence of the fissure in the well described above may be the result of this horizontal or torsional movement.

SEISMOLOGICAL REPORTS FOR DECEMBER, 1916.

W. J. HUMPHREYS, Professor in Charge.

[Dated: Weather Bureau, Washington, D. C., Dec. 1, 1916.]

TABLE 1.—Noninstrumental earthquake reports, December, 1916.

Day.	Approximate time, Greenwich Civil.	Station.	Approximate latitude.	Approximate longitude.	Intensity Rossi-Forsl.	Number of shocks.	Duration.	Sounds.	Remarks.	Observer.
ARIZONA.										
1916.	H. m.		° ' "	° ' "			M. s.			
Dec. 12	12 45	Fort Apache.....	33 47	109 55	5	1	0 3	Rumbling.....		J. C. F. Tillson, jr.
	12 45	Henry's Camp.....	33 41	109 48	5	1	7	None.....	Awakened people.....	G. J. Henry.
	12 45	Holbrook.....	34 54	110 08	5	1	15	None.....		Thorwald Larson.
	12 45	Lakeside.....	34 06	109 59	4-5	1	60	None.....	Dishes rattled.....	T. H. Owens.
	12 45	Pinedale.....	34 19	110 15	5	2	6	None.....		E. Thomas, jr.
	12 45	Plato.....	35 05	109 38	5	1	15	Rumbling.....	Doors slammed.....	Mrs. Cella Henning.
	12 45	Shumway.....	34 26	110 04	5	1	3	Rumbling.....		F. B. Wigely.
	12 45	Snowflake.....	34 33	110 04	4	1		None.....	Awakened people.....	W. J. Flaks.
	12 45	St. Michaels.....	35 38	109 05	5	1		Rumbling.....	Some plaster cracked.....	St. Michaels School.
	12 45	Thatcher.....	32 50	109 47	3	1	20	None.....		T. C. Snow.
CALIFORNIA.										
1	22 50	San Luis Obispo.....	35 18	120 39	7	1	0 8	Rumbling.....	Plaster fell.....	U. S. Weather Bureau.
	22 50	Santa Maria.....	34 58	120 28	3	1		None.....		Walter White.
7	18 55	Calexico.....	32 40	115 28	5	1		Rumbling.....		F. R. Spencer.
7	20 30	Bishop.....	37 21	118 22	3	2	8	None.....		E. L. Herzinger.
7	20 45	Calexico.....	32 40	115 28	5	1		Rumbling.....		F. R. Spencer.
18	19 50	Calexico.....	32 40	115 28	2	1		Rumbling.....		F. R. Spencer.
KENTUCKY.										
19	5 42	Hickman.....	36 35	89 12	5-6	2		Rumbling.....	Bricks shaken from chimneys.....	J. C. Sexton.

TABLE 2.—Instrumental seismological reports, December, 1916.

[Time used: Mean Greenwich, midnight to midnight. Nomenclature: International.]

[For significance of symbols see this REVIEW, January, 1916, p. 39.]

Date.	Charac-ter.	Phase.	Time.	Period T.	Amplitude.		Dis-tance.	Remarks.
					A _N	A _E		
Alaska. <i>Sitka. Magnetic Observatory. U. S. Coast and Geodetic Survey. J. W. Green.</i>								
Lat., 57° 03' 00" N.; long., 135° 20' 06" W. Elevation, 15.2 meters.								
Instruments: Two Bosch-Omori, 10 and 12 kg.								
Instrumental constants: $\begin{matrix} E & V & T_0 \\ N & 10 & 15.6 \\ & 10 & 15.4 \end{matrix}$								
(No earthquake recorded during December, 1916.)								

Arizona. <i>Tucson. Magnetic Observatory. U. S. Coast and Geodetic Survey. F. P. Ulrich.</i>								
Lat., 32° 14' 48" N.; long., 110° 50' 06" W. Elevation, 769.6 meters.								
Instruments: Two Bosch-Omori, 10 and 12 kg.								
Instrumental constants: $\begin{matrix} E & V & T_0 \\ N & 10 & 13.9 \\ & 10 & 19.1 \end{matrix}$								

1916.	Date.	Charac-ter.	Phase.	Time.	Period T.	Amplitude.	Dis-tance.	Remarks.
						A _N A _E		
1916.	Dec. 12	e		12-44-45				Earthquake in eastern Arizona.
		M		12-45-10	4			
		F		12-49-00				

California. <i>Berkeley. University of California.</i>								
Lat., 37° 52' 16" N.; long., 122° 15' 37" W. Elevation, 85.4 meters.								
(See Bulletin of the Seismographic Stations, University of California.)								

California. <i>Mount Hamilton. Lick Observatory.</i>								
Lat., 37° 20' 24" N.; long., 121° 38' 34" W. Elevation, 1,281.7 meters.								
(See Bulletin of the Seismographic Stations, University of California.)								

California. <i>Point Loma. Raja Yoga Academy. F. J. Dick.</i>								
Lat., 32° 43' 03" N.; long., 117° 15' 10" W. Elevation, 91.4 meters.								
Instrument: Two-component, C. D. West seismoscope.								

1916.	Date.	Charac-ter.	Phase.	Time.	Period T.	Amplitude.	Dis-tance.	Remarks.
						A _N A _E		
1916.	Dec. 2					*200 *200		Tremors during 24 hours preceding 15 ^h on dates given.
	3					*450 *450		
	4					*300 *400		
	5					*100 *100		
	9					*100 *200		
	11					*200 *200		
	14					*200 *200		
	16					*200 *300		
	22					*100 *100		
	24					*50 *100		
	28					*200 *400		

*Amplitudes on instrument.

California. <i>Santa Clara. University of Santa Clara. J. S. Ricard, S. J.</i>								
Lat., 37° 28' 36" N.; long., 121° 57' 03" W. Elevation, 27.43 meters.								
(See record of the Seismographic Station, University of Santa Clara.)								

Date.	Charac-ter.	Phase.	Time.	Period T.	Amplitude.		Dis-tance.	Remarks.
					A _N	A _E		
Colorado. <i>Denver. Sacred Heart College. Earthquake Station. A. W. Forstall, S. J.</i>								
Lat., 39° 40' 36" N.; long., 104° 56' 54" W. Elevation, 1,655 meters.								
Instrument: Wiechert 80 kg., astatic, horizontal pendulum.								
Instrumental constants:								
(No earthquakes observed during December, 1916.)								

District of Columbia. <i>Washington. U. S. Weather Bureau.</i>								
Lat., 38° 54' 12" N.; long., 77° 03' 03" W. Elevation, 21 meters.								
Instrument: Marvin (vertical pendulum), undamped. Mechanical registration.								
Instrumental constants: $\begin{matrix} V & T_0 \\ N & 110 & 6.4 \end{matrix}$								

1916.	Date.	Charac-ter.	Phase.	Time.	Period T.	Amplitude.	Dis-tance.	Remarks.
						A _N A _E		
1916.	Dec. 14	P		17 03 40				7,645
		S		17 12 42				
		eL _N		17 26 00				
		L		17 33 30	16			
		F		18 00 00				
	23	P		9 34 42				5,900
		S		9 43 06				
		L		9 51 40				
		L		10 05 01	20			
		F		10 20 ..				

F in microseisms.

District of Columbia. <i>Washington. Georgetown University. F. L. Tondorf, S. J.</i>								
Lat., 38° 54' 23" N.; long., 77° 04' 24" W. Elevation, 42.4 meters. Subsoil: decayed diorite.								
Instruments: Wiechert 200 kg., astatic, horizontal pendulums; 80 kg., vertical.								
Astatic pendulums after Mainka, 130 kg.								
Instrumental constants: $\begin{matrix} E & V & T_0 & e \\ N & 165 & 5.4 & 0 \\ Z & 80 & 3.0 & 0 \end{matrix}$								

1916.	Date.	Charac-ter.	Phase.	Time.	Period T.	Amplitude.	Dis-tance.	Remarks.
						A _N A _E		
1916.	Dec. 14	eP		17 03 41				Heavy microseisms due to wind. No distinct maximum
		eS _W		17 12 45				
		eS _N		17 12 47				
		eL _N		17 23 39				
		eL _W		17 23 44				
		L _N		17 33 30	36			
		L _W		17 33 44	36			
		F		18 03 00				
	23	eP _N		9 34 40				Heavy wind markings. No distinct maximum. F lost in wind markings.
		eP _W		9 34 52				
		IS _N		9 43 05				
		S _N		9 43 08				
		eL _N		9 53 25				
		eL _W		9 53 27				

TABLE 2.—Instrumental seismological reports, December, 1916—Continued.

Date.	Charac-ter.	Phase.	Time.	Period T.	Amplitude.		Dis-tance.	Remarks.
					A _m	A _w		
1916. Dec. 2	L.		12 22 54	19				
	M.		12 40 54		*200			
	F.		13 21 00					
2	L.		23 10 00	20				
	M.		23 15 00		*100			
	F.		23 28 00					
5	L.		15 32 42	18				Merely a broadening of the line.
	M.		15 51 12					
	F.		15 58 48					
13	L.		22 03 48	18				Probably airtremors.
	M.		22 06 00		*100			
	F.		22 08 42					
14	C.		17 08 00	20				
	M.		17 17 00		*1000			
	C.		17 19 54					
20	P.		19 15 42					
	L.		19 19 30	17				
	M.		19 22 00		*100			
21	C.		19 26 00					
	F.		19 28 45					
	L.		14 42 12	20				
22	M.		14 46 30		*400			
	C.		14 49 00					
	F.		14 59 18					
23	L.		16 35 06	21				
	M.		16 39 30		*100			
	C.		16 48 12					
26	P.		9 48 24					
	S.		9 56 06					
	L.		10 05 21	20				
27	M.		10 14 24		*2200			
	C.		10 21 00					
	F.		11 26 00					

* Trace amplitude.

Kansas. *Lawrence. University of Kansas. Department of Physics and Astronomy. F. E. Kester.*

Lat., 38° 57' 30" N.; long., 95° 14' 58" W. Elevation, 301.1 meters.

Instrument: Wiechert.

Instrumental constants... $\begin{matrix} V & T_0 & \epsilon \\ E & 177 & 3.4 & 4 \\ N & 205 & 3.4 & 4 \end{matrix}$

(Report for December, 1916, not received.)

Maryland. *Cheltenham. Magnetic Observatory. U. S. Coast and Geodetic Survey. George Hartnell.*

Lat., 38° 44' 00" N.; long., 76° 50' 30" W. Elevation, 71.6 meters.

Instruments: Two Bosch-Omori, 10 and 12 kg.

Instrumental constants... $\begin{matrix} V & T_0 \\ E & 10 & 32 \\ N & 10 & 27 \end{matrix}$

(No earthquake recorded during December, 1916.)

Date.	Charac-ter.	Phase.	Time.	Period T.	Amplitude.		Dis-tance.	Remarks.
					A _m	A _w		

Massachusetts. *Cambridge. Harvard University Seismographic Station. J. B. Woodworth.*

Lat., 42° 22' 36" N.; long., 71° 06' 39" W. Elevation, 5.4 meters. Foundation, glacial sand over clay.

Instruments: Two Bosch-Omori 100 kg. horizontal pendulums (mechanical registration).

Instrumental constants... $\begin{matrix} V & T_0 & \epsilon \\ E & 80 & 23 & 0 \\ N & 50 & 25 & 4.1 \end{matrix}$

(The records from Harvard University are several months behind and will appear in "Table 3.—Late reports," as rapidly as they are measured.)

Missouri. *Saint Louis. St. Louis University. Geophysical Observatory. J. B. Goesse, S. J.*

Lat., 38° 38' 15" N.; long., 90° 13' 58" W. Elevation, 160.4 meters. Foundation: 12 feet of tough clay over limestone of Mississippi system, about 300 feet thick.

Instruments: Wiechert 80 kg. astatic, horizontal pendulum.

Instrumental constants... $\begin{matrix} V & T_0 & \epsilon \\ E & 80 & 7 & 5.1 \end{matrix}$

(Report for December, 1916, not received.)

New York. *Buffalo. Canisius College. John A. Curtin, S. J.*

Lat., 42° 53' 02" N.; long., 78° 52' 40" W. Elevation, 190.5 meters.

Instrument: Wiechert 80 kg. horizontal.

Instrumental constants... $\begin{matrix} V & T_0 & \epsilon \\ E & 80 & 7 & 5.1 \end{matrix}$

(Report for December, 1916, not received.)

New York. *Fordham. Fordham University. W. C. Repetti, S. J.*

Lat., 40° 51' 47" N.; long., 73° 53' 08" W. Elevation, 23.9 meters.

Instrument: Wiechert, 80 kg.

Instrumental constants... $\begin{matrix} V & T_0 & \epsilon \\ E & 72 & 7.1 & 1.5:1 \\ N & 72 & 6.8 & 3.8:1 \end{matrix}$

(Report for December, 1916, not received.)

New York. *Ithaca. Cornell University. Heinrich Ries.*

Lat., 42° 28' 58" N.; long., 76° 29' 09" W. Elevation, 242.5 meters.

Instruments: Two Bosch-Omori, 25 kgm., horizontal pendulums (mechanical registration).

Instrumental constants... $\begin{matrix} V & T_0 & \epsilon \\ E & 13 & 22 & 4.1 \\ N & 14 & 25 & 4.1 \end{matrix}$

1916. Dec. 24	Charac-ter.	Phase.	Time.	Period T.	Amplitude.		Dis-tance.	Remarks.
					A _m	A _w		
	eL _m		17 27 49	19				Microseisms present.
	eL _w		17 30 32	25				
	F _m		17 43 ..					
	F _w		17 45 ..					

Panama Canal Zone. *Balboa Heights. Isthmian Canal Commission.*

Lat., 8° 57' 39" N.; long., 79° 33' 29" W. Elevation, 27.6 meters.

Instruments: Two Bosch-Omori, 100 kg.

Instrumental constants... $\begin{matrix} V & T_0 \\ E & 10 & 20. \end{matrix}$

1916. Dec. 10	Charac-ter.	Phase.	Time.	Period T.	Amplitude.		Dis-tance.	Remarks.
					A _m	A _w		
10	P _m		3 45 46				170	Direction? Phases indistinct on N-S, maximum amplitude 10μ.
	L _m		3 46 04					
	M _m		3 46 10		70			
	F _m		3 46 38					
19	P _w		3 53 40				113	Direction?
	L _w		3 53 50					
	M _w		3 53 50		100	120		
	F _w		3 54 45					

TABLE 2.—Instrumental seismological reports, December, 1916—Concl'd.

Date.	Charac-ter.	Phase.	Time.	Period T.	Amplitude.		Dis-tance.	Remarks.	
					A _N	A _E			
Porto Rico. <i>Vieques. Magnetic Observatory.</i> U. S. Coast and Geodetic Survey. F. L. Adams. Lat., 18° 09' N.; long., 65° 27' W. Elevation, 19.8 meters. Instruments: Two Bosch-Omorí.									
					$\text{Instrumental constants} \begin{cases} V & T_0 \\ E & 10 \ 18.0 \\ N & 10 \ 19.5 \end{cases}$				
1916.			<i>H. m. s.</i>	<i>Sec.</i>	μ	μ	<i>Km.</i>		
Dec. 23	eP _N		9 32 06	3				No long waves apparent on E-W.	
	eP _E		9 32 30	3					
	S		9 33 09	4					
	eL		9 43 00	14					
	M _N		9 55 00	14		120			
	C _N		10 00 00						
	F		10 25 00						
Vermont. <i>Northfield. U. S. Weather Bureau.</i> Wm. A. Shaw Lat., 44° 10' N.; long., 72° 41' W. Elevation, 256 meters. Instruments: Two Bosch-Omorí, mechanical registration.									
					$\text{Instrumental constants} \begin{cases} V & T_0 \\ E & 10 \ 15 \\ N & 10 \ 16 \end{cases}$				
1916.			<i>H. m. s.</i>	<i>Sec.</i>	μ	μ	<i>Km.</i>		
Dec. 14	L		17 35 00					Very feeble record. Phases indiscernible.	
			17 40 00						
Canada. <i>Ottawa. Dominion Astronomical Observatory.</i> Earthquake Station. Otto Klotz. Lat., 45° 23' 38" N.; long., 75° 42' 57" W. Elevation, 53 meters. Instruments: Two Bosch photographic horizontal pendulums, one Spindler & Hoyer 80 kg. vertical seismograph.									
					$\text{Instrumental constants: } 120 \ 26$				
1916.			<i>H. m. s.</i>	<i>Sec.</i>	μ	μ	<i>Km.</i>		
Dec. 14	O		16 52 05				7,770	Strong microseisms mask much on N-S.	
	P _N		17 03 14						
	S _N		17 12 22						
	eL?		17 25 ..						
	L		17 28 ..	20-18					
	L		17 33 ..	19-18					
	F		17 36 ..	18-15					
23	S _N ?		9 44 14				10,000?	Strong microseisms prevail.	
	S _E		9 44 24						
	L _W		10 10 ..	18					F masked by microseisms.
O = time at origin.									
Canada. <i>Toronto. Dominion Meteorological Service.</i> Lat., 43° 49' 01" N.; long., 79° 23' 54" W. Elevation, 113.7 meters. Subsoil: Sand and clay. Instrument: Milne horizontal pendulum, North. In the meridian.									
					$\text{Instrumental constant} \dots 18. \text{ Pillar deviation, } 1 \text{ mm., swing of boom} = 0.59''.$				
(Report for December, 1916, not received.)									
Canada. <i>Victoria, B. C. Dominion Meteorological Service.</i> Lat., 48° 24' N.; long., 123° 19' W. Elevation, 87.7 meters. Subsoil: Rock. Instrument: Wiechert, vertical; Milne horizontal pendulum, North. In the meridian.									
					$\text{Instrumental constant} \dots 18. \text{ Pillar deviation, } 1 \text{ mm., swing of boom} = 0.54''.$				
(Report for December, 1916, not received.)									

TABLE 3.—Late seismological reports. (Instrumental.)

Date.	Charac-ter.	Phase.	Time.	Period T.	Amplitude.		Dis-tance.	Remarks.	
					A _N	A _E			
Hawaii. <i>Honolulu. Magnetic Observatory.</i> U. S. Coast and Geodetic Survey. Frank Neumann. Lat., 21° 19' 12" N.; long., 158° 03' 48" W. Elevation, 15.2 meters. Instruments: Milne seismograph of the Seismological Committee of the British Association.									
					$\text{Instrumental constant} \dots 18.5$				
1916.			<i>H. m. s.</i>	<i>Sec.</i>	μ	μ	<i>Km.</i>		
Nov. 3	L		22 17 30	21				*300	
	M		22 21 12						
	F		22 29 36						
10	L		9 29 12						
	M		9 30 00						
	C		9 37 00						
11	P		13 34 00					Some doubt as to motion previous to 13° 40'.	
	S		13 39 42						
	L		13 43 48	19					
	M		13 47 48						
	C		13 51 30						
	F		14 31 00						
11	P		15 20 54					*400	
	S		15 26 00						
	L		15 31 00	19					
	M		15 35 00						
	C		15 47 00						
	F		16 32 00						
13	L		7 06 42						
	M		7 08 30						
	C		7 17 00						
13	e		11 55 00					Phases uncertain.	
	L		12 08 12	19					
	M		12 11 00						
	F		12 50 00						
14	P		23 01 00					*400	
	L		23 08 12	19					
	M		23 14 48						
	C		23 21 42						
18	P		11 50 00					Phases not distinct.	
	S		11 53 48						
	L		12 00 00	19					
	M		12 17 12						
	C		12 22 00						
	F		12 28 30						
20	P		22 48 42					*300	
	L		22 57 00	19					
	M		23 01 00						
	C		23 04 00						
	F		23 11 00						
21	L		3 06 54					Merely a broadening of the line.	
	C		3 15 00						
21	eP		6 36 12					*1200	
	S		6 44 00						
	eL		6 53 54	20					
	M		6 57 12						
	C		7 05 00						
	F		8 35 00						
24	P		2 59 36					*200	
	L		3 05 54	18					
	M		3 11 42						
	C		3 15 00						
24	P		4 19 54					*200	
	L		4 33 00	19					
	M		4 45 48						
	F		4 51 00						
24	L		13 22 00	19				*100	
	M		13 28 36						
	C		13 32 12						
24	L		22 29 24					Merely a broadening of the line.	
	C		22 41 00						
27	e		6 53 00	19				*300	
	M		6 54 12						
	C		6 57 30						
	F		7 11 00						
30	e		3 58 30					*300	
	L		4 04 18	19					
	M		4 10 12						
	C		4 14 00						
	F		4 45 00						

* Trace amplitude.

TABLE 3.—Late seismological reports. (Instrumental)—Concluded.

Date.	Charac-ter.	Phase.	Time.	Period T.	Amplitude.		Dis-tance.	Remarks.
					A _n	A _w		
Massachusetts. Cambridge. Harvard University Seismographic Station.								
[J. B. Woodworth temporarily absent. Records interpreted and measured by the U. S. Weather Bureau.]								
Lat., 42° 22' 36" N.; long., 71° 06' 59" W. Elevation, 5.4 meters. Foundation: Glacial sand over clay.								
Instruments: Two Bosch-Omori 100 kg. horizontal pendulums (mechanical registration).								
Instrumental constants. $\begin{cases} V & T & \mu \\ E & 80 & 23 & 0 \\ N & 50 & 25 & 4.1 \end{cases}$								
1916.								
June 2		P _a	H. m. s.	Sec.	μ	μ	Km.	
		PR _a	14 05 40				3,190	
		S.	14 10 37					
		L.	14 14 47					
		L.	14 20 22	18				F in microseisms.
		F.	14 50					
3		eL _m	6 14 30					Very feeble record.
		F.	6 22 00					
15		S.	11 30 53					Sheet changed at 13 ^h 18 ^m before end of quake.
		L _m	12 45 00	20				
19		P _a ?	1 24 53				2,960?	
		PR _a ?	1 26 48					
		S.	1 29 33					
		L _a ?	1 34 45					
		L _m	1 42 00	20				
		F.	2 10 00					
30		eL _m	7 27 45					
		F.	7 50 00					
21		IP.	21 43 19				6,925	
		PR.	21 45 20					
		S.	21 51 44					
		SR.	21 55 15					
		L.	22 01 40					F in microseisms.
24		L _m	7 21 00					Record feeble, phases indistinct.
		F.	8 00 00					
25		S.	18 28 00					
		S _a ?	18 34 45					
		L _m	18 40 00					
		F.	19 20 00					
30		P.	3 08 29				5,080	
		S.	3 15 15					
		SR.	3 19 52					
		L.	3 22 42					
		F.	3 50 00					

SEISMOLOGICAL DISPATCHES.¹

Kobe, Japan, December 1, 1916.

Damage caused by the earthquake of Sunday, November 25, which was briefly reported by cable, was considerably greater than was first indicated. It was the most severe in 25 years. Some of the Japanese earthquake experts believe the disturbance was due to the subsidence of subterranean fissures below the sea bottom, off the city of Kobe. (Assoc. Press.)

San Salvador, Republic of Salvador, December 20, 1916.

A volcanic explosion near the small village of Lower Verapaz, Guatemala, has caused the death of 15 persons. (Assoc. Press.)

Unionville, Nev., December 19, 1916.

Slight earth shocks were felt here on December 17th, 6:45 a. m. and on December 18th, 9 p. m., Pacific time. (Local observer.)

Redding, Cal., December 25, 1916.

Lassen Peak was in eruption to-day, emitting a great pillar of smoke. (Assoc. Press.)

Redding, Cal., December 28, 1916.

Two great pillars of smoke and steam poured from Lassen Peak to-day, rising almost vertically from the main crater and reaching an estimated height of 2,000 feet. The other smoke streamer from a smaller vent was about half as high. (Assoc. Press.)

¹ Reported by the organization indicated and collected by the seismological station at Georgetown University, Washington, D. C.

EARTHQUAKES FELT IN THE UNITED STATES DURING 1916.

By W. J. HUMPHREYS, Professor in Charge.

(Dated: Weather Bureau, Washington, D. C., Feb. 3, 1917.)

During 1916, 131 earthquakes strong enough to be felt were reported from different parts of the continental United States, as listed in the accompanying Table 1 and graphically represented (a dot for each report) on chart XI at the end of this issue of the REVIEW.

On February 21, a quake of intensity VI (Rossi-Forel), occurred near Asheville, N. C., that was reported from seven States. For further details see this REVIEW March, 1916, 44; 154; also Taber in the Bulletin of the Seismological Society of America, v. 6, p. 218.

On May 12 a quake of intensity VII, occurred near Boise, Idaho.

On October 18 a quake of intensity VII, occurred near Birmingham, Ala., that was reported from eight States. This is discussed in some detail by Finch and Hopkins in this issue of the REVIEW, p. 690-693.

None of these, however, did much damage; merely shook down some plaster, toppled over a few chimneys, and the like.

A few quakes of moderate intensities, V-VI, occurred in California, but none of them did any appreciable damage. A discussion by A. H. Palmer of the California earthquakes will appear in an early number of the Bulletin of the Seismological Society of America.

TABLE 1.—Places in the United States reporting earthquakes during 1916.

(Consult also Chart XI (XLIV-153).)

Place.	Ap-proxi-mate lati-tude (north).	Ap-proxi-mate longi-tude (west).	Num-ber of quakes re-ported.	Place.	Ap-proxi-mate lati-tude (north).	Ap-proxi-mate longi-tude (west).	Num-ber of quakes re-ported.
ALABAMA.				ARIZONA.			
Anniston.....	33 39	85 50	2	Cifton.....	33 04	109 17	1
Argo.....	33 42	86 31	1	Holbrook.....	34 54	110 08	1
Ashville.....	33 50	86 14	1	Nogales.....	31 20	110 52	1
Athens.....	34 50	86 59	1	Pinedale.....	34 19	110 15	1
Auburn.....	32 34	85 28	1	Pinto.....	35 05	109 38	1
Benton.....	32 19	86 47	1	Shumway.....	34 26	110 04	1
Bessemer.....	33 25	86 58	1	Snowflake.....	34 33	110 04	1
Birmingham.....	33 32	86 50	3	St. Michaels.....	35 38	109 05	1
Bridgeport.....	34 57	86 41	1	Thatcher.....	32 50	109 47	1
Calera.....	33 06	86 45	1	CALIFORNIA.			
Camden.....	32 00	87 16	1	Arrowhead.....			
Camp Hill.....	32 46	85 37	1	Springs.....	34 15	117 16	1
Clanton.....	32 49	85 39	1	Avalon.....	33 27	118 22	1
Cordova.....	32 44	87 08	1	Bakersfield.....	35 22	119 00	2
Dadeville.....	32 48	85 44	1	Barrett.....	32 43	116 46	1
Decatur.....	34 36	87 00	1	Barstow.....	34 53	117 12	1
Easonville.....	33 32	86 16	1	Beaumont.....	33 55	117 00	4
Eufaula.....	31 52	85 06	1	Bishop.....	37 21	118 22	1
Florence.....	34 48	87 40	1	Brawley.....	32 59	115 40	2
Fort Deposit.....	31 59	86 36	2	Bridgeport.....	38 18	119 15	1
Gadsden.....	33 59	86 00	1	Cahuilla.....	33 32	116 43	5
Geneva.....	31 02	85 50	1	Calxico.....	32 49	115 28	7
Goodwater.....	33 04	86 03	1	Camp Baldy.....	34 15	117 40	1
Guntersville.....	34 22	86 18	1	Carmont.....	34 07	117 44	5
Hamilton.....	34 07	87 58	1	Coachella.....	33 40	116 10	1
Irondale.....	33 33	86 42	2	Corona.....	33 62	117 35	1
Lincoln.....	33 36	86 03	1	Covelo.....	36 47	123 16	1
Madison.....	34 41	86 43	1	Edison.....	35 21	118 53	1
Maple Grove.....	34 09	85 49	1	El Cajon.....	32 48	116 58	1
Mentone.....	34 32	85 33	1	El Centro.....	32 50	115 32	1
Montgomery.....	32 23	86 18	1	Eureka.....	40 48	124 11	3
Moulton.....	34 30	87 18	1	Fairmont.....	34 45	118 25	2
Ozona.....	33 55	86 29	1	Fresno.....	36 43	119 49	1
Opelika.....	32 38	85 21	1	Gray.....	33 49	116 37	1
Osark.....	31 28	85 37	1	Gray Mountain.....	34 38	116 15	2
St. Bernard.....	34 11	86 46	1	Hollister.....	36 50	121 20	4
Scottsboro.....	34 40	86 02	1	Imperial.....	32 50	115 35	1
Selma.....	32 05	87 01	1	Indio.....	33 43	116 12	1
Talladega.....	33 26	86 05	1	Jollan.....	23 05	116 37	2
Valley Head.....	34 32	85 52	2	King City.....	36 14	121 06	2
Verona.....	33 48	83 06	1				
Wedowee.....	33 18	85 29	1				

TABLE 1.—Places in the United States reporting earthquakes during 1916—Continued.

(Consult also Chart XI (XLIV-153).)

Place.	Approximate latitude (north).	Approximate longitude (west).	Number of quakes reported.	Place.	Approximate latitude (north).	Approximate longitude (west).	Number of quakes reported.
CALIFORNIA—continued.				GEORGIA—CON.			
Livermore.....	37 40	121 45	1	Rome.....	34 15	85 10	1
Loano.....	36 20	120 55	3	Sandersville.....	32 56	82 48	1
Loma Pine.....	36 37	118 01	6	Savannah.....	32 05	81 05	1
Los Alamos.....	34 45	120 13	3	Summersville.....	34 28	83 20	1
Los Angeles.....	34 03	118 15	5	Tallapoosa.....	33 45	85 18	1
Los Gatos.....	37 12	121 53	3	Thomson.....	33 27	82 23	1
Maricopa.....	35 05	119 08	2	Thunder.....	32 56	84 30	1
Mecca.....	33 34	116 05	1	Toocoon.....	33 34	83 19	1
Merced.....	37 21	120 27	1	Warrenton.....	33 21	82 37	1
Mesa Grande.....	33 11	116 42	1	Washington.....	33 41	82 46	1
Mount Wilson.....	34 13	118 16	4	IDAHO.			
Nelle.....	33 22	116 52	3	Arrow Rock.....	43 35	116 05	1
Newhall.....	34 22	118 30	2	Boise.....	43 37	116 14	4
Niand.....	33 16	115 31	1	Bonanza.....	44 17	114 42	1
Nordhoff.....	34 35	119 14	1	Cambridge.....	44 32	116 37	1
Ozena.....	34 53	119 16	1	Challis.....	44 30	114 16	1
Pasadena.....	34 06	118 11	3	Clear Lake.....	43 48	115 25	1
Paso Robles.....	35 31	120 40	2	Emmett.....	43 51	116 34	1
Peachland.....	37 21	120 27	1	Hailey.....	43 32	114 20	2
Point Loma.....	32 43	117 15	1	Idaho City.....	43 34	115 58	2
Pomona.....	34 04	117 44	1	Lowman.....	44 08	115 41	1
Redlands.....	34 04	117 12	7	Meridian.....	43 38	115 24	1
Rialto.....	34 12	117 27	2	New Meadows.....	44 57	116 18	1
Riverside.....	33 31	117 21	5	Payette.....	44 05	116 56	2
Rohnerville.....	40 33	124 11	2	Pyle Creek.....	44 07	115 56	3
Round Valley.....	37 24	118 37	1	Salmon.....	45 13	113 55	1
Salinas.....	36 36	122 40	7	Soldier.....	43 22	114 49	1
San Bernardino.....	34 07	117 19	3	Weiser.....	44 15	116 58	1
San Diego.....	32 43	117 10	5	ILLINOIS.			
San Francisco.....	37 48	122 26	1	Anna.....	37 27	89 18	1
San Jose.....	37 20	121 54	3	Cairo.....	37 00	89 10	1
San Luis Obispo.....	35 18	120 39	4	New Burnside.....	37 36	88 46	1
San Pedro.....	33 45	118 14	1	INDIANA.			
Santa Barbara.....	34 23	119 40	1	Evansville.....	37 58	87 33	1
Santa Cruz.....	36 57	122 02	5	Worthington.....	39 08	86 58	1
Santa Maria.....	34 58	120 28	1	KENTUCKY.			
Santa Monica.....	34 00	118 30	2	Beaver Dam.....	37 23	86 53	1
Shively.....	40 25	123 56	3	Calhoun.....	37 34	87 16	1
Sierra Madre.....	34 08	118 06	1	Hickman.....	36 35	89 12	1
Spreckels.....	36 35	121 38	12	Louisville.....	38 15	85 45	1
Surrey.....	35 23	118 32	1	Mayfield.....	36 45	88 38	1
Taft.....	35 07	119 26	2	Middlesboro.....	36 36	83 43	1
Valley Center.....	34 23	119 40	1	Taylorsville.....	38 02	85 21	1
Venice.....	34 00	118 30	2	MISSISSIPPI.			
Ventura.....	34 16	119 17	1	Aberdeen.....	33 50	88 26	1
Victorville.....	34 32	117 18	4	Booneville.....	34 42	88 28	2
Warner Springs.....	33 17	116 37	1	Corinth.....	34 56	88 25	2
Yorba Linda.....	33 51	117 50	2	Fulton.....	34 17	88 20	1
COLORADO.				Porterville.....	32 42	88 22	1
Frances.....	40 03	105 32	1	Toomsuba.....	32 23	88 22	1
Grandlake.....	40 15	105 50	1	MISSOURI.			
GEORGIA.				New Madrid.....	36 35	89 32	2
Atlanta.....	33 45	84 23	2	NEBRASKA.			
Blairsville.....	34 54	83 53	1	Stapleton.....	41 33	100 28	1
Blue Ridge.....	34 52	84 21	1	NEVADA.			
Canton.....	34 14	84 29	2	Amos.....	41 26	117 48	1
Clarksville.....	34 36	83 30	1	Elko.....	40 51	115 45	2
Clayton.....	34 54	83 23	2	Eureka.....	39 23	115 59	1
Cleveland.....	34 36	83 45	1	Fallon.....	39 30	118 45	1
Columbus.....	32 28	85 00	2	Francis.....	39 44	119 58	1
Concord.....	33 05	84 26	1	Gerlach.....	40 38	119 24	1
Covington.....	33 36	83 48	1	Las Vegas.....	38 09	115 09	1
Dahlonega.....	34 32	83 59	2	McDermitt.....	41 58	117 45	3
Dalton.....	34 46	84 58	1	Millet.....	39 01	117 15	1
Duluth.....	34 00	84 08	2	Pahrump.....	36 11	115 58	1
Forsyth.....	33 02	83 55	1	Paradise Valley.....	41 32	117 34	1
Gainesville.....	34 17	83 46	1	Rabel Creek.....	41 39	117 45	3
Gilsville.....	34 19	83 38	1	Reno.....	39 32	119 49	1
Griffin.....	33 16	84 18	1	NEW YORK.			
Hiwassee.....	34 56	83 44	1	Albany.....	42 39	73 45	1
Kirkwood.....	33 46	84 18	1	Amsterdam.....	42 55	74 08	1
La Fayette.....	34 43	85 18	1	Ballston Lake.....	41 10	73 45	1
La Grange.....	33 01	85 01	1	Eastchester.....	43 21	73 36	1
Macon.....	32 50	83 38	2	Glens Falls.....	43 04	74 20	1
Madison.....	33 32	83 28	1	Gloversville.....	43 09	73 50	2
Marietta.....	33 56	84 32	1	Greenfield.....	43 24	73 43	2
Marshallville.....	32 27	83 55	1	Lake George.....	43 48	73 45	1
Monticello.....	33 16	83 38	1	Little Falls.....	41 08	73 46	1
NEW MEXICO.				Mount Vernon.....	41 10	73 45	1
NEW MEXICO.				Scarsdale.....	41 10	73 45	1
NEW MEXICO.				NORTH CAROLINA.			
NEW MEXICO.				Altapass.....	35 53	82 00	1
NEW MEXICO.				Andrews.....	35 11	83 48	1
NEW MEXICO.				Asheville.....	35 36	82 32	1
NEW MEXICO.				Baroness.....	35 28	82 14	1
NEW MEXICO.				Black Mountain.....	35 41	82 24	1
NEW MEXICO.				Blount.....	35 16	82 36	1
NEW MEXICO.				Brevard.....	35 12	82 46	1
NEW MEXICO.				Brewers.....	36 22	81 06	1
NEW MEXICO.				Charlotte.....	35 15	81 50	1
NEW MEXICO.				Cherokee.....	35 18	83 10	1
NEW MEXICO.				Cherokee.....	36 14	80 51	1
NEW MEXICO.				Elkin.....	34 35	78 33	1
NEW MEXICO.				Elizabethton.....	35 10	83 22	1
NEW MEXICO.				Franklin.....	36 05	79 50	1
NEW MEXICO.				Greensboro.....	36 20	78 25	1
NEW MEXICO.				Henderson.....	35 45	81 22	1
NEW MEXICO.				Hickory.....	35 02	83 15	2
NEW MEXICO.				Highlands.....	35 53	82 50	1
NEW MEXICO.				Hot Springs.....	35 05	82 56	1
NEW MEXICO.				Lake Toxaway.....	35 55	81 36	2
NEW MEXICO.				Lenoir.....	35 27	81 18	2
NEW MEXICO.				Lincolnton.....	35 54	82 02	1
NEW MEXICO.				Marion.....	35 47	82 40	1
NEW MEXICO.				Marshall.....	35 45	81 38	2
NEW MEXICO.				Morganton.....	36 30	80 38	1
NEW MEXICO.				Mount Airy.....	35 06	84 00	1
NEW MEXICO.				Murphy.....	35 17	83 43	1
NEW MEXICO.				Nantahala.....	35 42	81 14	1
NEW MEXICO.				Newton.....	36 08	81 13	1
NEW MEXICO.				N. Wilkesboro.....	35 12	79 29	1
NEW MEXICO.				Pinehurst.....	35 45	78 37	1
NEW MEXICO.				Raleigh.....	35 38	80 32	1
NEW MEXICO.				Salisbury.....	35 14	82 20	1
NEW MEXICO.				Saluda.....	35 59	80 44	1
NEW MEXICO.				Settle.....	35 30	82 30	1
NEW MEXICO.				Skyland.....	33 55	78 02	1
NEW MEXICO.				Southport.....	35 48	80 55	1
NEW MEXICO.				Statesville.....	35 36	82 23	1
NEW MEXICO.				Swannanoa.....	35 53	81 12	1
NEW MEXICO.				Taylorsville.....	34 14	77 57	1
NEW MEXICO.				Wilmington.....	35 06	80 17	1
NEW MEXICO.				Winston-Salem.....	35 06	80 17	1
NEW YORK.				OREGON.			
NEW YORK.				Newport.....	44 38	124 06	1
NEW YORK.				SOUTH CAROLINA.			
NEW YORK.				Anderson.....	34 30	82 39	1
NEW YORK.				Batesburg.....	33 50	81 38	1
NEW YORK.				Belton.....	34 30	82 34	1
NEW YORK.				Cahoon Falls.....	34 05	82 36	1
NEW YORK.				Chappells.....	34 09	81 52	1
NEW YORK.				Charleston.....	32 47	79 56	3
NEW YORK.				Clemson College.....	34 39	82 52	1
NEW YORK.				Columbia.....	34 00	81 03	2
NEW YORK.				SOUTH CAROLINA—CON.			
NEW YORK.				Gadney.....	35 08	81 36	1
NEW YORK.				Greenville.....	34 50	82 24	1
NEW YORK.				Greenville.....	34 10	82 10	1
NEW YORK.				Homes Path.....	34 25	82 23	1
NEW YORK.				Landrum.....	36 14	82 15	1
NEW YORK.				Liberty.....	34 47	82 11	2
NEW YORK.				Little Mountain.....	34 09	81 24	1
NEW YORK.				Mountain Rest.....	34 52	83 09	1
NEW YORK.				Newberry.....	34 16	81 39	1
NEW YORK.				Rock Hill.....	34 54	81 05	1
NEW YORK.				Santuck.....	34 35	81 35	1
NEW YORK.				Spartanburg.....	34 52	81 58	1
NEW YORK.				Summerville.....	33 03	80 14	6
NEW YORK.				Walhalla.....	34 45	83 04	1
NEW YORK.				Westminster.....	34 38	83 06	1
NEW YORK.				SOUTH DAKOTA.			
NEW YORK.				Pine Ridge.....	43 02	102 32	1
NEW YORK.				Winner.....	43 24	99 53	1
NEW YORK.				TENNESSEE.			
NEW YORK.				Bluff City.....	36 27	82 15	1
NEW YORK.				Bristol.....	36 30	82 12	1
NEW YORK.				Carthage.....	36 16	85 56	1
NEW YORK.				Charleston.....	35 17	84 45	2
NEW YORK.				Chattanooga.....	35 04	85 14	1
NEW YORK.				Clinton.....	36 05	84 07	1
NEW YORK.				Copperhill.....	35 00	84 22	2
NEW YORK.				Elizabethton.....	36 20	82 10	1
NEW YORK.				Elizabethton.....	35 56	83 18	1
NEW YORK.				Lewisburg.....	35 27	86 48	1
NEW YORK.				Loudon.....	35 44	84 21	1
NEW YORK.				Lynchburg.....	35 24	87 02	1
NEW YORK.				McMinnville.....	35 40	85 48	2
NEW YORK.				Murfreesboro.....	35 53	86 26	2
NEW YORK.				Nashville.....	36 10	86 47	1
NEW YORK.				Newport.....	35 56	83 12	1
NEW YORK.				Rogersville.....	36 25	83 00	1
NEW YORK.				Sewanee.....	35 13	85 53	1