SECTION V.—SEISMOLOGY.

SEISMOLOGICAL REPORTS FOR NOVEMBER, 1916.

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[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.
	H. m.		° ′	° ′			*M. s.*			
		ALABAMA.								
4	12 15	Birmingham	33 32	86 50	3	1	0 2	Rumbling	Possibly due to explosion	U. S. Weather Bureau.
		CALIFORNIA.								
3	5 55	Calexico	32 40	115 28	5	1	30	None		F. R. Spencer.
3	10 05	Los Gatos	37 12	121 58	2	1	5	do		Irving H. Snyder.
	10 05	Santa Cruz	36 57	122 02	5	1	1	do		W. R. 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.
		NEVADA.								
9	11 00	Sharp	38 07	115 28	2	1	Few	None		F. A. Sears.
10	9 13	Las Vegas	36 09	115 09	3	1	5	do		C. P. Squires.
	9 13	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. Buol.
		NEW YORK.								
2	2 32	Caldwell	43 24	73 43	5	1		Loud		Charles Forsell.
		WASHINGTON.								
21	19 30	Silverton	48 00	121 32	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.]

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: E: V 10, T_0 16.7; N: V 10, T_0 15.4

Date.	Character.	Phase.	Time.	Period. T.	Amplitude. A_E	Amplitude. A_N	Distance.	Remarks.
1916.			*H. m. s.*	*Sec.*	μ	μ	*Km.*	
Nov. 10		L_N	9 25 37	12				Microseisms on 4, 16, 17, 20, and 24–28.
		M_N	9 26 15	10		40		
		C_N	9 28 00	10				
		F_N	9 32 00					
21		eL_E	6 53 30	16				
		eL_N	6 53 38	18				
		M_E	6 54 10	14	100			
		M_N	6 54 32	16		90		
		C_E	6 55 20					
		C_N	7 02 10	12				
		F_E	7 04 00					
		F_N	7 11 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: E: V 10, T_0 14; N: V 10, T_0 19

Date.	Character.	Phase.	Time.	Period. T.	Amplitude. A_E	Amplitude. A_N	Distance.	Remarks.
1916.			*H. m. s.*	*Sec.*	μ	μ	*Km.*	
Nov. 10		P_N	9 14 01					
		P_E	9 14 04					
		L_E	9 15 29	8				
		L_N	9 15 30	7				
		M_E	9 15 38	9	350			
		M_N	9 16 05	6		270		
		C_N	9 16 22					
		C_E	9 16 45					
		F	9 34					
12		eL	11 09 30					
		M	11 10 13	5	10	20		
		F	11 24 00					
19		eL_E	20 55 33	6				Very faint. No phases.
		eL_N	20 55 42	5				
		F	21 00 00					
21		eP_N	6 30 41					
		eP_E	6 30 49					
		S_N	6 34 39					
		S_E	6 34 44					
		L_E	6 37 38					
		L_N	6 37 45					
		M_E	6 38 05	18	700			
		M_N	6 40 18	13		720		
		C	6 41 30					
		F	7 10 00					

TABLE 2.—*Instrumental reports, November, 1916*—Continued.

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′ 02″ N.; long., 117° 15′ 10″ W. Elevation, 91.4 meters.

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

Date.	Character.	Phase.	Time.	Period. T.	Amplitude. A_E	Amplitude. A_N	Distance.	Remarks.
1916.			*H. m. s.*	*Sec.*	*μ*	*μ*	*Km.*	
Nov. 1					*400	*300		Tremors recorded during 24 hours preceding 15h 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	*400		
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° 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′ 36″ N.; long., 104° 56′ 54″ W. Elevation, 1,655 meters.

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

Date.	Character.	Phase.	Time.	Period. T.	Amplitude. A_E	Amplitude. A_N	Distance.	Remarks.
1916.			*H. m. s.*	*Sec.*	*μ*	*μ*	*Km.*	
Nov. 5-6								Visible activity at intervals during day.
10		P_E	9 14 00					Record can not be read on N–S owing to defect in smoking of paper.
		L_E	9 16 00					
		M_E	9 17 00	8–9	50			
		C_E	9 19 00					S_E?
		F_E	9 21 00					
21		P	6 35 00					S?; not discernible. Maximum rather doubtful.
		L	6 42 00	10–12				
		M	6 43 00	20–25	5–6	5–6		
		F_N	6 48 00					
		F_E	6 50 00					
25–26								Visible activity at intervals during day.
30		L	3 40 00					Extremely weak and uncertain.
		F	4 50 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 110 T_0 6.4

Date.	Character.	Phase.	Time.	Period. T.	Amplitude. A_E	Amplitude. A_N	Distance.	Remarks.
1916.			*H. m. s.*	*Sec.*	*μ*	*μ*	*Km.*	
Nov. 10		e	9 24 30					Preliminary phases uncertain.
		L_N	9 27 54					
		M_E	9 32 00		68			
		F	9 50 00					
18		L_E	12 26 45	20				Other phases lost in microseisms. Barely perceptible on N–S.
		F	12 50 00					
21		P	6 31 59				2,690	
		S	6 36 19					
		L	6 39 41					
		F	7 40 00					
30		iP	3 22 40				2,290	Phases well defined. eS at 3h 26m 08s possibly Y, see British Association report, 1915, On Seismological Investigations.
		iS	3 26 28					
		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:

	V	T_0	ϵ
E	165	5.4	0
N	143	5.2	0
Z	*80*	*5.0*	*0*

Date.	Character.	Phase.	Time.	Period. T.	Amplitude. A_E	Amplitude. A_N	Distance.	Remarks.
1916.			*H. m. s.*	*Sec.*	*μ*	*μ*	*Km.*	
Nov. 10		e_E	9 24 19					Heavy wind markings; P and S very doubtful.
		e_N	9 24 33					
		eL_N	9 28 35					
		eL_E	9 28 43					
		M_N	9 29 40	9		8		
		M_N	9 30 37	9		6		
		M_N	9 31 18	8		4		
		M_E	9 31 54	9	8			
		M_E	9 33 45	9	4			
		F	9 50 00					
13		L?	12 26 42					Of doubtful seismicity.
		F	12 41 00					Heavy microseisms.
18		eL_E?	12 26 24					Heavy microseisms. N–S not well defined. Mainka instrument shows what appears to be e at 12h 28m 05s.
		L_E	12 29 12					
		F	12 50 00					
21		eP_E	6 31 32					Heavy microseisms. Sheet changed by mistake at 7h 32m at which time traces were still apparent; F?
		eP_N	6 31 33					
		S_E	6 36 24					
		S_N	6 36 27					
		eL_N	6 39 30					
		eL_E	6 39 36					
		L_E	6 43 21					
		L_N	6 44 18					
			VERTICAL.					
		e	*6 31 27*					
		eL	*6 39 38*					
		L	*6 45 00*	*9*				
		F	*7 18 00*					
30		e	3 22 41					Vertical shows e at 3h 22m 33s.
		S_E	3 26 29					
		S_N	3 26 31					
		eL_N	3 27 24	8				
		eL_E	3 27 26	8				
		M_N	3 33 45			4		
		M_E	3 33 59		5			
		F	4 40 00					

TABLE 2.—*Instrumental reports, November, 1916*—Continued.

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.

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

Instrumental constant.. T_0 18.9

(Report for November, 1916, not received.)

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.. V, T_0, ε: E 177 3.4 4.0; N 205 3.4 3.8

(Report for November, 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.. V, T_0: E 10 32; N 10 27

Date.	Character.	Phase.	Time.	Period. T.	Amplitude. A_E	Amplitude. A_N	Distance.	Remarks.
1916.			H. m. s.	Sec.	μ	μ	Km.	
Nov. 10	.....	eL_E...	9 28 07	.....	.....	.....	.....	
		eL_N...	9 28 30	.....	.....	.....	.....	
		M_N...	9 29 10	8	.....	40	.....	
		M_E...	9 31 53	8	40	.....	.....	
		C.....	9 32 ..	.....	.....	.....	.....	
		F.....	9 40 ..	.....	.....	.....	.....	
21	.....	eP_N...	6 31 13	.....	.....	.....	.....	
		eS_E...	6 36 16	.....	.....	.....	.....	
		eL_N...	6 41 20	17	.....	.....	.....	
		eL_E...	6 42 31	18	.....	.....	.....	
		M_N...	6 45 16	.....	.....	90	.....	
		M_E...	6 45 56	.....	60	.....	.....	
		C.....	6 55 00	.....	.....	.....	.....	
		F.....	7 04 00	.....	.....	.....	.....	
30	.....	eP_E...	3 22 32	.....	.....	.....	.....	
		eP_N...	3 22 48	.....	.....	.....	.....	
		S_E...	3 26 22	.....	.....	.....	.....	
		S_N...	3 26 27	.....	.....	.....	.....	
		eL_E...	3 27 30	24	.....	.....	.....	
		eL_N...	3 27 44	20	.....	.....	.....	
		M.....	3 22 40	.....	80	100	.....	
		C.....	3 35 ..	.....	.....	.....	.....	
		F.....	4 08 ..	.....	.....	.....	.....	

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.. V, T_0, ε:1: E 80 23 0; N 50 25 4:1

(Report for November, 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, 166.4 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.. V 80, T_0 7, ε 5:1

Date.	Character.	Phase.	Time.	Period. T.	Amplitude. A_E	Amplitude. A_N	Distance.	Remarks.
1916.			H. m. s.	Sec.	μ	μ	Km.	
Nov. 10	H_r....	P_N...	9 15 45	.....	.....	.....	3,200	E-W not well defined.
		S_N...	9 20 42	.....	.....	.....	.....	
		L_N...	9 22 21	.....	.....	.....	.....	
		F.....	9 36 00	.....	.....	.....	.....	
21	H_r....	P_N...	18 31 00	.....	.....	.....	.....	E-W not well defined.
		M_N?...	18 35 06	.....	.....	.....	.....	
		F.....	19 00 00	.....	.....	.....	.....	
30	H_r....	P.....	3 23 00	.....	.....	.....	.....	
		S?.....	3 28 30	.....	.....	.....	.....	
		L.....	3 33 00	.....	.....	.....	.....	
		F.....	4 04 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.. V 80, T_0 7, ε 5:1

Date.	Character.	Phase.	Time.	Period. T.	Amplitude. A_E	Amplitude. A_N	Distance.	Remarks.
1916.			H. m. s.	Sec.	μ	μ	Km.	
Nov. 10	.....	e_E.....	9 23 45	.....	.....	.....	.....	
		e_N.....	9 24 00	.....	.....	.....	.....	
		L_N.....	9 28 00	.....	.....	.....	.....	
		L_E.....	9 28 30	.....	.....	.....	.....	
		M_N.....	9 29 00	10	.....	19	.....	
		M_E.....	9 29 30	7	6	.....	.....	
		F.....	9 53 00	.....	.....	.....	.....	
12	.....	e_E.....	13 02 15	.....	.....	.....	.....	2 sharp shocks—E-W.
		e_N.....	13 02 30	.....	.....	.....	.....	
		M_N.....	13 07 00	.....	.....	.....	.....	
		M_E.....	13 07 10	.....	12	.....	.....	
		F.....	13 09 00	.....	.....	.....	.....	
21	.....	eP.....	6 32 30	.....	.....	.....	.....	
		S.....	6 37 30	.....	.....	.....	.....	
		L.....	6 45 00	.....	.....	.....	.....	
		M_E.....	6 47 00	25	6	.....	.....	
		M_N.....	6 48 00	20	.....	10	.....	
		M_N.....	6 51 00	.....	.....	.....	.....	
		F.....	7 08 00	.....	.....	.....	.....	
30	.....	eP.....	3 29 20	.....	.....	.....	.....	
		S.....	3 33 40	.....	.....	.....	.....	
		L.....	3 39 00	.....	.....	.....	.....	
		M.....	3 41 00	.....	12	16	.....	
		F.....	4 08 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.. V, T_0, ε: E 72 6.6 1.5:1; N 72 7.1 3.8:1

Date.	Character.	Phase.	Time.	Period. T.	Amplitude. A_E	Amplitude. A_N	Distance.	Remarks.
1916.			H. m. s.	Sec.	μ	μ	Km.	
Nov. 10	.....	eL_N...	9 23 10	.....	.....	.....	.....	Mere trace on E-W. P and S both lost in microseisms.
		M_N...	9 25 39	9.6	.....	21	.....	
		F_N...	9 37 00	.....	.....	.....	.....	
12	.....	eP_N?..	12 17 54	.....	.....	.....	.....	F lost in microseisms
		eL_N...	12 20 48	.....	.....	.....	.....	
21	.....	eP_N?..	6 30 49	.....	.....	.....	.....	E-W lost through defective smoking of record. All phases doubtful because of heavy microseisms.
		S_N?...	6 33 48	.....	.....	.....	.....	
		eL_N?..	6 35 50	.....	.....	.....	.....	
30	.....	iP_N...	3 18 19	.....	.....	.....	.....	
		P_E...	3 18 21	.....	.....	.....	.....	
		S_E.....	3 21 54	.....	.....	.....	.....	
		iS_N...	3 22 10	.....	.....	.....	.....	
		L_E.....	3 23 30	.....	.....	.....	.....	
		L_N.....	3 23 37	.....	.....	.....	.....	
		M_N.....	3 30 51	13	.....	16	.....	
		F_E.....	4 00 00	.....	.....	.....	.....	
		F_N.....	4 03 00	.....	.....	.....	.....	

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.. V, T_0, ε: E 13 22 4:1; N 14 25 4:1

Date.	Character.	Phase.	Time.	Period. T.	Amplitude. A_E	Amplitude. A_N	Distance.	Remarks.
1916.			H. m. s.	Sec.	μ	μ	Km.	
Nov. 10	.....	e_N.....	9 28 34	6	.....	.....	.....	
		e_E.....	9 29 35	7	.....	.....	.....	
		M_N.....	9 30 16	13	.....	71	.....	
		F_E.....	9 45 00	.....	.....	.....	.....	
		F_N.....	9 48 00	.....	.....	.....	.....	
21	.....	e_N.....	6 34 12	9	.....	.....	.....	Phases not differentiated.
		e_E.....	6 36 14	5	.....	.....	.....	
		M_N.....	6 51 02	12	.....	36	.....	
		F_E.....	7 17 00	.....	.....	.....	.....	
		F_N.....	7 19 00	.....	.....	.....	.....	
24	.....	e_N.....	12 34 41	33	.....	.....	.....	Obscured by irregular microseisms.
		F_N.....	13 21 00	.....	.....	.....	.....	
30	.....	P_N.....	3 23 52	6	.....	.....	.....	
		P_E.....	3 24 01	3	.....	.....	.....	
		S_N.....	3 28 05	11	.....	86	.....	
		S_E.....	3 28 11	5–10	.....	.....	.....	
		L_E.....	3 30 09	22	.....	.....	.....	
		L_N.....	3 30 31	20	.....	.....	.....	
		F_E.....	4 20 00	.....	.....	.....	.....	
		F_N.....	4 21 00	.....	.....	.....	.....	

TABLE 2.—*Instrumental reports, November, 1916*—Continued.

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.. V 10 T_0 20

Date.	Character.	Phase.	Time.	Period. T.	Amplitude. A_E	Amplitude. A_N	Distance.	Remarks.
1916.			*H. m. s.*	*Sec.*	μ	μ	*Km.*	
Nov. 20		P	18 16 02				315	Direction?
		L	18 16 40					
		M_N	18 16 48			50		
		M_E	18 16 50		40			
		F_E	18 20 00					
		F_N	18 21 00					
21		P_N	6 29 18				2,010	Movement barely perceptible on E-W.
		S_N	6 33 00					
		L_N	6 35 18					
		M_N	6 38 34			100		
		F	7 04 00					

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.. E. V 10 T_0 18; N. V 10 T_0 19.5

Date.	Character.	Phase.	Time.	Period. T.	Amplitude. A_E	Amplitude. A_N	Distance.	Remarks.
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	2	550	400		
		C	13 11 00	2				
		F	13 14 00					
25		P	13 14 38					
		L	13 14 51	2				
		M	13 15 08	2	30	40		
		F_N	13 18 ..					
		F_E	13 20 ..					
25		P	13 46 30					Slight shocks, resembling microseismic tremors, occurred during the 48 hours following this quake.
		L	13 46 44	3				
		M_E	13 46 57	4	40			
		M_N	13 47 02	2		40		
		F	13 50 00					
30		P_E	3 18 46	3				Phases and periods not well defined.
		L_E	3 19 03	6				
		L_N	3 19 03	8				
		M_N	3 20 15	18		900		
		M_E	3 20 52	14	300			
		C_N	3 25 00	12				
		C_E	3 26 00	8				
		F_N	3 37 00					
		F_E	3 46 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.. E V 10 T_0 15; N V 10 T_0 16

Date.	Character.	Phase.	Time.	Period. T.	Amplitude. A_E	Amplitude. A_N	Distance.	Remarks.
1916.			*H. m. s.*	*Sec.*	μ	μ	*Km.*	
Nov. 10		e_N	9 24 17					Phases indeterminate.
		e_E	9 29 54					
		M_N	9 30 42			200		
		F	10 00 00					
21		S	6 37 42					P uncertain.
		L	6 40 40					
		F	7 30 00					
24		L_N	12 36 40					Record faint, not discernible on E-W.
		F_N	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., 75° 42′ 57″ W. Elevation, 83 meters.

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

Instrumental constants: V 120 T_0 26

Date.	Character.	Phase.	Time.	Period. T.	Amplitude. A_E	Amplitude. A_N	Distance.	Remarks.
1916.			*H. m. s.*	*Sec.*	μ	μ	*Km.*	
Nov. 10		e?	9 19 00					Microseisms mask first phases.
		e?	9 24 07					
		e?	9 24 40					
		eL	9 27 48					
		M	9 29 30	14	8	70		
		L	9 32 00	6				
		F	10 00 00					
18		eL_E	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					
		eL	6 40 24	12–14				
		L_E	6 45 00	20				
		L_N	6 49 00	18				
		L_E	6 53 00	16				
		L_E	7 01 00	12				
		F	7 25 00					
24		eL_N	12 36 18	36				Microseisms mask other phases.
		L_E	12 42 00	28				
		F	13 — —					
30		*O*	*3 17 56*				2,870	
		iP_N	3 23 40					
		S	3 28 14					
		eL	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				
		L	4 10 00	11				
		F	4 45 00					

O=time at origin.

TABLE 2.—*Instrumental reports, November, 1916*—Continued.

Canada. *Toronto. Dominion Meteorogical 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.. T_0 18. Pillar deviation, 1 mm. swing of boom=0.50″.

Date.	Character.	Phase.	Time.	Period. T.	Amplitude. A_E	Amplitude. A_N	Distance.	Remarks.
1916.			*H. m. s.*	*Sec.*	μ	μ	*Km.*	
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 56 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					
		eL	12 49 48					
		M	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					
		L	6 59 00					
		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.
		L	12 46 12					
		eL	12 48 36					
		M	12 51 30		*200			
30		P?	3 24 12				2,590	A marked quake. P not well defined. Possibly in West Indies.
		iS	3 28 24					
		iL	3 31 00	24				
		L	3 33 30	24				
		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.

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=0.54″.

Date.	Character.	Phase.	Time.	Period. T.	Amplitude. A_E	Amplitude. A_N	Distance.	Remarks.
1916.			*H. m. s.*	*Sec.*	μ	μ	*Km.*	
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					
		M	12 14 56		*200			
18		L	12 39 14		*200			May be part of preceding quake.
20		L	21 47 19					
		M	21 53 16		*100			
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		*1500			
		F	7 55 18					
			VERTICAL.					
					A_z			
		S	*6 43 12*	*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. 1.7
		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. A_E	Amplitude. A_N	Distance.	Remarks.
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..					V 80	T_0 7	ε 5:1	
1916.			*H. m. s.*	*Sec.*	μ	μ	*Km.*	
Sept. 21								Microseisms during day and night.
23		eP_N	5 49 00					E-W indistinct.
		S_N	5 55 00					
		M_N	6 01 00					
		F_N	6 06 00					
28		i_E	15 58 00					Heavy microseisms. Very short period.
		i_N	15 58 10					
		F	16 00 40					
Oct. 3		eP	1 36 00					
		S_E	1 44 00					
		S_N	1 44 15					
		L_E	1 57 00					
		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]

Glenns 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.