SECTION V.—SEISMOLOGY.

SEISMOLOGICAL REPORTS FOR DECEMBER, 1918.

W. J. HUMPHREYS, Professor in Charge.

[Dated: Seismological Investigations, Weather Bureau, Feb. 3, 1919.]

TABLE 1.—*Noninstrumental earthquake reports, December, 1918.*

Day.	Approximate time, Greenwich Civil.	Station.	Approximate latitude.	Approximate longitude.	Intensity Rossi-Forel.	Number of shocks.	Duration.	Sounds.	Remarks.	Observer.
		CALIFORNIA.								
1918.	*H. m.*		° ′	° ′			*M. s.*			
Dec. 5	2 38	Paso Robles	35 37	120 42	4	1	5	Rumbling	Abrupt rocking	E. J. Nye.
		San Luis Obispo	35 18	120 39	2	1	Few.	None	Trembling	J. E. Hissong.
14	10 00	San Miguel Island	34 02	120 20	4	1		None		James R. Moore.
29	6 50	Calexico	32 41	115 30	2	1		Rumbling	Bumping	H. M. Rouse.
	7 00	do	32 41	115 30	1	1	1	None	do	Do.
		OREGON.								
6	8 45	Portland	45 32	122 41	1	6	12	Faint	Gradual rocking	Helen J. Olson.
		WASHINGTON.								
6	8 45	Seattle	47 38	122 20		1				Associated Press.

TABLE 2.—*Instrumental reports, October, 1918.*

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

[For significance of symbols see REVIEW for January, 1918, p. 34.]

Alabama. *Mobile. Spring Hill College.* Cyril Ruhlmann, S. J.

Lat., 30° 41′ 44″ N.; long., 88° 08′ 46″ W. Elevation, 60 meters.
Instrument: Wiechert 80 kg. horizontal.

Instrumental constants.. V — T_0 — ϵ —

Date.	Character.	Phase.	Time.	Period. T.	Amplitude. A_E	Amplitude. A_N	Distance.	Remarks.
1918.			*H. m. s.*	*Sec.*	μ	μ	*km.*	
Dec. 2		e	10 03 00					
4		eP	11 57 50				6,350	N undamped.
		P_{repl}	12 00 20					
		S_N	12 05 45					
		F	13 19 00					
6		eP	8 47 50					
		iS	8 53 28					
		S_{repl}	8 59 20	8	*1,000	*3,500		
		L_N	9 00 50	6		*29,000		
		L_E	9 01 02	6	*5,000			
		M_N	9 01 22	6		*31,000		
		M_E	9 02 20	6	*5,500			
		M_N	9 03 50	5		*15,000		
		F	9 36 00					
6		e	12 21 20					
		F	12 36 00					

* Trace amplitude.

Alaska. *Sitka. Magnetic Observatory.* U. S. Coast and Geodetic Survey. F. P. Ulrich.

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

Instrumental constants.. V T_0 E 10 18 N 10 17

Date.	Character.	Phase.	Time.	Period. T.	Amplitude. A_E	Amplitude. A_N	Distance.	Remarks.
1918.			*H. m. s.*	*Sec.*	μ	μ	*km.*	
Dec. 4		eL_E	12 56 ..					Only a few long waves.
		M_E	13 01 ..	18	10			
		C_E	13 05 ..					
6		P_E	8 43 15	4			1,040	Time at origin 8h., 41m.
		eP_N	8 43 23	7				
		eS_E	8 45 10					
		eS_N	8 45 12					
		L_E	8 45 32	20				
		L_N	8 45 39	18				
		M_E	8 46 15	18	870			
		M_N	8 46 43	16		1,070		
		C	8 48 ..	10				
		F_N	9 23 ..					
		F_E	9 34 ..	6				
6		eP_E	12 07 09	4				Not far distant. No discount M. N not in good adjustment.
		eP_N	12 07 24					
		eL_E	12 07 45		10			
		eL_N	12 08 02			10		
		F	12 28 ..	4				

Arizona. *Tucson. Magnetic Observatory.* U. S. Coast and Geodetic Survey. William H. Cullum.

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

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

Instrumental constants.. V T_0 E 10 14 N 10 19

Date.	Character.	Phase.	Time.	Period. T.	Amplitude. A_E	Amplitude. A_N	Distance.	Remarks.
1918.			*H. m. s.*	*Sec.*	μ	μ	*km.*	
Dec. 2		eL_E	10 21 00					Nothing on N.
		M_E	10 25 20	19	10			
		C_E	10 31 ..					
		F_E	11 07 ..					
4		eP_N	11 58 00	4				Time marking clock out of order. Times are based on the assumption of a uniform rate of the driving clocks.
		eP_E	11 59 23					
		eS_N	12 08 22					
		eL_E	12 16 ..					
		eL_N	12 24 ..					
		M_E	12 26 34	15	60			
		M_N	12 26 35			40		
		C_N	12 35 ..					
		C_E	12 50 ..	15				
		F_N	13 24 ..					
		F_E	14 07 ..	13				
6		P_E	8 45 52	3				Do.
		P_N	8 46 50	3				
		S_E	8 49 53	12				
		S_N	8 50 55					
		eL_E	8 51 15	25				
		eL_N	8 54 10					
		M_N	8 55 30	17		340		
		M_E	8 55 35	12	600			
		C_N	8 57 ..					
		C_E	9 00 ..	11				
		F_N	9 11 ..					
		F_E	9 42 ..	8				
9		eP_E	19 21 20					
		eL_E	19 43 15					
		M_E	19 46 10	16	10			
		F_E	20 39 ..					
23		eP_E	19 54 35					
		eL_E	19 59 28					
		M_E	20 00 43	12	50			
		F_E	20 14 ..					

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.)

TABLE 2.—*Instrumental reports, October, 1918*—Continued.

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 College.* F. J. Dick.

Lat., 32° 43′ 03″ 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
1918.			*H. m. s.*	*Sec.*	μ	μ	*km.*	
Dec. 4					200	200		Tremors during 24 hours preceding 16h. 00m. on date given.

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.

Date.	Character.	Phase.	Time.	Period. T.	Amplitude. A_E	Amplitude. A_N	Distance.	Remarks
1918.			*H. m. s.*	*Sec.*	μ	μ	*km.*	
Dec. 2		L_E	14 30 ..					Distinct activity on E-W.
		F_E	19					
4		L	11 37 ..	20	*500	*500		Very regular sinusoidal. Time and beginning somewhat doubtful.
		F	11 46 ..					
6		P	8 43 ..		*4,000	*3,500		First preliminaries of large amplitude. Second preliminaries not easily discernible.
		S	8 ? ?					
		L	8 49 ..	5-6	*6,000	*6,000		
		M_E	8 50 ..	6	*7,500			
		M_N	8 51 ..	6		*7,500		
		C	8 53 ..					
		F	9 02 ..					
21		L_N	12 26 ..					Distinct but very small waves, stronger on N-S.
		F_N	12 34 ..					
30-31								Activity at intervals.
31		P	3 33 ..	20		*6,800		First preliminaries on N-S have large amplitude. Second preliminaries not discernible.
		L	3 36 ..					
		F	3 53 ..					

* Trace amplitude.

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.
1918.			*H. m. s.*	*Sec.*	μ	μ	*km.*	
Dec. 1		i	2 59 33					
		eL	3 30 ..					
		L	3 33 ..	16				
		F	4 00 ..					
2		iP	9 55 21				4,080	
		S	10 01 35					
		L	10 05 40	24				
		F	11 00 ..					
4		P	11 58 24				7,030	
		S	12 06 55					
		L	12 16 ..	24				
		L	12 29 ..	18				
		L	12 44 ..	16				
		L	14 28 ..	26				
		F	15 00 ..					

District of Columbia. *Washington*—Continued.

Date	Character.	Phase.	Time.	Period. T.	Amplitude. A_E	Amplitude. A_N	Distance.	Remarks.
1918.			*H. m. s.*	*Sec.*	μ	μ	*Km.*	
Dec. 6		iP	8 48 10				3,940	
		S	8 53 54					
		L?	8 57 40					
		M	9 02 ..		*75,000	*75,000		
		F	9 55 ..					
6		e	12 20 ..					Followed by very heavy microseisms.
		M	12 22 40		*7,000			
		F?	12 45 ..					
9		e	18 41 ..					
		L	18 44 30	16				
		F	19 00 ..					
9		P?	19 03 34					
		S?	19 17 36					
		eL?	19 27 35					
		L?	19 31 30	16				
		F?	20 25 ..					
21		P	9 32 20				3,040	
		S	9 37 52					
		L?	9 47 ..					
		F	9 55 ..					
23		e	19 58 25					
		eL	19 59 20					
		F	20 20 ..					

* Trace amplitude.

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.

Instrumental constants.. E: V 165 T_0 5.4 ε 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.
1918.			*H. m. s.*	*Sec.*	μ	μ	*km.*	
Dec. 1		e	2 59 30					Heavy microseisms. No distinct Main.
		eL?	3 30 06					
		L_E	3 33 12	16				
		L_N	3 33 37	16				
		F	3 55 ..					
2		P	9 55 21					Do.
		S_N	10 01 38					
		S_E	10 01 39					
		eL	10 07 00	32				
		F	10 56 ..					
			VERTICAL.		*Az.*			
		eP	*9 55 29*					*S doubtful.*
		eL	*10 06 48*	24				
		F	*10 40* ..					
4		P_E	11 58 22					Heavy microseisms. F difficult.
		P_N	11 58 27					
		S	12 07 07					
		eL	12 17 42	20				
		M_E	12 19 54	23	*1,000			
		M_N	12 30 00	20		*1,300		
		F	15 ca					
6		e_N	7 41 10					Microseisms. Difficult.
			Set post-ea.					
6		iP	8 48 11					E-W needle off.
		S	8 53 57					
		eL_E	8 57 24	7				
		eL_N	8 57 30	7				
		M_E	9 00 44	8	*42,000+			
		M_N	9 00 51	8		*30,500		
		F	10ca					
			VERTICAL.		*Az.*			
		P	*8 47 54*					
		eS	*8 53 29*					
		eL	*8 56 30*	11				
		M	*9 00 48*	7		*11,300		
		F	*10 20* ..					
6		e_E	12 13 45					Gram difficult, very heavy microseisms. F surely after 12h, 30m.
		e_N	12 14 29					
		S?	12 21 34					
		i?	12 22 21					
		F?	12 ? ?					

* Trace amplitude.

TABLE 2.—*Instrumental reports, October, 1918*—Continued.

District of Columbia. *Washington*—Continued.

Date.	Character.	Phase.	Time.	Period. T.	Amplitude. A_E	Amplitude. A_N	Distance.	Remarks.
1918.			*H. m. s.*	*Sec.*	μ	μ	*km.*	
Dec. 9		e	18 41 26					Very heavy microseisms. F lost in following 'quake.
		eL_E?	18 43 42	16				
		eL_N?	18 44 24	13				
		L_E	18 46 ..	16				
		F?	19 ? ?					
9		eL	19 26 ..					Very heavy microseisms. F difficult.
		L_E	19 30 30	14				
		L_N	19 30 42	16				
		L_N	19 34 ..	19				
		L_E	19 35 ..	19				
		F	20 20 ..					
21		P_N	9 32 21					
		P_E	9 32 24					
		i_N	9 32 56					
		S_E	9 38 23					
		eL	9 42 06	11				
		L	9 47 ..	14				
		F	10 02 ..					
23		e	19 57 04					Heavy microseisms. S very doubtful.
		S_N?	19 58 38					
		S_E?	19 58 40					
		F	20 10 ..					

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.

Instrument constant..T_0 18.5

Date.	Character.	Phase.	Time.	Period. T.	Amplitude. A_E	Amplitude. A_N	Distance.	Remarks.
1918.			*H. m. s.*	*Sec.*	μ	μ	*km.*	
Dec. 1		eP	3 12 00					
		L	3 25 00					
		M	3 28 30		*200			
		F	4 00 ..					
2		P	10 12 18	19				Irregular tremors continued to 12h. 28m.
		S	10 15 54	20				
		L	10 20 00					
		M	10 23 12		*200			
		C	10 25 ..					
		F	? ? ?					
2		eL	10 47 30					Do.
		M	10 52 24	20	*300			
		C	10 54 ..					
		F	? ? ?					
2		eL	12 05 00					
		M	12 23 30	18	*100			
		F	12 48 ..					
3		eL	23 31 12					
		M	23 39 30	18	*50			
		C	23 44 ..					
4		F	0 33 ..					
4		P	12 03 24	20				Preceeded and followed by five hours of microseisms.
		S	12 13 12	17				
		L	12 33 42	25				
		M	12 41 18	17	*8,400			
		C	12 47 ..	18				
		F	15 postea					
6		e	7 33 12					
		L	8 07 12					
		M	8 14 00		*600			
		C	8 16 ..					
		F	8 20 ..					
6		eP	8 48 24	18				
		iS	8 54 06	16				
		eL	8 58 30					
		M	9 03 00	18	*2,400			
		C	9 07 ..	19				
		F	10 32 ..					
6		e	11 49 30					
		M	11 52 00		*100			
		F	12 27 ..					
9		e	1 38 42					
		M	1 43 ..		*100			
		C	1 47 ..					
		F	2 04 ..					

District of Columbia. *Washington*—Continued.

Date.	Character.	Phase.	Time.	Period. T.	Amplitude. A_E	Amplitude. A_N	Distance.	Remarks.
1918.			*H. m. s.*	*Sec.*	μ	μ	*km.*	
Dec. 9		e	4 32 00					
		M	4 44 00	19	$100			
		C	4 46 ..	19				
		F	4 59 ..					
9		eP	18 16 18					Tremors continue to next 'quake.
		iS	18 18 24					
		eL	18 21 42					
		M	18 25 00		*700			
		F	19 ? ?					
9		eP	19 01 00					
		iS	19 06 48					
		eL	19 12 00					
		M	19 16 00		*1,200			
		C	19 20 ..					
		F	20 13 ..					
10		e	17 33 30	22				
		M	17 39 12		*200			
		C	17 42 ..					
		F	17 55 ..					
23		eP	20 14 54	20				Pendulum not entirely free from Dec. 16–23.
		eL	20 16 00	20				
		M	20 19 30	18	*100			
		C	20 22 ..	18				
		F	21 22 ..					
25		P	10 29 12	18				
		iS	10 36 24	20				
		eL	10 49 12					
		M	10 52 54		*300			
		C	11 01 ..					
		F	11 23 ..					
30		eP	7 36 24	20				
		eL	7 42 48	21				
		M	7 48 00	17	*200			
		C	7 50 ..	18				
		F	8 21 ..					

*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..

	V	T_0	e
E	177	3.4	4:1
N	205	3.4	4:1

Date.	Character.	Phase.	Time.	Period. T.	Amplitude. A_E	Amplitude. A_N	Distance.	Remarks.
1918.			*H. m. s.*	*Sec.*	μ	μ	*km.*	
Dec. 4		eP	11 58 41					
		eS_E	12 07 43					
		eS_E?	12 07 51					
		L_E	12 16 22					
		L_N?	12 16 53					
		M_E	12 16 58		7.9			
		M_N	12 17 10			2.0		
		F_E	14 45 ..					
		F_N	14 51 ..					
6		P_E	8 46 24					
		P_N	8 46 26					
			8 46 27		−7.6	−3.9		
		M	8 46 30	4–6	+27.1	+15.6		
		S_E	8 50 49					
		S_N	8 50 51					
		L_E	8 53 57					
		L_N?	8 54 04					
		M_E	8 54 32	4–5	+55.4			
		M_N	8 54 39	4–5		−48.3		
		F	10 15 ..					
6		P_E	12 08 17					
		P_N	12 08 19					
			12 08 20		+25.4	−19.5		
		S_N?	12 12 48					
		S_E?	12 12 52					
		L_E	12 15 55					
		L_N	12 15 57					
		F	12 46 ..					

TABLE 2.—*Instrumental reports, October, 1918*—Continued.

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: E: V 10, T_0 15; N: V 10, T_0 15

Date.	Character.	Phase.	Time.	Period. T.	Amplitude. A_E	Amplitude. A_N	Distance.	Remarks.
1918.			*H. m. s.*	*Sec.*	*μ*	*μ*	*km.*	
Dec. 1		eL_E	3 32 20					
		eL_N	3 33 30					
		M_N	3 34 10	15		10		
		M_E	3 34 20	16	15			
		F	3 46 ..	15				
2		eP	9 55 36	3				Long waves not well defined.
		S_N	10 01 46	9				
		S_E	10 01 55	9				
		M_N	10 02 00			30		
		M_E	10 07 20		20			
		F_N	10 31 ..	9				
		F_E	10 38 ..	9				
4		P	11 58 30	3				
		S_E	12 07 00					
		eS_N	12 07 57					
		eL_N	12 25 45					
		eL_E	12 28 40					
		M_N	12 30 10	18		410		
		M_E	12 30 30		50			Actual maximum (100 μ) at 12h., 08m., 25s.
		C	12 33 ..					
		F	13 47 ..					
6		P	8 48 16	3			4,020	Time at origin 8h., 41m.
		S	8 54 04	8				
		eL_N	8 58 40					
		eL_E	9 00 06					
		M_N	9 00 40			600		
		M_E	9 01 02		550			
		C	9 06 ..					
		F	9 35 ..	8				
6		eP_N	12 21 28	3				
		eP_E	12 22 08	3				
		S	12 22 40	3				
		eL_E	12 25 ..					
		M_E	12 25 45	6	20			Actual maximum (40 μ) at 12h., 22m., 42s. on both N. and E.
		F	12 31 ..					
9		eL_E	18 44 30					
		eL_N	18 44 50					
		M_N	18 48 ..	18				
		F	18 49 ..					
9		eL_N	19 28 25					
		eL_E	19 30 55					
		M_E	19 36 15	15	10			
		M_N	19 37 10	15		10		
		F	19 52 ..					
23		eP_N	19 54 51					
		eP_E	19 55 46					
		L_N	19 59 24					
		L_E	19 59 54					
		M_E	20 00 18	11	20			
		M_N	20 00 18	13	20			
		C	20 01 ..	8				
		F	20 13 ..	8				

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

Date.	Character.	Phase.	Time.	Period. T.	Amplitude. A_E	Amplitude. A_N	Distance.	Remarks.
1918.			*H. m. s.*	*Sec.*	*μ*	*μ*	*km.*	
Dec. 1		*O*	*8 postea*					
		i_N?	2 59 44	6				Isolated waves. Continuous record from e_N.
		i_N?	3 00 40	7				
		e_N	3 12 51	6				
		L_N	3 24 52	20				
		L_N	3 27 06	28				
		L_N	3 28 20	18				
		L_N	4 04 30	14				
		F?	4 05 50					
1		L?	5 48 49	8				
		F?	5 49 45					

Massachusetts. *Cambridge*—Continued.

Date.	Character.	Phase.	Time.	Period. T.	Amplitude. A_E	Amplitude. A_N	Distance.	Remarks.
1918.			*H. m. s.*	*Sec.*	*μ*	*μ*	*Km.*	
Dec. 2		*O*	*9 47 48*				4,220	N uncertain.
		P_E?	9 55 21					
		P_N?	9 55 24					
		S_N?	10 00 56	22				
		S_E	10 01 21					
		eL_E	10 04 22	16				
		F_E	11 30 ..					
4		O_N	*11 47 57*				7,550	67° 57′. Northern Chile.
		O_E	*11 47 50*				7,650	68° 45′.
		P_N	11 58 35					Break in records changing sheets from 13h., 06m. to 14h., 24m.
		P_E	11 58 53					
		S_N	12 07 32	19				
		S_E	12 07 55	14				
		eL_N	12,22 33	44				F masked by microseisms.
		M_N	12 24 58	25				
		M_N	12 27 40	18		*3,500		
		M_E	12 28 46	19	*3,500			
		M_E	12 30 49	18	*4,375			
		to	12 34 ..					
		M_N	12 31 05	20				
		M_N	12 33 23	20		*40,000		Undamped.
		M_N	12 35 51	20				
		M_E	12 36 02	18	*5,000			
		M_N	12 37 24	20		*41,000		Do.
		C_E	12 40 ..					
		C_N	12 46 ..					
		..	.. ..					
		CL	14 25 22	16				
		..	14 27 31	24				
		..	14 38 41	20				
		..	14 43 16					
		..	15 11 ..	22				
		F_N?	15 52 ..					
4		L_N	18 16 04	20				May not be seismic: not shown on E among microseisms.
		L_N	18 19 10	20				
		to	18 23 ..					
6		*O*	*8 40 54*				3,930	35° 22′.
		iP_E	8 48 07					N undamped, stylus thrown off sheet at 9h. 02m.
		S_E	8 53 50					
		eL_N	8 59 44	44				
		eL_E	9 01 17	40				
		M_E	9 02 04	15	*19,000			
		M_E	9 03 ..					
		M_E	9 06 28		*13,700			
		F_E	9 54 ..					
6		*O*	*18 postea*				2,000–3,000	e and F in microseisms.
		e_N	12 18 43					
		e_E	12 22 14					
		eL_N	12 22 16	40				
		L_E	12 23 51	4–6				
		M_E	12 24 13					
		F?	12 38 ..					
9		*O*	*18 postea*					e lost in heavy microseisms. Times of phases somewhat uncertain, clock pendulum out of order. F merged in next 'quake.
		e?	18 21 ..					
		eL_N	18 34 05	40				
		L_E	18 40 05	15				
		M_N	18 44 08	19				
		M_N	18 45 05					
		F	19 ? ?					
9		e_N?	19 20 28					e confused with earlier 'quake and microseisms. F in heavy microseisms.
		eL_N	19 23 58	40				
		L_E	19 25 04	12				
		M_E	19 31 21	16	*800			
		M_E	19 34 37	16	*1,000			
		M_N	19 34 53					
		F?	21 43 ..					
14		*O*	*19*					
		eL_E	19 40 ..	16				
		L	19 41 30	20				
		to	19 50 ..					
21		*O*?	*9 31 18*				4,170?	Δ and *O* from L–S.
		i_N	9 32 41					Pendulum steps north.
		e_N	9 33 22	2				
		i_N	9 33 28					Pendulum steps north. But microseisms of 6 seconds period were running at the time.
		S_N?	9 34 39	6				
		e_E	9 36 37	6				
		eL_N	9 36?39	13				
		e_E	9 40 46	6				
		e_N	9 42 34	6				
		L_E	9 42 53	8				
		L_N	9 43 15	10				
		L_N	9 47 48	10				
		F	9 55 ..					
25		*O*	*6 14 15*				27	Explosion of powder mill, Maynard, Mass. E damped 1.5/1; N 0/1. Loud noise heard, shook house near by.
		P_N	6 14 19					
		P_E	6 14 19					
		M_E	6 14 21½	0.41	*500			
		M_N	6 14 22					
		C_E	6 14 28					
		F_E	6 14 33					
		F_N	6 14 41					

* Trace amplitude.

TABLE 2.—*Instrumental reports, October, 1918*—Continued.

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.. V 80, T_0 7, ϵ 5:1

Date.	Character.	Phase.	Time.	Period. T.	Amplitude. A_E	Amplitude. A_N	Distance.	Remarks.
1918.			*H. m. s.*	*Sec.*	μ	μ	*km.*	
Dec. 2	.....	eP....	9 56 48	.....	.....	.....	5,200	
		eS....	10 03 42	.....	.....	.....	.....	
		eL....	10 06 06	.....	.....	.....	.....	
		M.....	10 09 06	30	.....	*1,000	.....	
		F.....	11 05 ..	.....	.....	.....	.....	
4	.....	iP$_N$...	11 58 42	.....	.....	.....	9,600	Reported from Chili. N-S well defined, E-W very undefined and irregular.
		eS....	12 08 24	.....	.....	*4,000	.....	
		L.....	12 19 00?	.....	.....	.....	.....	
		L.....	12 26 00	18	.....	.....	.....	
		L.....	12 29 54	18	.....	*3,000	.....	
		F.....	13 26 ..	.....	.....	.....	.....	
4	.....	eL$_E$...	13 48 06	.....	.....	.....	.....	Record on E-W well defined. N-S hardly noticeable; hence it is believed that this disturbance is quite distinct from the one above. P and S lost changing record. F lost in microseisms, which continued all day.
		P.....	13 ? ?	.....	.....	.....	.....	
		S.....	13 ? ?	.....	.....	.....	.....	
		F.....	14	.....	.....	.....	.....	
6	.....	iP$_E$...	8 47 00	.....	.....	.....	3,200	Both E and N undamped.
		eS$_E$...	8 51 48	.....	.....	.....	.....	
		S$_N$....	8 52 00	.....	.....	.....	.....	
		L$_N$....	8 55 36	.....	.....	.....	.....	
		L$_E$....	8 55 54	.....	.....	.....	.....	
		M$_N$....	8 56 18	6	.....	*46,000	.....	
		M$_E$....	8 56 30	9	*21,000	.....	.....	
		F.....	10 16 ..	.....	.....	.....	.....	
6	.....	e$_N$.....	12 10 54	.....	.....	.....	.....	
		e$_N$.....	12 17 36	.....	.....	.....	.....	
		i$_E$.....	12 17 48	.....	.....	.....	.....	
		e$_E$.....	12 20 12	.....	.....	.....	.....	
		F.....	? ? ?	.....	.....	.....	.....	
9	.....	e$_E$.....	18 22 00	.....	.....	.....	.....	
		eL....	18 35 36	.....	.....	.....	.....	
		F.....	? ? ?	.....	.....	.....	.....	
9	.....	iP$_E$...	19 03 00	.....	.....	.....	.....	
		e.....	19 11 09	.....	.....	.....	.....	
		L.....	19 26 00	.....	.....	.....	.....	
		F.....	21 ? ?	.....	.....	.....	.....	

* Trace amplitude.

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

(Report for December, 1918, not received.)

New York. *Fordham. Fordham University.* Daniel H. Sullivan, S. J.

Lat., 40° 51′ 46″ N.; long., 73° 53′ 08″ W. Elevation, 29.3 meters.

Instrument: Wiechert, 80 kg.

Instrumental constants.. V 72, T_0 5.0, ϵ 0 (E); V 72, T_0 5.0, ϵ 0 (N)

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

Lat., 42° 36′ 58″ N.; long., 76° 29′ 09″ W. Elevation, 242.6 meters.

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

Instrumental constants.. V 13, T_0 22, ϵ 4:1 (E); V 14, T_0 25, ϵ 4:1 (N)

Date.	Character.	Phase.	Time.	Period. T.	Amplitude. A_E	Amplitude. A_N	Distance.	Remarks.
1918.			*H. m. s.*	*Sec.*	μ	μ	*km.*	
Dec. 2	.....	eP$_E$...	9 51 19	3	.....	.....	.....	Microseisms. Time clock erratic.
		eP$_N$...	9 51 23	3	.....	.....	.....	
		S$_E$....	9 57 47	15	.....	.....	.....	
		S$_N$....	9 57 48	17	.....	.....	.....	
		L$_N$....	10 03 02	21	.....	.....	.....	
		L$_E$....	10 03 10	16	.....	.....	.....	
		M$_N$....	10 03 55	15	.....	*600	.....	
		F$_E$....	10 51 ..	.....	.....	.....	.....	
4	.....	eP$_N$...	11 59 47	3	.....	.....	.....	
		eP$_E$...	12 00 25	3	.....	.....	.....	
		eS$_N$...	12 08 43	10	.....	.....	.....	
		eS$_E$...	12 08 50	9	.....	.....	.....	
		i$_E$.....	12 09 45	15	*1,000	.....	.....	
		M$_N$....	12 34 10	19	.....	*1,500	.....	
		M$_E$....	12 34 20	18	$1,300	.....	.....	
		F.....	15	.....	.....	.....	.....	
6	.....	P$_E$....	8 48 33	3	.....	.....	.....	Time clock not in good order.
		P$_N$....	8 4 358	3	.....	.....	.....	
		eS$_N$...	8 54 02	6	.....	.....	.....	
		eS$_E$...	8 54 03	7	.....	.....	.....	
		M.....	9 00 33	15	*4,200	*7,000	.....	
		M$_E$....	9 01 09	10	*4,000	.....	.....	
		M$_N$....	9 01 18	9	.....	*6,000	.....	
		F.....	9 59 ..	.....	.....	.....	.....	
6	.....	e.....	12 19 ..	5	.....	.....	.....	Microseisms.
		M.....	12 22 15	5	*500	.....	.....	
		L$_E$....	12 24 45	11	.....	.....	.....	
		F.....	12 31 ..	.....	.....	.....	.....	
9	.....	eL$_E$...	18 40 ..	25	.....	.....	.....	
		F$_E$....	19 02 ..	.....	.....	.....	.....	
9	.....	eP? ...	19 12 ..	4	.....	.....	.....	Time marker not working; times estimated.
		eL? ...	19 27 15	13	.....	.....	.....	
		L$_E$....	19 30 ..	14	.....	.....	.....	
		F$_E$....	20 11 ..	.....	.....	.....	.....	
21	.....	eP$_N$...	9 33 26	3	.....	.....	.....	
		S$_E$....	9 39 14	6	.....	.....	.....	
		e.....	9 42 30	5	.....	.....	.....	
		L$_E$....	9 44 15	26	.....	.....	.....	
		F$_E$....	10 00 ..	.....	.....	.....	.....	
23	.....	e$_E$.....	19 54 15	6	.....	.....	.....	
		L$_E$....	19 59 11	25	.....	.....	.....	
		F.....	20 22 ..	.....	.....	.....	.....	

*Trace amplitude.

Panama Canal. *Balboa Heights.* Governor, Panama Canal.

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

Instruments: Two Bosch-Omori, 100 kg.

Instrumental constants.. V 35, T_0 20

Date.	Character.	Phase.	Time.	Period. T.	Amplitude. A_E	Amplitude. A_N	Distance.	Remarks.
1918.			*H. m. s.*	*Sec.*	μ	μ	*km.*	
Dec. 2	.....	P.....	9 54 46	.....	.....	.....	.....	Faint trace.
		F.....	10 28 00	.....	.....	.....	.....	
4	.....	P$_E$....	11 55 08	.....	.....	.....	2,320	
		P$_N$....	11 55 16	.....	.....	.....	.....	
		L$_E$....	12 01 42	.....	.....	.....	.....	
		L$_N$....	12 02 08	.....	.....	.....	.....	
		M$_E$....	12 04 06	.....	*4,000	.....	.....	
		M$_N$....	12 13 56	.....	.....	$3,000	.....	
		F$_N$....	13 27 32	.....	.....	.....	.....	
		F$_E$....	13 30 00	.....	.....	.....	.....	
4	.....	P$_E$....	15 27 36	.....	.....	.....	90	
		P$_N$....	15 27 56	.....	.....	.....	.....	
		L$_E$....	15 28 24	.....	.....	.....	.....	
		M$_E$....	15 28 30	.....	*800	.....	.....	
		L$_N$....	15 28 34	.....	.....	.....	.....	
		M$_N$....	15 28 40	.....	.....	*1,800	.....	
		F$_E$....	15 32 00	.....	.....	.....	.....	
		F$_N$....	15 34 00	.....	.....	.....	.....	

* Trace amplitude.

TABLE 2.—*Instrumental reports, October, 1918*—Continued.

Panama Canal. *Balboa Heights*—Continued.

Date.	Character.	Phase.	Time.	Period. T.	Amplitude. A_E	Amplitude. A_N	Distance.	Remarks.
1918.			*H. m. s.*	*Sec.*	*μ*	*μ*	*km.*	
Dec. 4		P	17 15 04		*300	*500		Faint trace.
		F	17 19 00					
6		P	8 51 00					Do.
		F	8 58 00					
11		P_N	17 48 50				735	
		P_E	17 49 14					
		L_E	17 50 50					
		M_E	17 50 54		*1,000			
		L_N	17 52 26					
		M_N	17 52 36			*1,000		
		F	18 00 00					
12		P	8 21 00					Very indistinct trace.
		F	8 22 00					
21		P_E	9 27 46				1,000	
		P_N	9 27 49					
		L_N	9 29 53					
		L_E	9 29 54					
		M_E	9 29 55		*3,000			
		M_N	9 29 57			*1,500		
		F	9 42 00					
23		P	19 47 00					Slight disturbance.
		F	20 02 00					
27		P	8 27 00					Do.
		F	8 31 00					

* Trace amplitude.

Porto Rico. *Vieques. Magnetic Observatory.* U. S. Coast and Geodetic Survey. Wallace M. Hill.

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

Instruments: Two Bosch-Omori.

Instrumental constants.. E: V 10, T_0 17; N: V 10, T_0 20

Date.	Character.	Phase.	Time.	Period. T.	Amplitude. A_E	Amplitude. A_N	Distance.	Remarks.
1918.			*H. m. s.*	*Sec.*	*μ*	*μ*	*km.*	
Dec. 2		P_E	9 52 44	4				
		P_N	9 52 50	3				
		S?	9 56 52					
		M_E	9 57 50		20			
		M_N	9 58 14	28		300		
		C	10 00 ..	8				
		F	10 50 ..					
4		eP_N	11 55 59	3				Phases not well defined and difficult to correlate. Paper of N changed at 12h., 57m. and nothing appears on the new sheet.
		eP_E	11 56 12	3				
		eS_E	12 03 34	13				
		eS_N	12 03 52	8				
		$?_E$	12 06 40	24				
		$?_N$	12 06 56	14				
		M_E	12 07 12	26	420			
		eL_E	12 10 30	24				
		eL_N	12 12 20	30				
		M_E	12 14 30	22	240			
		M_N	12 19 01	18		1,200		
		C	12 25 ..	16				
		F_N	12 57 ?	15				
		F_E	14 02 ..	16				
6		P_N	8 51 32	4				P and S very faint.
		S_E	8 59 02	8				
		S_N	8 59 08	8				
		eL_E	9 09 11	24				
		eL_N	9 09 50	22				
		M_N	9 16 04	20		20		
		M_E	9 16 31	20	20			
		C	9 20 ..	17				
		F	9 34 ..					
21		e_N	9 29 54	5				No definite phases.
		e_E	9 30 25					
		M_N	9 35 03	8		10		
		M_E	9 37 09	12	10			
		F_N	9 42 ..					
		F_E	9 50 ..					
23		P_E	19 49 31	5				
		P_N	19 49 40	5				
		S_N?	19 55 50					
		eL_E	20 00 11	10				
		eL_N	20 00 20	12				
		M_E	20 00 25	10	10			
		F_N	20 05 ..					
		F_E	20 08 ..	(end)				

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.
1918.			*H. m. s.*	*Sec.*	*μ*	*μ*	*km.*	
Dec. 2		e	9 55 27					
		S	10 01 44					
		L	10 05 00	20				
		L	10 21 00	14				
		F	10 40 ..					
4		P	11 58 54					
		S	12 08 05					
		eL	12 16 20					
		L	12 34 00	16				
		F	13 20 ..					
6		P	8 47 57					
		S	8 53 55					
		eL	8 59 ?					
		M_E	9 04 ..		*6,000			
		F	9 40 ..					
6		e_N	12 21 ..					Phases uncertain.
		F	12 35 ..					

* Trace amplitude.

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.
1918.			*H. m. s.*	*Sec.*	*μ*	*μ*	*km.*	
Dec. 1		i	2 58 56					
		eL_E?	3 14 48					
		L	3 20 ..	32				
		L	3 28 ..	18				
		L	3 38 ..	14				
		F	3 55 ..					
2		*O*	*9 47 30*				4,800	
		iP	9 55 45					
		iS	10 02 16					
		eL	10 05 30	21				
		L	10 09 ..	21				
		L	10 17 ..	14				
		L	10 32 ..					
		F	11 10 ..					
4		*O*	*11 47 43*				8,000	
		eP	11 59 04					
		eS	12 08 24					
		eL	12 19 18	34				
		L	12 30 ..	19				
		L	12 36 ..	17				
		L	12 50 ..	17				
		L	13 00 ..	16				
		L	13 15 ..	18				
		L	13 33 ..	18				
		L	13 50 ..	15				
		L	14 05 ..	15				
		L	14 15 ..	15				
		$L_{N\,repl}$	14 16 ..	30				
		L_{repl}	14 25 ..	23				
		F	15 10 ..					
6		i	7 42 28					
		eL_N	8 05 48	18				
		to	8 17 ..					
6		*O*	*8 40 58*				3,650	
		P	8 47 50					
		S	8 53 16					
		eL	8 55 ..	?				
		M	9 00 ..	10	100	200		
		L	9 20 ..	10				
		F	9 55 ..					
		SASKATOON RECORD.						
		O	*8 40 56*				1,460	
		P	8 44 05					
		S	8 46 38					
		L	8 47 36					

TABLE 2.—*Instrumental reports, October, 1918*—Continued.

Canada. *Ottawa*—Continued.

Date.	Character.	Phase.	Time.	Period. T.	Amplitude. A_E	Amplitude. A_N	Distance.	Remarks.
		HALIFAX RECORD.						
1918.			*H. m. s.*	*Sec.*	μ	μ	*km.*	
		O	*8 40 57*				4,560	N-S component off the sheet during maximum.
		P_N	8 48 55					
		S	8 55 13					
6		e_N?	12 13 44					Above value for Δ indicate an epicenter in northern British Columbia.
		e_N	12 15 ..					
		eL?	12 19 36					
		M	12 22 ..		15ca	35ca		
		F	12 35 ..					
9		e	18 30 30					F merged in next 'quake.
		eL?	18 35 30					
		L	18 39 ..	21				
		L	18 43 ..	15				
		L	18 52 ..	15				
		F	? ? ?					
9		e	? ? ?					e lost in microseisms and Coda of 'quake above.
		eL?	19 25 ..					
		L	19 29 ..	15				
		L	19 45 ..	13				
		L	20 01 ..	13				
		F	20 40 ..					
19		eL_E?	20 40 ..					Very small amplitude, barely visible.
		to	20 45 ..					
21		*O*	*9 24 51*				4,920	
		P_N	9 33 14					
		S	9 39 52					
		eL_E	9 45 30	24				
		L_N	9 51 ..	12				
		F	10 05 ..					
23		e_N?	19 56 ..					
		eL	20 00 ..	21?				
		L	20 10 ..	14?				
		F	20 35 ..					
25		e	10 59 40					L barely visible.
		eL	11 24 ..	21				
		to	11 32 ..					
		F	11 40 ..					
26		eL_N	8 49 ..	21				Barely visible.
		to	8 54 ..					

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.. $\overset{To}{18}$. Pillar deviation: 1 mm. swing of boom=0.50″.

Date.	Character.	Phase.	Time.	Period. T.	Amplitude. A_E	Amplitude. A_N	Distance.	Remarks.
1918.			*H. m. s*	*Sec.*	μ	μ	*km.*	
Dec. 1		P?	3 14 24?					F lost in microseisms.
		e	3 21 24					
		L	3 22 24					
		eL	3 32 24					
		eL	3 37 42					
		M	3 42 48		*700			
		L?	4 36 42					
		F	? ? ?					
2		P	9 56 00				5,220	S waves came in abruptly and of large amplitude. F lost in microseisms.
		iS	10 02·54					
		L	10 05 36					
		L	10 08 42					
		M	10 09 48		*1,300			
		F	? ? ?					
3								Microseisms during night hours when other stations record a small 'quake.
4		eP	11 59 36				7,850	Chili. Well-defined record. S waves of large amplitude.
		e	12 07 36					
		iS	12 08 48					
		iL	12 15 48					
		L	12 19 36					
		iL	12 30 48					
		iL	12 37 12					
		M	12 38 54		*4,800			
		iL	12 44 06					
		eL	12 56 12					
		eL	13 39 18					
		eL	14 55 12					
		F	15 21 36					

Canada. *Toronto*—Continued.

Date.	Character.	Phase.	Time.	Period. T.	Amplitude. A_E	Amplitude. A_N	Distance.	Remarks.
1918.			*H. m. s.*	*Sec.*	μ	μ	*km.*	
4		eL	18 22 12					
		M	18 23 12		*100			
		F	18 41 00					
6		L	7 47 24		*100			Microseisms masked other phases.
6		P	8 47 54				3,520	Epicenter 49° 32′ N, 127° W. P poorly defined and microseisms may have masked beginning of S. F lost in microseisms.
		e	8 50 18					
		S	8 53 12					
		L	8 55 00					
		iL	8 58 06					
		M	9 01 24		*6,800			
		L	9 18 42					
		F	? ? ?					
6		L	12 18 30					F lost in microseisms.
		L	12 20 06					
		M	12 21 42		*400			
		F	? ? ?					
9		eL	5 20 36					Gradual thickening.
		M	5 23 24		*200			
		F	5 38 18					
9		L	18 35 12					F merged in following 'quake.
		L	18 39 48					
		eL	18 43 06					
		M	18 44 12		*300			
		F	19					
9		L	19 31 36					Earlier phases lost; light off at 19h., 21m.
		M?	19 33 06		*2,200			
		eL	19 39 36					
		F	20 35 12					
14		L	19 02 48		*50			
		F	19 19 18					
14		L	19 37 54					Gradual thickening.
		eL	19 43 36					
		M	19 50 18		*200			
		F	20 02 ..					
19		L?	20 24 ..					Heavy microseisms.
21		S	9 39 42					F lost in microseisms.
		eL	9 47 30					
		M	9 49 36		*700			
		F	? ? ?					
23		e?	19 46 00				4,120?	Microseisms going on during first phases.
		e?	19 51 18					
		P	19 52 48					
		S	19 58 42					
		eL	20 00 18					
		eL	20 01 00					
		M	20 02 12		*1,000			
		F	20 37 06					
25		L	11 24 12					Microseisms masked phases.
		L	11 31 24		*200			
		L	11 33 24					
		F	? ? ?					
26								Microseisms going on when other stations record a small 'quake.

* 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.. $\overset{T_0}{18}$. Pillar deviation: 1 mm. swing of boom=0.54″.

Date.	Character.	Phase.	Time.	Period. T.	Amplitude. A_E	Amplitude. A_N	Distance.	Remarks.
1918.			*H.m.s.*	*Sec.*	μ	μ	*km.*	
Dec. 1		P	3 13 09?				2,760	Alaska?
		S	3 17 34					
		L	3 24 27					
		M	3 30 31		*300			
		F	4 04 18					
2		P	10 07 30?				3,240	Aleutian Islands? Times of P and S very doubtful.
		S	10 12 30?					
		L	10 22 00					
		M	10 38 00		*1,200			
		F	12 55 00					

* Trace amplitude.

TABLE 2.—*Instrumental reports, October, 1918*—Continued.

Canada. *Toronto*—Continued.

Date.	Character.	Phase.	Time.	Period. T.	Amplitude. A_E	Amplitude. A_N	Distance.	Remarks.
			H. m. s.	*Sec.*	μ	μ	*km.*	
1918 Dec. 4		M	0 00 19		*50			
		F	0 07 12					
4		P	12 00 56				9,520	Northern Chili (Copiapo).
		S	12 11 14					
		S	12 11 32					
		L	12 28 51					
		M	12 42 59		*2,600			
		F	15 37 42					
			VERTICAL.		*Az.*			
		P	*12 00 44*				*8,710*	Do.
		S	*12 10 40*					
		L	*12 19 00*					
		M	*12 41 00*			9		
		F	*13 26 00*					
4		P	18 24 08				890	
		S	18 26 07					
		L	18 29 46					
		M	18 32 04		*300			
		F	18 52 54					
6		P	8 04 18					
		M	8 12 20		*200			
		F	? ? ?					
6		P	8 41 39				336?	Probably off west coast of Vancouver Island and northwest of Estevan.
		S. & L.	8 42 27					
		M	8 43 15		*17,000			
		eL	9 24 34					
		F	10 34 25					
			VERTICAL.		*Az.*			
		P	*8 41 44*	*2*			*320*	Do.
		S. & L.	*8 42 28*	*4*				
		M	*8 42 40*	*8*		*490*		
		F	*9 29 00*					
6		P	12 02 51				220	Probably off west coast of Vancouver Island and south of Estevan
		S. & L.	12 03 21					
		M	12 04 20		*1,500			
		F	12 24 10					
			VERTICAL.		*Az.*			
		P	*12 03 32*	*2*			*270*	Do.
		S. & L.	*12 04 08*	*4*				
		M	*12 04 24*	*4*		*71*		
		F	*12 16 00*					
9		P	4 51 47				4,140?	
		S	4 56 42					
		L	5 04 08					
		M	5 05 37		*200			
		F	5 11 34					
9		P	18 10 04?				1,400?	
		S	18 12 31					
		L	18 15 58					
		M	18 25 18		*400			
		F	18 49 53					
9		L	19 04 41					
		M	19 16 35		*500			
		F	20 02 42					
11			9					Estevan reports 2 local tremors. Not recorded at Victoria.
14		L	18 59 31?					
		M	19 03 29		*200			
		M	19 30 16		*400			May be a dual 'quake.
		F	19 39 11					
19		L	20 11 00					No cut-off for first phases.
		M	20 20 21		*200			
		F	20 28 13					
21		P	9 38 33?				2,770?	
		S	9 42 59					
		L	9 52 19					
		M	10 03 09		*200			
		F	10 28 14					
23		M ?	20 12 12		*1,000			First phases lost at cut-off.
		F	20 24 30					
25		L	10 50 04					
		M	11 16 13		*400			
		F	11 31 57?					

* Trace amplitude.

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

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
E	80	23	0
N	50	25	4:1

Date.	Character.	Phase.	Time.	Period. T.	Amplitude. A_E	Amplitude. A_N	Distance.	Remarks.
			H. m. s.	*Sec.*	μ	μ	*km.*	
1918. Nov. 3		*O*	*11 48 36*				7,950	71° 55′.
		S_E	12 09 12	6				
		eL_E	12 23 28	28				Amplitude E very small; not recognized on N undamped.
		L	12 30 06	20				
		L	12 40 41	20				
		L	12 44 51	15				Press reports 'quake in Hawaii at 11h., 33m. p. m. and outbreak of Kilauea.
		L	13 00 06	15				
		F	13 02 24					
4		L_E?	18 34 51	15–12				Not assuredly seismic; among microseisms of 8 sec. period.
		F?	18 36 45					
5		*O*?	*22 30 05*				6,580	59° 22′ of arc.
		S_N?	22 46 27	10				N undamped.
		eL_N?	22 58 57	38				L_E 23h., 00m., 04s. to 23h. 05m., 46s. period.
		L_N	23 00 00	20				
		M_N	23 02 36	20				18–16 sec.
		C_N?	23 04 16	15				
		F_N?	23 16 ..					
8		*O*	*4 38 21*				8,750	78° 45′ of arc.
		P_N	4 50 21	2				
		P_E	4 51 08					
		S_E	5 00 19	6				
		S_N	5 00 48	10				
		i_E	5 01 41					
		e_E	5 02 50	13				
		e_E	5 03 19					
		eL_N	5 16 ..					Short waves superposed.
		eL_E	5 16 01	44				Do.
		L_E	5 17 15	35				
		M_E	5 18 56	21	*8,000			A 235.
		M_E	5 25 19	22	*7,000			
		M_E	5 27 35	23	*11,500			
		M_E	5 31 25	21	*17,500			A 515.
		M_E	5 34 35		*12,500			
		M_E	5 36 49	20	*9,750			
		M_E	5 37 43	17	*18,750			A 1,000.
		C_E	5 38 25	14				
		F	7 22 ..					
12		*O*	*21 44 24*				2,680	23° 56′ of arc.
		iP_N	21 49 40	4				N undamped, E damped by magnet, N starts before E. Microseism mask certain phases. Compare record Oct. 11, 1918, Δ 2,690, *O 14h., 14m., 14s.*
		iP_{repl}	21 49 52					
		eP_{Erepl}	21 50 09	2				
		S_N	21 53 59	14				
		S_E?	21 54 09	6				
		eL_N	21 55 45	22–30				
		eL_E	21 55 33	24				
		M_E	21 57 57	16	*1,500			
		M_E	21 59 43	16	*1,250			
		C_N	22 00 30					
		F_E	22 43 ..					
		F_N	22 56 ..					
18		*O*	*18 41 55*				16,000	*O* computed from Riverview, Sydney, N. S. W., gives Δ 3,470 km., giving epicenter lat. 10° S., long. 130° E.; reported as felt at Port Darwin. i from W. L_N at 20h., 28m. is evidently M of a second 'quake coming from same epicenter about 35m. after the first M on return of P reflected from anticentrum. M_N does not accord with L_{rep}. A similar group of lenticular M waves appears about 35m. after M_1 in the record of Jan. 1, 1919; *0, 3h. plus.*
		iP_E	18 59 35					
		eP_N	19 00 46					
		P_{Erepx}	19 01 18	10	*1,000			
		P_{Nrepx}	19 01 30			*1,000		
		P_{Nrepl}	19 04 25	12		*5,000		
		P_{Erepl}	19 05 01	8	*3,500			
		iS_N	19 13 18	9				
		S_{rep1}	19 23 05	14				
		S_{rep2}	19 29 16		*5,750			
		i_N	19 32 56			*7,300		
		i_E	19 40 36	18		*9,000		
		eL_N	19 51 06					
		M_N	19 54 05					
		M_N	19 57 22			*5,700		
		M_N	20 06 04					
		M_N	20 13 46					
		to	20 15 36					
		L_N	20 28 ..					
		M_N	20 29 24					
		F_N	21 17 ..					

* Trace amplitude.

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

Date.	Character.	Phase.	Time.	Period. T.	Amplitude. A_E	Amplitude. A_N	Distance.	Remarks.
			Massachusetts. *Cambridge*—Continued.					
1918.			*H. m. s.*	*Sec.*	μ	μ	*Km.*	
Nov. 23	.....	*O*.....	*22 52 11*	.....	.....	.....	10,550	94° 57′. △ and *O* from L_N–S_E. N much masked by microseisms.
		e_E.....	23 09 31	3	.....	.....	.....	
		i_E.....	23 09 51	6	.....	.....	.....	
		S_E.....	23 17 02	6	.....	.....	.....	
		i_N.....	23 26 34	.....	.....	.....	.....	
		i_N?....	23 26 57	8	.....	.....	.....	
		eL_E...	23 34 40	24	.....	.....	.....	
		eL_N...	23 38 29	28	.....	.....	.....	
		L_E....	23 39 20	36	.....	.....	.....	
		L_E....	23 43 49	24	.....	.....	.....	
		L_E....	23 50 30	16	.....	.....	.....	
24	.....	L_E....	0 03 10	24	.....	.....	.....	
		L_E....	0 07 29	24	.....	.....	.....	
		L_E....	0 10 16	20	.....	.....	.....	
		to	0 51 ..	.....	.....	.....	.....	
		L_{repl}..	0 57 50	16	.....	.....	.....	
		F_E....	1 05 ..	.....	.....	.....	.....	
30	.....	*O*?....	*6 28 13*	.....	.....	.....	11,970	? 107° 44′ from eL–S? P and S masked by microseisms.
		S_E?....	6 55 06	6	.....	.....	.....	
		eL_E...	7 21 22	26	.....	.....	.....	
		L_E....	7 23 39	27	.....	.....	.....	
		L_E....	7 24 16	20	.....	.....	.....	
		L_E....	7 26 45	16	.....	.....	.....	
		L_E....	7 28 03	.....	.....	.....	.....	A increased slightly.
		to	7 30 07	14	.....	.....	.....	
		L_N....	7 28 45	20–16	.....	.....	.....	
		L_E....	7 31 51	14–12	.....	.....	.....	
		F_E....	7 49 ..	.....	.....	.....	.....	

* Trace amplitude.

SEISMOLOGICAL DISPATCHES.[1]

Santiago, Chile, Dec. 4, 1918.

An earthquake has occurred in Northern Chile. In the towns of Copiapo and Vallener important damages were caused. In other localities damage of minor importance resulted.

Reports received here say that the earthquake destroyed Vallener, and that it wrecked 10 per cent of the buildings at Copiapo. Several deaths occurred in Copiapo, where many persons are homeless. (Assoc. Pr.)

Vancouver, British Columbia, Dec. 6, 1918.

This city was shaken violently by an earth tremor at 12:45 this morning. The tremors, which appeared to be from north to south, were felt for two minutes. A distinct rumbling was noticeable. Occupants of tall buildings were especially affected by the disturbance, many being seized with nausea.

The shock was felt in all parts of the city, many persons being awakened by the shaking of furniture and tumbling of dishes. (Assoc. Pr.)

Victoria, British Columbia, Dec. 6, 1918.

A pronounced earthquake of several seconds' duration was felt here at 12:45 o'clock this morning. Houses shook and windows rattled all over the city. Island points in the immediate vicinity also reported noticing the disturbance. (Assoc. Pr.)

Seattle, Washington, Dec. 6, 1918.

What was believed to be an earth disturbance was felt in Seattle at 12:45 o'clock this morning. The tremor shook buildings in the downtown district. (Assoc. Pr.)

EARTHQUAKES FELT IN THE UNITED STATES DURING 1918.

[Consult also Chart XI (XLV–122) in this issue.]

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

[Dated: Weather Bureau, Washington, Feb. 4, 1919.]

During the year 1918, 127 separate 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 (XLVI–111)) at the end of this issue of the Review.

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

Earthquakes of moderate intensities, V–VI (Rossi-Forel), accompanied by only slight damage or none at all, occurred in California on February 11, March 6, 8, 21, 30, April 7, 23, 29, May 1, 2, June 3, 6, 14, 22, July 15, August 20, October 14, November 19, 29; in Arizona on April 21, 28; in Virginia on April 10; in the State of Washington on June 21, December 6; in Tennessee on June 22, October 16; in Oklahoma on September 11; in Arkansas on October 4, 13; and in Utah on November 16. The Virginia earthquake was apparently central in the vicinity of Luray and was felt over most of Virginia, a portion of West Virginia, much of Maryland, the District of Columbia, and into Pennsylvania.

Earthquakes of intensity, VII–VIII, accompanied by only a very moderate amount of damage, such as the fall of chimneys, occurred in California on March 12, apparently central near Downieville; and in Maine on August 21, apparently central near South Paris.

An earthquake of intensity, IX–X, and accompanied by some destruction of property, occurred in California on April 21, when the entire business sections of Hemet and San Jacinto were destroyed. This shock was felt over southern California and Nevada, western New Mexico, and into Utah, and was apparently caused by a new slip in the San Jacinto Fault.

An earthquake of similar intensity occurred in New Mexico on May 28, causing an open break in the surface of the ground at Cerillos.

There remains to be mentioned the great earthquake, not shown on the chart, but given in the tables, which occurred in Porto Rico on October 11. A great tidal wave 2 miles wide swept inland a half mile at Aguadilla, rising to a height of 40 feet against the cliffs, destroying everything in its path, and drowning many people. Over 60 shocks were noted during the period from October 11 to November 12. The frequency diminished rapidly, as is usual, and had fallen to about one a day by the end of October.

TABLE 1.—*Places in the United States reporting earthquakes during 1918.*

[Consult also Chart XI (XLV–122) in this issue.]

Place.	Approximate latitude (north.)	Approximate longitude (west).	Number of quakes reported.	Place.	Approximate latitude (north).	Approximate longitude (west).	Number of quakes reported.
ARIZONA.	° ′	° ′		CALIFORNIA.	° ′	° ′	
Aztec	32 49	113 28	1	Aguanga	33 27	116 55	2
Bouse	33 57	114 01	1	Arroyo Seco	34 07	118 11	1
Cibola	33 21	114 42	1	Bagdad	34 35	115 52	1
Crozier	35 24	113 40	1	Banning	33 55	116 53	1
Flagstaff	35 12	111 37	4	Barrett	32 42	116 41	3
Kingman	35 11	114 04	1	Barstow	34 54	117 02	1
Mohave City	35 02	114 38	1	Beaumont	33 55	117 00	3
Oatman	35 02	114 25	1	Big Bar	40 44	123 18	1
Parker	34 10	114 17	1	Bishop	37 23	118 24	3
Quartzite	33 40	114 11	1	Blythe	33 35	114 41	1
Salome	33 47	113 37	1	Bonita	32 39	117 03	2
Seligman	35 19	112 51	1	Boulder Creek	37 08	122 07	1
Somerton	32 35	114 43	1	Brawley	33 00	115 31	1
Truxton	35 18	113 36	1	Cabazon	33 55	116 47	1
Wellton	32 40	114 08	1	Cahuilla	33 32	116 45	10
Wenden	33 49	113 32	1	Calexico	32 41	115 30	27
Yucca	34 52	114 09	1	Claremont	34 06	117 43	2
Yuma	32 45	114 36	2	Corona	33 53	117 34	3
				Coulterville	37 43	120 13	1
ARKANSAS.				Downieville	39 34	120 50	2
				El Cajon	32 48	116 59	3
Bauxite	34 33	92 24	1	Escondido	33 07	117 06	3
Black Rock	36 08	91 02	2	Eureka	40 48	124 11	8
Brinkley	34 53	91 07	1	Fairmont	34 45	118 26	1
Carlisle	34 47	91 39	1	Fontana	34 06	117 27	1
England	34 32	91 52	1	Fort Bragg	39 25	123 47	1
Hardy	36 19	91 21	1	Fresno	36 43	119 49	1
Hoxie	36 03	90 55	1	Hemet	33 44	116 58	21
Jonesboro	35 51	90 39	1	Hollywood	34 06	118 20	1
Little Rock	34 45	92 06	1	Imperial	32 51	115 33	1
Lonoke	34 47	91 49	1	Indio	33 43	116 13	3
Pine Bluff	34 13	91 54	1	Julian	33 04	116 36	3
Pocahontas	36 15	90 56	1	Keeler	36 38	117 52	1
Scott	34 43	92 01	1	Laguna Beach	33 31	117 47	1
Searcy	35 15	91 39	1	Lakeport	39 03	122 56	1