SEISMOLOGY.

W. J. HUMPHREYS, Professor in Charge.

[Dated: Weather Bureau, Washington, D. C., July 2, 1919.]

TABLE 1.—*Noninstrumental earthquake reports, May, 1919.*

Day.	Approximate time, Greenwich civil.	Station.	Approximate latitude.	Approximate longitude.	Intensity Rossi-Forel.	Number of shocks.	Duration.	Sounds.	Remarks.	Observer.
	H. m.	ARIZONA.	° ′	° ′			*M. s.*			
23	11 05	Flagstaff	35 12	111 37	3	1	Few.	None		G. T. Herrington.
		CALIFORNIA.								
2	8 25±	Kennett	40 45	122 24	4	1			Awakened some people	Jos. F. Beattie.
2	8 30	Anderson	40 30	122 22	5	1				Assoc. Press.
		Kennett	40 45	122 24	5	1		Rumbling	Awakened many people	Jos. F. Beattie.
		Redding	40 35	122 25	5	1				Assoc. Press.
2	8 38	Kennett	40 45	122 24	3–4	1				Jos. F. Beattie.
10	7 55	Lone Pine	36 37	118 01	4	2	Few.	None	Windows rattled	G. F. Marsh.
29	20 17	Calexico	32 41	115 30	3	1	½	Rumbling		H. M. Rouse.
		ILLINOIS.								
25	9 45	McLeansboro	38 07	88 33	3	1		Rumbling		A. E. Wilson.
		Mount Carmel	38 25	87 48	4	1		do		H. W. Seine.
		Olney	38 05	88 07	4	2		do		J. T. Ratcliffe.
		Springfield	39 48	89 39	3	1			May not be seismic	Mrs. M. W. Draper.
26	13 25½	Cairo	37 00	89 10	3	3	6	None	Windows rattled	U. S. Weather Bureau.
		INDIANA.								
25	9 45	Booneville	38 04	87 16	4				Doors banged	Wm. B. Bethell.
		Evansville	37 58	87 33	3	1		Rumbling		U. S. Weather Bureau.
		Mount Vernon	37 56	87 54	4–5	2		do	Awakened people	Guy B. Green.
		New Harmony	38 08	85 56	4	1	60	do	do	C. P. Wolfe.
		Petersburg	38 31	87 15	3–4	1	50	do	Shook buildings	David D. Corre.
		Princeton	38 23	87 34	4–5	2	60	do		R. R. Marshall.
		Vincennes	38 42	87 32	4–5				Awakened many people	Edward Cress.
		Washington	38 40	87 11	4	1	5	None		Chas. C. Feagans.
		KANSAS.								
27	3 06	Wichita	37 41	97 20	4–5	1	4	Rumbling	Furniture moved	U. S. Weather Bureau.
		KENTUCKY.								
23	12 30	Hickman	36 34	89 12	3	1	60	Rumbling		R. A. Johnson.
24	13 30	do	36 34	89 12	3	1		do		Do.
25	9 45	Louisville	38 15	85 45	2–3	1	Few.	None	Noticed by people awake	Mrs. J. B. Harris.
		do	38 15	85 45	2–3	1	10	do	Awakened people	Dr. G. C. Smith.
		Taylorsville	38 02	85 21	2	1	6	Rumbling		E. S. Speed.
26	13 25	Bardwell	36 52	89 01	2	1	10	do		Oscar Bodkin.
		Hickman	36 34	89 12	3	1		do		R. A. Johnson.
28	11 30	do	36 34	89 12	2	1	30	None		Do.
		MISSOURI.								
26	13 25	New Madrid	36 35	89 32	3	1	Few.	Rumbling		Miss Josie Smith.
		TENNESSEE.								
28	13 45	Tiptonville	36 24	89 30	3	1		None		Lucille Morris.
		UTAH.								
7	23 30	Moroni	39 32	111 30	2–3	1		None	Windows rattled	B. G. Eliason.

TABLE 2.—*Instrumental seismological reports, May, 1919.*

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

[For significance of symbols see REVIEW for January, 1919, p. 59.]

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

Lat., 30° 41′ 44″ N.; long., 88° 08′ 46″ W. Elevation, 60 meters.

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

(No earthquake recorded during May, 1919.)

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.. E: V 10, T_0 17.7; N: V 10, T_0 16.6

Date.	Character.	Phase.	Time.	Period T.	Amplitude. A_E	Amplitude. A_N	Distance.	Remarks.
1919.			H. m. s.	Sec.	μ	μ	km.	
May 3	.....	P_E	1 01 08	3	.....	.....	.....	Very slight motion.
		eS_E	1 08 30	.....	.....	.....	.....	
		eS_N	1 08 35	.....	.....	.....	.....	
		eL_E	1 21 00	.....	.....	.....	.....	
		eL_N	1 24 23	.....	.....	.....	.....	
		M_E	1 25 44	15	20	.....	.....	
		M_N	1 26 45	.....	.....	30	.....	
		F_N	1 40 ..	.....	.....	.....	.....	
		F_E	2 07 ..	9	.....	.....	.....	
6	.....	eP_E	20 04 56	.....	.....	.....	.....	Indefinite.
		eP_N	20 06 25	.....	.....	.....	.....	Just one wave.
		L_N	20 20 00	.....	.....	.....	.....	
		L_E	20 20 32	27	.....	.....	.....	L_E well defined.
		M_E	20 23 17	20	40	.....	.....	
		M_N	20 23 26	14	.....	80	.....	
		C_N	20 24 ..	.....	.....	.....	.....	
		C_E	20 28 ..	20	.....	.....	.....	
		F_N	20 40 ..	.....	.....	.....	.....	
		F_E	20 51 ..	18	.....	.....	.....	
18	.....	P_N	9 36 51	.....	.....	.....	.....	Motion on N-S very slight. Felt by a number of people in Sitka. Shook pictures and furniture.
		P_E	9 37 00	.....	.....	.....	.....	
		M_E	9 37 12	.....	60	.....	.....	
		F_N	9 41 30	.....	.....	.....	.....	
		F_E	9 45 00	5	.....	.....	.....	
18	.....	P_N	10 24 14	.....	.....	.....	.....	Felt in Sitka.
		P_E	10 24 26	.....	.....	.....	.....	
		M_E	10 24 52	.....	540	.....	.....	
		M_N	10 24 57	.....	.....	120	.....	
		F_N	10 27 20	.....	.....	.....	.....	
		F_E	10 44 50	6	.....	.....	.....	
20	.....	eP_E	4 27 00	.....	.....	.....	.....	Nothing on N-S.
		eL_E	4 28 00	.....	.....	.....	.....	
		F_E	4 36 ..	.....	.....	.....	.....	

Arizona. *Tucson. Magnetic Observatory.* U. S. Coast and Geodetic Survey. Wm. 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.. E: V 10, T_0 14; N: V 10, T_0 18

Date.	Character.	Phase.	Time.	Period T.	Amplitude. A_E	Amplitude. A_N	Distance.	Remarks.
1919.			H. m. s.	Sec.	μ	μ	km.	
May 3	.....	eS_N	1 14 15	.....	.....	10	.....	Nothing on E-W.
		F_N	1 42 ..	.....	.....	.....	.....	
6	.....	L_N	20 21 30	37	.....	.....	.....	P and S masked by defective record. Only a faint record on E-W.
		M_N	20 23 20	37	.....	100	.....	
		C_N	20 32 ..	12	.....	.....	.....	
		F_N	21 05 ..	.....	.....	.....	.....	

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.

Date.	Character.	Phase.	Time.	Period T.	Amplitude. A_E	Amplitude. A_N	Distance.	Remarks.
1919.			H. m. s.	Sec.	μ	μ	km.	
May 22	.....	.....	.....	.....	*200	*200	.....	Tremors during 24 hours preceding 15h on date given.

*Amplitude on instrument.

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.

Instrumental constants .....

Date.	Character.	Phase.	Time.	Period T.	Amplitude. A_E	Amplitude. A_N	Distance.	Remarks.
1919.			H. m. s.	Sec.	μ	μ	km.	
May 3	.....	L_N	1 31 —	.....	.....	.....	.....	P and S not discernible. Weak and irregular on both components.
		L_E	1 35 —	.....	.....	.....	.....	
		C_N	1 36 —	.....	.....	.....	.....	
		C_E	1 42 —	.....	.....	.....	.....	
		F_E	1 50 —	.....	.....	.....	.....	
		F_N	2 00 —	.....	.....	.....	.....	
6	.....	P	20 28 —	.....	.....	.....	.....	Waves on N-S are very weak and indistinct. S? L_N? C_N?
		M_N	20 32 —	.....	.....	*1,000	.....	
		L_E	20 40 —	15	.....	.....	.....	
		M_E	20 41 —	15	*1,000	.....	.....	
		C_E	20 47 —	.....	.....	.....	.....	
		F_E	21 03 —	.....	.....	.....	.....	
		F_E	21 08 —	.....	.....	.....	.....	
31	.....	L_E	12 20 —	.....	.....	.....	.....	Distinct wavelets on E-W.
		F_E	14 04 —	.....	.....	.....	.....	

*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.
1919.			H. m. s.	Sec.	μ	μ	km.	
May 1	.....	S_N?	5 59 40	.....	.....	.....	.....	
		L	6 08 30	20	.....	.....	.....	
		L	6 23 —	16	.....	.....	.....	
		F	6 30 —	.....	.....	.....	.....	
2	.....	e	2 57 30	.....	.....	.....	.....	
		L	3 02 30	18	.....	.....	.....	
		L	3 12 —	16	.....	.....	.....	
		F	3 40 —	.....	.....	.....	.....	
3	.....	P	1 05 10	.....	.....	.....	10,110	
		PR_1	1 08 52	.....	.....	.....	.....	
		PR_2	1 10 40	.....	.....	.....	.....	
		S	1 16 13	.....	.....	.....	.....	
		L	1 34 —	40	.....	.....	.....	
		L	1 42 —	20	.....	.....	.....	
		L	1 48 —	16	.....	.....	.....	
		F	3 40 —	.....	.....	.....	.....	
6	.....	eP	20 01 00	.....	.....	.....	10,720	
		S	20 12 30	.....	.....	.....	.....	
		L	20 33 30	40	.....	.....	.....	
		L	20 39 40	18	.....	.....	.....	
		L	20 49 —	20	.....	.....	.....	
		L	21 04 —	16	.....	.....	.....	
		F	22 40 —	.....	.....	.....	.....	
18	.....	e_N	9 56 50	.....	.....	.....	.....	Not on E-W.
		F	10 10 10	.....	.....	.....	.....	
18	.....	e	10 42 10	.....	.....	.....	.....	
		S	10 45 07	.....	.....	.....	.....	
		L?	10 47 10	.....	.....	.....	.....	
		F	11 15 00	.....	.....	.....	.....	
20	.....	P	4 27 10	.....	.....	.....	.....	S not discernible.
		eL	4 40 35	.....	.....	.....	.....	
		F	5 15 00	.....	.....	.....	.....	
22	.....	P	12 03 26	.....	.....	.....	7,175	
		S	12 12 04	.....	.....	.....	.....	
		eL	12 24 45	.....	.....	.....	.....	
		L	12 30 30	16	.....	.....	.....	
		F	12 50 —	.....	.....	.....	.....	

TABLE 2.—*Instrumental seismological reports, May, 1919*—Continued.

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..

	V	T_0	ε
E	165	5.4	0
N	143	5.2	0
Z	*80*	*3.0*	*0*

Date.	Character.	Phase.	Time.	Period T.	Amplitude. A_E	Amplitude. A_N	Distance.	Remarks.
1919.			*H. m. s.*	*Sec.*	*μ*	*μ*	*km.*	
May 1		L_E	6 06 11	20				Does not show on N-S.
		F	6 40 ..					
2		e_E	2 36 19					Microseisms present.
		eL_E	3 02 12	18				
		eL_N?	3 02 12	18				
		F	3 53 ..					
			Vertical					
		eL	*3 01 54*	*24*				
		F	*3 55* ..					
3		eP	1 05 13					Heavy microseisms present.
		P_NR	1 08 57					
		S_N	1 16 13					
		S_E	1 16 16					
		eL_E	1 37 12	27				
		eL_N	1 37 12	11				
		M_E	1 43 10	21	*700			F. 4h.
			Vertical					
		iP	*1 05 04*					
		i	*1 08 46*					
		S	*1 16 17*					
		eL	*1 36 00*					
5		L_E	5 06 11 5 12 ..	27				Does not show on N-S.
6		eP_E	20 00 40					Heavy microseisms present.
		eP_N	20 00 49					
		eS	20 12 33					
		eL_E	20 33 36	27				
		eL_N	20 34 00	22				
		M_N	20 43 41	14		*700		
		M_E	20 51 ..	16	*1,800			F, 23h.
18		e	10 41 05					
		S	10 45 15					
		eL_E?	10 47 12	6				
		F	11 50 ..					
20		e_E	4 27 15					
		e_N	4 32 ..					
		e_E	4 32 43					
		eL	4 41 00	14				
		F	4 47 ..					
22		eP_N	12 03 18					Heavy microseisms present.
		ePE	12 03 20					
		S	12 12 01					
		eL	12 30 06	13				F, 13h.

* Trace amplitude.

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..T_0 18.4. Sensitiveness 0.40 arc tilt″=1 mm.

Date.	Character.	Phase.	Time.	Period T.	Amplitude. A_E	Amplitude. A_N	Distance.	Remarks.
1919.			*H. m. s.*	*Sec.*	*μ*	*μ*	*km.*	
May 1		L	5 46 ..	19				
		M	6 51 12		*400			
		C	7 00 ..					
		F	7 16 ..					
1		L	21 38 ..	18				
		M	21 56 00		*400			
		C	22 02 ..					
		F	22 14 ..					
2		P	2 15 12	19				
		S	2 22 00					
		L	2 25 18	19				
		M	2 34 00	20	*2,500			
		C	2 41 ..	20				Tremors for several hours.

*Trace amplitude.

Hawaii. *Honolulu. Magnetic Observatory*—Continued.

Date.	Character.	Phase.	Time.	Period T.	Amplitude. A_E	Amplitude. A_N	Distance.	Remarks.
1919.			*H. m. s.*	*Sec.*	*μ*	*μ*	*km.*	
May 3		P	1 01 06	20				
		L	1 08 12	20				
		M	1 23 00	21	*12,000			
		C	1 29 ..					
		F	4 20 ..					
4		L	22 58 ..	20				
		M	23 11 30	20	*100			
		F	23 53 ..					
6		P	4 24 00					
		L?	4 27 48	20				
		M	4 37 00	18	*400			
		C	4 43 ..					
		F	5 20 ..					
6		P	19 50 00	20				Pendulum swung off the paper at 20:08:06 from 20:12:48 to 20:14:36 and from 20:16:30 to 20:18:48.
		i	19 56 30	18				
		i	19 59 30					
		L	20 05 30					
		M	20 14 00	18	*17,000			
		C	21 21 ..					
		F	24 47 ..	19				Apparently two shocks.
7		P	5 25 06	17				The two phases (I) may be P and S corresponding to L, judging by the time intervals.
		i	5 32 06	20				
		i	5 38 12					
		L	5 43 24					
		M	5 48 18	19	*4,500			
		C	5 58 ..					
		F	10 03 ..	20				
8		L	5 12 ..					
		M	5 15 30	20	*100			
		F	5 18 ..					
8		P	10 21 54	20				
		iS	10 25 42	20				
		eL	10 30 ..					
		M	10 35 ..	18	*400			
		C	10 40 ..	17				
		F	11 30 ..	20				
8		eL	18 38 ..					
		M	18 43 30	20	*200			
		F	18 49 ..					
8		P	19 25 30					
		eL	19 30 ..					
		M	19 31 18	15	*200			
		C	19 40 ..	20				
		F	21 26 ..	..				A few isolated tremors.
16		eP	1 24 54	18				
		eL	1 38 ..					
		M	1 42 30	19	*100			
		F	1 54	..				
18		L	10 40 30					
		M	10 41 00	19	*100			
		F	10 43 ..					
19		eP	4 19 12	20				
		L	4 25 ..					
		M	4 28 06		*300			
		C	4 31 ..	20				
		F	4 52 17					
20		P	4 33 36		*200			Local tremors; waves irregular.
		F	4 45 ..	20				
22		eP	12 04 42					
		eL	12 08 24					
		M	12 09 54	19	*500			
		C	12 18 ..					
		F	12 55 ..	19				
23		eP	3 39 48					
		eL	3 47 ..					
		M	3 52 06	18	*200			
		F	4 00 ..	18				
27		eP	17 40 24					P is faint. L is obscured by other activity.
		eS	17 45 48	20				
		eL	17 49 30					
		M	17 54 ..	20	*400			
		C	18 04 ..	17				
		F	18 21 ..	20				
28		eP	3 22 ..					
		L	3 25 ..					
		M	3 30 ..	20	*200			
		F	3 54 ..					

*Trace amplitude.

TABLE 2.—*Instrumental seismological reports, May, 1919*—Continued.

Illinois. *Chicago. University of Chicago.* U. S. Weather Bureau.

Lat., 41° 47′ N., long., 87° 37′ W. Elevation, 180.1 meters.

Instruments: Two Milne-Shaw horizontal pendulums, 0.45 kg.

Instrumental constants.. V, T_0, ε, Sensitivity.
E 150 12 20:1 1″arc tilt=26.6 mm.
N 150 8 20:1 1″arc tilt=13.2 mm.

Date.	Character.	Phase.	Time.	Period T.	Amplitude. A_E	Amplitude. A_N	Distance.	Remarks.
1919.			*H. m. s.*	*Sec.*	μ	μ	*km.*	
May 1		S?	5 59 40					
		L	6 08 55	25				
		L	6 13 00	18				
		F	7 30 ..					
2		P?	2 21 14				9,310	
		S	2 31 40					
		L	2 58 00	25				
		L	3 04 ..	18				
		F	5 20 ..					
2		P?	5 58 06				11,810?	
		S	*6 10 20*					
		L	6 32 30					F merges with long period disturbance that continues for hours.
		L	7 06 00	18				
2		eL	21 01 00					
		L	21 10 30	18				
		F	21 40 ..					
3		iP	1 04 35				9,290	
		PR	1 07 54					
		S	1 15 00					
		L	1 31 42	40				
		L	1 47 00	18				Continues with same period and small amplitude for over an hour.
		L	2 02 55	18				
		F	5 20 ..					
4		P	22 58 08				8,740	
		S	23 08 05					
		L	23 25 00					
		L	23 33 00	18				
5		F	0 40 ..					
6		S?	4 34 33					
		L?	4 55 30					
		L	5 01 ..	18				
		F	6 30 ..					
6		P	19 59 20				10,725	
		S	20 10 50					
		L	20 31 ..	35				
		L	20 50 ..	18				
		F	23 40 ..					
7		P	5 32 46				9,060	
		S	5 43 00					
		L	6 02 20					
		L	6 08 ..	30				
		L	6 15 .	18				
		L	6 30 ..	16				Merges into other disturbances at 8h.
8		P?	10 19 30				12,810?	
		S	10 32 20					
		L	10 59 00	18				
		L	11 18 00	16				F lost in disturbances after 12h.
8		L?	21 21 ..					All phases uncertain.
11		eL	10 58 20					
		L	11 01 ..	16				
		F	11 30 ..					
14		eL	4 42 ..					
		F	*5 10* ..					
18		e	9 53 54					
		F	10 05 ..					
18		P?	10 37 00				1,990?	
		S	10 40 22					
		L?	10 44 ..					
		F	11 30 ..					
18		eL	22 44 ..					
		L	22 46 20	18				
		L	23 00 ..	16				
		F	23 20 ..					
19		eL	4 45 30					
		L	4 47 30	24				
		L	4 55 ..	18				
		F	5 20 ..					
20		P	4 26 23				3,080	
		S	4 31 12					
		L	4 34 30					
		L	4 36 00	16				
		F	5 50 ..					

Illinois. *Chicago. University of Chicago*—Continued.

Date.	Character.	Phase.	Time.	Period T.	Amplitude. A_E	Amplitude. A_N	Distance.	Remarks.
1919.			*H. m. s.*	*Sec.*	μ	μ	*km.*	
May 22		P_E	12 02 47				6,425	N-S component not working.
		S_E	12 10 46					
		L_E	12 20 42					
		L_E	12 25 ..	18				
		L_E	12 44 30	16				
		F_E	15 00 ..					
23		eL	6 59 30					
		L	7 06 ..	28				
		L	7 17 ..	15				
		F	8 00 ..					
27		e	17 47 24					
		L	18 05 20	24				Merges with disturbance that continues for some time.
		F	18 40 ..					
28		L	3 40 ..	24				
		F	4 00 ..					
29		L	11 59 ..	24				
		L	12 10 ..	15				
		F	12 30 ..					

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 4:1
N 205 3.4 4:1

(Report for May, 1919, 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 15
N 10 15

Date.	Character.	Phase.	Time.	Period T.	Amplitude. A_E	Amplitude. A_N	Distance.	Remarks.
1919.			*H. m. s.*	*Sec.*	μ	μ	*km.*	
May 3		P_N	1 05 14					L and succeeding portions of E-W are barely discernible.
		P_E	1 05 25	4				
		S_N	1 16 14					
		S_E	1 16 19	5				
		eL_N	1 38 50					
		eL_E	1 42 00					
		M_E	1 54 00	15	10			
		M_N	1 54 37	16		80		
		C_N	2 08 ..	15				
		F_N	3 10 ..					
6		eP_E	20 02 45					
		eP_N	20 03 51					
		eL_N	20 34 ..					
		eL_E	20 36 ..					
		M_N	20 50 00	20		170		
		M_E	21 01 20	16	40			
		C_E	21 11 ..	16				
		C_N	21 18 ..	17				
		F_E	21 39 ..	16				
		F_N	22 17 ..					
18		P_N	10 45 12	4				Faint, near-by shock.
		P_E	*10 45 16*	4				
		M_E	10 45 40		30			
		M_N	10 46 02			30		
		C	*10 54* ..					
20		eP_N	4 36 45					Very faint; nothing on E-W.
		eL_N	4 41 ..					
		C	4 56 ..					

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.
1919.			*H. m. s.*	*Sec.*	μ	μ	*km*	
May 1		O?	*7 23 54*				7,280?	65° 31′ of arc. First phase masked by microseisms.
		S_N?	7 43 32	6				
		eL_N?	7 56 02	40?				
		L_N	7 56 44	24				
		L_E	8 02 26	25				
		L_N	8 03 48	20				
		L_E	8 04 37	24				
		M_E?	8 07 35	20				
		F	8 38 ..					

TABLE 2.—*Instrumental seismological reports, May, 1919*—Continued.

Massachusetts. *Cambridge. Harvard University Seismographic Station*—Continued.

Date.	Character.	Phase.	Time.	Period T.	Amplitude. A_E	Amplitude. A_N	Distance.	Remarks.
1919.			*H. m. s.*	*Sec.*	μ	μ	*km.*	
May 2	.....	*O?*	*2 09* ..	.....	.....	.....	10,700	Distance from eL–S
		P_N?	2 22 19	.....	.....	.....	.....	
		S_N?	2 34 29	12	.....	.....	.....	
		i_N	2 36 24	7	.....	.....	.....	
		eL_N	2 56 21	32	.....	.....	.....	
		L_N	2 58 54	18	.....	.....	.....	
		M_N?	3 08 ..	17	.....	.....	.....	
		F	4 38 ..	.....	.....	.....	.....	
3	.....	*O?*	*0 51 33*	.....	.....	.....	10,525?	Distance from eL–P. S phases rather vaguely defined. Possibly begins with PR_1, making distance 11,790 km. and *O*:0h46m 11s. Cf. La Paz, distance 14,260 km *O*:0h 51m.
		eP	1 05 01	3	.....	.....	.....	
		i_N	1 08 37	17	.....	.....	.....	
		i_E	1 15 32	16	.....	.....	.....	
		S_N	1 16 ..	.....	.....	.....	.....	
		eL_N	1 37 44	30	.....	.....	.....	
		L_N	1 38 01	32	.....	.....	.....	
		L_E	1 40 15	24	.....	.....	.....	
		M_N	1 54 ..	.....	.....	.....	.....	
		M_N	1 55 ..	.....	.....	.....	.....	
		F	5 19 ..	.....	.....	.....	.....	
4	.....	L_E	23 42 02	20	.....	.....	.....	No trace on N–S.
		L	23 44 32	18	.....	.....	.....	
5	.....	F	0 10 ..	.....	.....	.....	.....	
6	.....	L_E	7 09 16	20	.....	.....	.....	Not trace on N–S.
		L	7 10 24	18	.....	.....	.....	
		F	7 28 37	.....	.....	.....	.....	
6	.....	*O*	*19 47 13*	.....	.....	.....	10,640	95°/45′ of arc.
		eP_E	20 00 57	.....	.....	.....	.....	
		e_E	20 02 13	6	.....	.....	.....	
		e_N	20 02 33	6	.....	.....	.....	
		S_E	20 12 12	12	.....	.....	.....	
		e_E	20 16 46	15	.....	.....	.....	
		i_N	20 20 07	24	.....	.....	.....	
		i_E	20 20 27	20	.....	.....	.....	
		eL_N	20 33 52	78	.....	.....	.....	
		eL_E	20 33 54	60	.....	.....	.....	
		L	20 36 17	48	.....	.....	.....	
		L	20 37 00	9–15	.....	.....	.....	
		L	20 41 02	35	.....	.....	.....	
		eM_E	20 42 54	18	.....	.....	.....	
		M_E	20 44 46	14	.....	.....	.....	Several maxima from 20h 56m 02s to 21h 17m 25s with periods from 18 to 15 secs.
		C_E	21 29 22	.....	.....	.....	.....	
		F	23 16 30	.....	.....	.....	.....	
7	.....	L_E	11 05 18	20	.....	.....	.....	Indistinct on N–S. eE, 11h.
		F	11 31 ..	.....	.....	.....	.....	
18	.....	*O?*	*8 53* ..	.....	.....	.....	.....	Distance under 2,000 km.
		e_N	8 57 44	2	.....	.....	.....	
		e_E	8 57 59	.....	.....	.....	.....	
		i_N	8 58 29	6	.....	.....	.....	
		L_E	9 01 59	10	.....	.....	.....	
		F	9 05 ..	.....	.....	.....	.....	
18	.....	e_E	10 42 55	.....	.....	.....	.....	*O*? 10h. Distance around 2,000 km. Cf. preceding.
		e_N	10 43 19	.....	.....	.....	.....	
		L_N	10 45 40	.....	.....	.....	.....	
		L_E?	10 45 43	6	.....	.....	.....	
		L_E	10 46 21	8	.....	.....	.....	
		F	11 35 ..	.....	.....	.....	.....	
20	.....	*O?*	*4 31 11*	.....	.....	.....	2,805	25° 13′ of arc.
		iP_E	4 36 49	.....	.....	.....	.....	From the west.
		iP_N	4 36 59	.....	.....	.....	.....	From the north.
		e_E	4 40 20	6	.....	.....	.....	*O* and distance from L–P.
		e_N	4 41 15	.....	.....	.....	.....	
		e_N	4 41 36	.....	.....	.....	.....	
		eL_E	4 42 29	13	.....	.....	.....	
		eL_N	4 42 31	12	.....	.....	.....	
		M_N	4 45 01	.....	.....	.....	.....	
		M_E	4 45 24	.....	.....	.....	.....	
		C_N	4 45 31	.....	.....	.....	.....	
		F_E	5 15 ..	.....	.....	.....	.....	
22	.....	O	*11 52 00*	.....	.....	.....	7,790	70° 16′ of arc. Changing records from 12h 09m to 12h 26m.
		P_N	12 03 10	2	.....	.....	.....	
		S_E	12 12 19	8	.....	.....	.....	
		eL_N	12 26 20	20	.....	.....	.....	
		L_E	12 30 06	18	.....	.....	.....	
		L_E	12 33 10	22	.....	.....	.....	
		C_E	12 43 14	10–12	.....	.....	.....	
		F?	13 02 ..	.....	.....	.....	.....	

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..80 V 7 T_0 5:1 ϵ

(Report for May, 1919, not received.)

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..{E 13 V 22 T_0 4:1 ϵ; N 14 25 4:1}

Date.	Character.	Phase.	Time.	Period T.	Amplitude. A_E	Amplitude. A_N	Distance.	Remarks.
1919.			*H. m. s.*	*Sec.*	μ	μ	*km.*	
May 1	.....	e_E	6 00 15	4	.....	.....	.....	
		eL_E	6 06 25	23	.....	.....	.....	
		F_E	6 34 —	.....	.....	.....	.....	
2	.....	eL_E	3 01 30	20	.....	.....	.....	
		F_E	4 00 —	.....	.....	.....	.....	
3	.....	P_E	1 04 53	4	.....	.....	.....	
		P_N	1 04 56	4	.....	.....	.....	
		PR_1	1 08 12	5	.....	.....	.....	
		S_N	1 14 49	5	.....	.....	.....	
		S_E	1 15 09	6	.....	.....	.....	
		L_N?	1 25 26	22	.....	.....	.....	
		L_E	1 31 50	44	.....	.....	.....	
		F_E	3 54 —	.....	.....	.....	.....	
4	.....	L_E	23 44 20	17	.....	.....	.....	
5	.....	F_E	0 03 —	.....	.....	.....	.....	
6	.....	eP_E	20 01 49	6	.....	.....	.....	
		L	20 32 25	28	.....	.....	.....	
		F	23 05 —	.....	.....	.....	.....	
7	.....	e_E	2 49 27	11	.....	.....	.....	
		e_E	2 51 58	7	.....	.....	.....	
		L_E	2 54 33	24	.....	.....	.....	
		F_E	3 05 —	.....	.....	.....	.....	
18	.....	eP_E	10 43 40	3	.....	.....	.....	Phases overlapping N–S not recording.
		F_E	10 54 —	.....	.....	.....	.....	
20	.....	e_N	4 39 17	5	.....	.....	.....	
		L_E	4 40 13	17	.....	.....	.....	
		F_E	5 04 —	.....	.....	.....	.....	

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

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

Instrument: Wiechert, 80 kg.

Instrumental constants..{E 72 V 5.0 T_0 0 ϵ; N 72 5.0 0}

(Report for May, 1919, 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, 25 kg.

Instrumental constants..10 V 20 T_0

Date.	Character.	Phase.	Time.	Period T.	Amplitude. A_E	Amplitude. A_N	Distance.	Remarks.
1919.			*H. m. s.*	*Sec.*	μ	μ	*km.*	
May 6	.....	L_N	8 35 30	.....	.....	.....	.....	
		L_E	8 40 30	.....	.....	.....	.....	
		M_N	8 50 00	.....	.....	*600	.....	
		M_E	8 56 00	.....	*900	.....	.....	
		F	9 28 00	.....	.....	.....	.....	

* Trace amplitude.

TABLE 2.—*Instrumental seismological reports, May, 1919*—Continued.

Porto Rico. *Vieques. Magnetic Observatory.* U. S. Coast and Geodetic Survey. W. 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 19}

Date.	Character.	Phase.	Time.	Period T.	Amplitude. A_E	Amplitude. A_N	Distance.	Remarks.
1919.			*H. m. s.*	*Sec.*	μ	μ	*km.*	
May 2		eL_E	3 04 28	18	10			Nothing definite on N.
		F_E	3 12 ..	18				
3		eE	1 11 39					Probably PR_1.
		eN	1 11 48					Do.
		eN	1 21 27					
		eL_E	1 43 40					
		eL_N	1 54 30					
		M_E	1 54 07	18	20			
		M_N	2 00 58	19		30		
		F_N	2 18 ..					
		F_E	3 18 ..	16				
6		eP_E	20 01 58					
		eP_N	20 02 05					
		L_E	20 40 15	40				
		L_N	20 40 46	40				Well defined.
		M_E	21 00 02	18	120			
		M_N	21 00 20	19		60		
		C_N	21 11 ..	19				
		C_E	21 21 ..	16				
		F_N	21 54 ..	19				
		F_E	22 05 ..	16				
23		eP_E	3 18 10	13	10			Nothing on N.
		F_E	3 44 ..					

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.
1919.			*H. m. s.*	*Sec.*	μ	μ	*km.*	
May 2		eL	3 07 ..	16				
		F	3 20 ..					
3		P	1 04 57				9,450	
		S	1 15 30					
		eL	1 37 ..					
		L	1 54 ..	16				
		F	2 45 ..					
6		eP	20 01 20				9,700	
		S	20 12 05					
		L	20 35 00	40				
		L	20 41 30	16				
		L	20 56 00	20				
		L	21 03 00	16				
		F	22 05 ..					
18		e	10 43 35					
		F	11 00 ..					
20		e_N	4 36 ..					
		F	4 55 ..					
22		e	12 30 00					
		L	12 33 30					
		F	12 45 ..					

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 80k. vertical seismograph.

Instrumental constants..V 120, T_0 26

(Report for May, 1919, not received.)

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..T_0 18. Pillar deviation, 1 mm. swing of boom=0.45″.

Date.	Character.	Phase.	Time.	Period T.	Amplitude. A_E	Amplitude. A_N	Distance.	Remarks.
1919.			*H. m. s.*	*Sec.*	μ	μ	*km.*	
May 1		eL	6 09 00					Gradual thickening.
		M	6 15 54		*800			
		F?	6 50 18					
		I	2 33 54					
2		L	2 54 42					
		eL	3 02 42					
		M	3 08 42		*2200			
		F	4 36 54					
3		eP	1 05 18				9,520	Phases clearly marked.
		eS	1 15 54					
		i	1 22 00					
		L	1 30 00					
		iL	1 40 48					
		iL	1 46 30					
		M	1 48 48		*6800			
		F	2 16 42					
4		L	23 41 24					
		eL	23 43 00					
		M	23 44 30		*200			
		F	23 54 12					
6		L	5 05 18					
		eL	5 07 18					
		M	5 10 54		*300			
		F?	6 01 00					
6		e	20 00 00				9,520	
		eP	20 01 24					
		P	20 02 12					
		iP	20 04 54					
		iP	20 07 24					
		S	20 12 00					
		eS	20 12 48					
		L	20 20 06					
		L	20 24 06					
		L	20 39 30					
		iL	20 43 36					
		iL	20 47 36					Well defined vibrations continue until 21h 33m.
		iL	20 49 36					
		M	20 52 36		*7800			
		M	21 02 54		*8500			
		eL	21 56 00					Increase of movement.
		M	22 00 30		*3500			
7		F?	0 47 36					
7		L	5 44 12		*100			
		F	5 48 18					
7		P	5 59 36					
		e	6 08 30					
		S?	6 10 30					
		eS?	6 12 54					
		e	6 16 36					
		eL	6 23 00					
		M	6 31 00		*1400			
		eL*rep.*	7 25 54					
		M	7 29 06		*200			
		F	7 46 06					
7		L	10 28 18					
		M	10 33 24		*50			
8		e?	10 50 30					
		L	11 03 00					
		eL	11 04 48					
		M	11 08 42		*400			
8		M	21 11 12		*50			
14		L	4 49 18		*50			
		F	4 55 36					
18		i	12 34 30					Probably off west coast of Vancouver Island.
		eL	12 44 00					
		M	12 44 24		*400			
		F	13 08 30					
19		L?	5 01 36		*50			

* Trace amplitude.

TABLE 2.—*Instrumental seismological reports, May, 1919*—Continued.

Canada. *Toronto. Dominion Meteorological Service*—Continued.

Date.	Character.	Phase.	Time.	Period T.	Amplitude. A_E	Amplitude. A_N	Distance.	Remarks.
1919.			*H. m. s.*	*Sec.*	*μ*	*μ*	*km.*	
May 20		e	4 29 12					
		L	4 38 42					
		eL	4 41 42					
		M	4 42 06		*200			
		F	4 48 30					
22		L	12 11 18					
		L	12 24 36					
		eL	12 29 06					
		M	12 35 24		*800			
		F	13 14 12					
23		L	7 08 36					
		M	7 12 00		*200			Thickening.
		F	7 29 36					
27		L	17 51 30					
		L	18 03 42					
		M	18 08 30		*100			
		F	18 18 36					
29		eL	6 29 06					Gradual thickening
		M	6 30 06		*200			
		F	6 37 06					

* 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 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.
1919.			*H. m. s.*	*Sec.*	*μ*	*μ*	*km.*	
May 1		L	6 25 53					
		M	6 30 18		*100			
		F?	7 13 35					
1		L	16 10 42					
		M	16 16 36		*100			
1		L	22 09 14					
		M	22 14 38		*200			
		F	22 24 28					
2		P	2 29 37					
		L	2 41 33					
		M	2 50 28		*2,400			
		F	5 01 52					
2		M	7 06 18		*50			
3		P	1 01 55				7,530	
		S	1 10 51					
		L	1 24 44					
		M	1 30 02		*3,500			
		F	4 11 51					
4		L?	23 14 58					
		M	23 28 15		*100			
		F	23 49 23					
6		L?	4 49 26					
		M	4 54 21		*300			
		F	5 06 10					
6		P	19 56 51				6,860	
		S	20 05 13					
		L	20 18 59					
		M	20 37 40		*21,000			
7		F	1 04 44					
7		P	5 37 43				4,690	
		S	5 43 08					
		L	5 52 58					
		M	6 02 49		*1,000			
		$L_{rep.}$	7 40 51					
		M	7 44 09					
		M	7 49 27		*200			
		F	7 52 28					
7		M	10 07 15		*200			Very gradual thickening.
8		L	10 47 38					
		M	10 52 33		*500			
		F	11 00 26					

* Trace amplitude.

Canada. *Victoria, B. C. Dominion Meteorological Service*—Contd.

Date.	Character.	Phase.	Time.	Period T.	Amplitude. A_E	Amplitude. A_N	Distance.	Remarks.
1919.			*H. m. s.*	*Sec.*	*μ*	*μ*	*km.*	
May 8		M	21 06 53		*200			
		F	21 13 46					
14		M	4 35 06		*100			
18		P	10 28 47				270	Probably off west coast of Vancouver Island.
		L	10 29 17					
		M	10 30 16		*100			
		F	10 39 07					
			Vertical					
		P	*10 28 44*	*2*			*360*	
		L	*10 29 24*	*3*				
		M	*10 30 24*	*5*	*7*			
		F	*10 34 08*					
19		L	4 32 49					
		M	4 41 40		*500			
		F	4 52 29					
19		M	23 38 45		*200			
20		P	4 21 35				550	
		L	4 22 34					
		M	4 23 33		*1,500			
		F	4 39 46					
			Vertical					
		L	*4 22 30*	*16*				
		M	*4 23 34*	*14*	*6*			
22		L	12 04 54					
		M	12 07 21		*300			
		F	13 05 23					
23		P	7 06 23					
		M	7 17 42		*250			
		F	7 29 00					No further record until the 30th, supply of paper exhausted.

* Trace amplitude.

SEISMOLOGICAL DISPATCHES.[1]

Redding, Calif., May 2, 1919.

An earthquake of 15 seconds duration was felt here early to-day and also at Anderson, Calif. No damage was reported. (Assoc. Press.)

Laspalmas, Canary Islands, May 13, 1919.

Four people were killed in the earthquake which shook the island of Fuertaventura several days ago. The bulk of the population of the island has fled. Relief measures have been undertaken. (Assoc. Press.)

Flagstaff, Ariz., May 23, 1919.

A light earthquake shock at 5:05 o'clock this morning, following a night of rain, thunder, lightning, and snow roused the city from its slumbers but caused no material damage. The home of C. O. Lampland, astronomer at Lowell Observatory, was badly shaken. (Assoc. Press.)

Tokyo, Japan, May 24, 1919.

Sixteen thousand persons were killed or injured by a volcanic eruption in central Java on May 20. This information is contained in official advices from Batavia. (Assoc. Press.)

Vincennes, Ind., May 25, 1919.

Earthquake shocks lasting two minutes were felt here and at other places in southern Indiana and Illinois and western Kentucky to-day. Many persons were awakened by the tremors, but late to-night no reports of damage had been received. (Assoc. Press.)

Amsterdam, May 26, 1919.

The volcano of Kalut in Java has burst into eruption, wiping out 20 villages in the district of Brengat and 11 in the vicinity of Blitar, and causing deaths estimated at 15,000, according to a Central News dispatch received here. (Assoc. Press.)

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