SECTION V.—SEISMOLOGY.

SEISMOLOGICAL REPORTS FOR MARCH, 1918.

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[Dated: Seismological Investigations, Weather Bureau, May 2, 1918.]

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

Date.	Approximate time, Greenwich Civil.	Station.	Approximate latitude.	Approximate longitude.	Intensity Rossi-Forel.	Number of shocks.	Duration.	Sounds.	Remarks.	Observer.
		CALIFORNIA.								
1918.	*H. m.*		° ′	° ′			*Seconds.*			
Mar. 1	2 35	Bishop (18 miles W.)	37 22	118 47	3	1	2	No	Gradual trembling	William Barth.
	2 35	Round Valley (6 miles W.)	37 25	118 46	4	1	15	Yes	Rumbling and trembling	Glen H. Crow.
3	4 30	Eureka	40 48	124 11	3	1	Short.	No	Trembling	G. E. Kammerer.
5	11 00	Cahuilla	33 32	116 45	4	1		No	Water level in well fell 2 feet and rose several feet in well 3 miles north during following 48 hours and had not returned to former levels up to Apr. 8.	Hartwell W. Gardner.
	16 30									
6	16 15									
6	18 25	Arroyo Seco	34 07	118 11	4	1		No		W. D. Marx.
		Hollywood	34 06	118 20	5	1		No		Los Angeles Times.
		Los Angeles	34 03	118 15	5	1		No		U. S. Weather Bureau.
		Santa Monica	34 02	118 30	3	1	4	No	Twisting movement	W. F. Bates.
		Venice	33 58	118 28	5	1	7	Yes	Rumbling like an explosion, rocking NE.-SW.	Dr. Jas. T. Brown.
8	12 30	Ocean Park	34 02	118 30	4	2	Few.	Yes	Rumbling and bumping	A. W. Pugh.
		Venice	33 58	118 28	5	1	2	Yes	Rumbling and bumping	A. H. Anthony.
12	10 30	Downieville	39 34	120 50	8	1		No	A few chimneys toppled over during these two 'quakes.	San Francisco Chronicle.
12	12 30	Downieville	39 34	120 50	8	1		No		
21	23 25	Barrett (6 miles N.)	32 42	116 41	5	1	3	Yes	Loud rumbling and trembling	L. Watts.
30	16 05	Cahuilla	33 32	116 45	6	1		No		Hartwell W. Gardner.
		WASHINGTON.								
2	00 08	Walla Walla	46 02	118 20	3	2	1	No	Abrupt bumping N.-S	C. C. Garrett.
		LATE REPORT.								
		MICHIGAN.								
Feb. 22	Early morning.	Morrice	42 51	84 11	4	1	1	Yes	Abrupt bump. Frost crack 150 feet long, 4 feet deep. Numerous diverging cracks.	Mr. and Mrs. Buck.

TABLE 2.—*Instrumental seismological reports, March, 1918.*

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

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

Date.	Character.	Phase.	Time.	Period. T.	Amplitude. A_E	Amplitude. A_N	Distance.	Remarks.

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; N V 10 T_0 15

(No earthquake recorded during March, 1918.)

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 19; N V 10 T_0 19

(No earthquake recorded during March, 1918.)

Date.	Character.	Phase.	Time.	Period. T.	Amplitude. A_E	Amplitude. A_N	Distance.	Remarks.

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.

1918.			*H. m. s.*	*Sec.*	μ	μ	*km.*	
Mar. 5	.....	.....	.....	.....	100	100	.....	Tremors during 24 hours preceding 15^h.

TABLE 2.—*Instrumental seismological reports, March, 1918*—Continued.

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.*	
Mar. 10								Activity and thickening of pen marks at intervals during day.
14 to 22								Seismograph clock out of repair. Instrument not working.
22 to 31								No 'quakes recorded.

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.*	
Mar. 16		P	13 46 20					
		Prep¹	13 47 00					
		S	13 54 33					
		Srep¹	13 55 15					
		Srep²	13 56 55					
		eL	14 08 ..					
		L	14 13 30	20				
		F	14 25 ..					
19		eL	6 55 36					
		F	7 20 ..					
21		e	17 06 ..					
		eL	17 10 25					
		F	17 40 ..					

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.
1918.			*H. m. s.*	*Sec.*	μ	μ	*km.*	
Mar. 16								Quake lost between 13h. and 14h. while changing sheets.
19		L_E	6 57 ..					Periods variable. No trace on N-S. All seismographs show alike.
			7 18 ..					
21		e	3 53 59					Heavy microseisms.
		eL_N	4 39 ..					
21		e_N	17 05 19					Heavy microseisms. Gram difficult. L shows on vertical. No other phases apparent.
		e_E	17 05 21					
		S_N?	17 10 51					
		eL_N?	17 14 07					
		eL_E?	17 14 10					
		L_N	17 19 04	13				
		F	17 36 ..					

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 18.6

(No earthquake recorded during March, 1918.)

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 March, 1918, not received.)

Maryland. *Cheltenham. Magnetic Observatory.* U. S. Coast and Geodetic Survay. 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

(No earthquake recorded during March, 1918.)

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	86	23	0
N	50	25	4.1

(Report for March, 1918, not received.)

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

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

Instruments: 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.*	
Mar. 4								Heavy microseisms. No other disturbances recorded during the month.
5								
21								

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 March, 1918, 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..

	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.
1918.			*H. m. s.*	*Sec.*	μ	μ	*km.*	
Mar. 21		e_N	17 11 13	8				See Table 3 for Feb. report.
		F_N	17 46 ..					

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

Lat., 40° 51′ 47″ N.; long., 73° 53′ 08″ W. Elevation, 23.0 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

(No earthquake recorded during March, 1918.)

TABLE 2.—*Instrumental seismological reports, March, 1918*—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 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.*	
Mar. 11	.....	P.....	16 25 44	.....	.....	.....	386	Direction?
		L_E....	16 25 32	20	*22,000	.....	.....	
		M_E....	16 25 40	.....	.....	.....	.....	
		L_N....	16 26 32	20	.....	*18,000	.....	
		M_N....	16 26 44	.....	.....	.....	.....	
		F_E....	16 45 ..	.....	.....	.....	.....	
		F_N....	16 46 ..	.....	.....	.....	.....	

*Trace amplitude.

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

Date.	Character.	Phase.	Time.	Period. T.	Amplitude. A_E	Amplitude. A_N	Distance.	Remarks.
1918.			*H. m. s.*	*Sec.*	μ	μ	*km.*	
Mar. 13	.....	e.....	14 49 55	.....	.....	.....	.....	
		M.....	14 50 43	2	10	10	.....	
		F.....	14 54 ..	.....	.....	.....	.....	

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.*	
Mar. 16	.....	e.....	13 48 ..	.....	.....	.....	.....	
		Srep? .	13 55 36	.....	.....	.....	.....	
		L.....	14 04 ..	12	.....	.....	.....	
		F.....	14 20 ..	.....	.....	.....	.....	

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 & Hoy 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.*	
Mar. 11	.....	eL?...	16 44 ..	22	.....	.....	.....	Heavy microseisms on both components.
16	.....	O.....	13 40 31	.....	.....	.....	3,380	
		P.....	13 47 02	.....	.....	.....	.....	
		Prep[1] .	13 47 45	.....	.....	.....	.....	Heavy microseisms on both components.
		Prep[2] .	13 48 00	.....	.....	.....	.....	
		S.....	13 52 11	.....	.....	.....	.....	
		eL....	13 55 51	14	.....	.....	.....	
		L.....	14 04 ..	10	.....	.....	.....	
		F.....	14 30 ..	.....	.....	.....	.....	
19	.....	eL....	6 55 to	20	.....	.....	.....	
		.....	7 05 ..	18	.....	.....	.....	
		L.....	7 09 ..	17	.....	.....	.....	
		L.....	7 16 ..	16	.....	.....	.....	
		L.....	7 23 ..	16	.....	.....	.....	
		L.....	7 28 ..	16	.....	.....	.....	
		F.....	7 40 ..	.....	.....	.....	.....	
21	.....	*Prep*[1] .	73 49 20	.....	.....	.....	6,000	△ approximate.
		S.....	3 54 44	.....	.....	.....	.....	
		Srep[1] .	3 58 51	.....	.....	.....	.....	
		eL....	†4 03 30	16	.....	.....	.....	
		F.....	4 15 ..	.....	.....	.....	.....	
21	.....	e?.....	†16 39 30	.....	.....	.....	.....	
		e.....	†16 47 06	.....	.....	.....	.....	
21	.....	e.....	17 06 43	5	.....	.....	.....	
		eB?....	17 12 04	8	.....	.....	.....	
		e.....	†17 16 48	Irreg..	.....	.....	.....	
		eL....	17 20 ..	18	.....	.....	.....	
		L.....	17 32 ..	9	.....	.....	.....	
		F.....	17 55 ..	.....	.....	.....	.....	
22	.....	eL....	† 6 30 30	.....	.....	.....	.....	
		L.....	6 40 ..	18	.....	.....	.....	
		F.....	6 50 ..	.....	.....	.....	.....	

† Original time given in tenths of a minute.

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=0.50″.

Date.	Character.	Phase.	Time.	Period. T.	Amplitude. A_E	Amplitude. A_N	Distance.	Remarks.
1918			*H. m. s.*	*Sec.*	μ	μ	*km.*	
Mar. 11	.....	L.....	†16 38 00	.....	.....	.....	.....	Microseisms going on.
		L.....	16 43 24	.....	.....	.....	.....	
		L.....	16 48 36	.....	*200	.....	.....	
		F.....	16 59 18	.....	.....	.....	.....	
16	.....	L.....	13 53 06	.....	.....	.....	.....	
		iL.....	13 55 48	.....	.....	.....	.....	
		M.....	13 56 42	.....	*300	.....	.....	
		F.....	14 30 36	.....	.....	.....	.....	
19	.....	eL....	6 57 48	.....	.....	.....	.....	Marked gradual thickening. Markings at 6[h] 45[m] 42[s] and 6[h] 49[m] 42[s]; may not be seismic.
		M.....	7 02 54	.....	*800	.....	.....	
		F.....	7 32 24	.....	.....	.....	.....	
19	.....	L.....	7 59 42	.....	.....	.....	.....	May not be seismic.
		L.....	8 05 54	.....	*50	.....	.....	
		L.....	8 17 36	.....	.....	.....	.....	
20	.....	L.....	1 48 12	.....	*50	.....	.....	
		F.....	1 52 12	.....	.....	.....	.....	
20	.....	L.....	2 06 24	.....	*50	.....	.....	
		F.....	2 11 54	.....	.....	.....	.....	
21	.....	L.....	1 11 06	.....	.....	.....	.....	May not be seismic.
		M.....	1 12 18	.....	*200	.....	.....	
		F.....	1 16 18	.....	.....	.....	.....	
21	.....	L.....	4 01 36	.....	.....	.....	.....	May not be seismic.
		L.....	4 10 12	.....	*100	.....	.....	
		F.....	4 21 24	.....	.....	.....	.....	
21	.....	L.....	16 55 48	.....	*50	.....	.....	
		F.....	17 03 06	.....	.....	.....	.....	
21	.....	L.....	17 18 36	.....	.....	.....	.....	Gradual thickening.
		L.....	17 20 36	.....	*200	.....	.....	
		M.....	17 26 42	.....	.....	.....	.....	Marked microseisms during night of 21st and morning of 22d.
		F.....	17 35 48	.....	.....	.....	.....	
22	.....	iL.....	6 32 36	.....	*200	.....	.....	
		M.....	6 32 48	.....	.....	.....	.....	
		F.....	6 41 12	.....	.....	.....	.....	
26	.....	.....	.....	.....	.....	.....	.....	'Quake lost while changing sheet. Light down at 19[h] 41[m].

* Trace amplitude.
† Original time of all readings given in tenths of a minute.

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.
1918.			*H. m. s.*	*Sec.*	μ	μ	*km.*	
Mar. 16	.....	M.....	14 00 00	.....	*200	.....	.....	
19	.....	L.....	6 38 51	.....	.....	.....	.....	Marked gradual thickening.
		eL....	6 39 24	.....	.....	.....	.....	
		M.....	6 46 43	.....	*1,000	.....	.....	
		F.....	7 19 40	.....	.....	.....	.....	
			VERTICAL		A_Z.			
		M	*6 41 30*	*20*	*2*	.....	.....	
20	.....	L.....	1 56 35	.....	.....	.....	.....	
		M.....	2 00 28	.....	*400	.....	.....	
		F.....	2 11 21	.....	.....	.....	.....	
20	.....	.....	.....	.....	.....	.....	.....	No trace from 20[h] 01[m] to 21st, 19[h] 53[m].
22	.....	.....	.....	.....	.....	.....	.....	Center line so thick impossible to detect a small 'quake.
26	.....	P.....	19 51 41	.....	.....	.....	1,410?	
		L.....	19 54 09	.....	.....	.....	.....	
		M.....	19 55 37	.....	*700	.....	.....	
		F.....	20 01 32	.....	.....	.....	.....	

* Trace amplitude.

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

Date.	Character.	Phase.	Time.	Period. T.	Amplitude. A_E	Amplitude. A_N	Distance.	Remarks.
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	
1918.			*H. m. s.*	*Sec.*	μ	μ	*Km.*	
Feb. 12	.....	eL_N...	1 41 20	13	.....	.....	.....	
		F_E....	1 58 ..	.....	.....	.....	.....	
12	.....	e_E.....	20 20 21	3	.....	.....	.....	
		e_N.....	20 20 29	3	.....	.....	.....	
		eL_N...	20 20 58	14	.....	.....	.....	
		eL_E...	20 23 01	10	.....	.....	.....	
		F.....	20 28 ..	.....	.....	.....	.....	
13	.....	eL_N...	3 55 17	22	.....	.....	.....	
		F_N....	4 09 ..	.....	.....	.....	.....	
Feb. 13	.....	e.....	6 25 28	.....	.....	.....	.....	
		e.....	6 27 50	.....	.....	.....	.....	
		e.....	6 35 30	.....	.....	.....	.....	
		e_N.....	6 42 40	40	.....	.....	.....	
		L_N....	6 59 45	35	.....	.....	.....	
		M_N....	7 21 05	16	.....	*500	.....	
		F.....	8	.....	.....	.....	.....	
19	.....	eL_N...	17 21 ..	22	.....	.....	.....	
		F_N....	17 48 ..	.....	.....	.....	.....	

* Trace amplitude.

SEISMOLOGICAL DISPATCHES.[1]

There were no press reports of seismological or vulcanological disturbances during March, 1918.

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