THE PENNSYLVANIA STATE COLLEGE

MINERAL INDUSTRIES EXPERIMENT STATION

GEOPHYSICAL LABORATORY

Seismograph Report XVI

1 January to 31 December 1951

School of Mineral Industries
State College, Penna., U.S.A.

Locality: The station is located in a vault under the central wing of the School of Mineral Industries Building. The instruments are mounted on a concrete pillar separated from the foundations and anchored to bedrock (dolomite). The geographic coordinates are:

$\phi = 40^{\circ}48'$ N $= 77^{\circ}52'$ W H = 354 m

The geocentric coordinates are (according to Gutenberg and Richter):

A = $40^{\circ}36'$ N $= 77^{\circ}52'$ W H = + 3 km.

Please address all communications to:

Geophysical Laboratory
Mineral Sciences Bldg.
State College, Pennsylvania

From 1 January to 16 February, three seismographs were in continuous operation (1 vertical and 2 horizontal components). On 16 February the vertical was disconnected in order to move the recorder to a new location. The new installation was completed on 1 May. On 8 May, the galvanometers were switched so that all instrument sensitivities changed. Further adjustments were made on 7 June, 8 June, 10 June, 21 June, 11 September, 18 September, and 20 September.

From 1 January to 8 May, the horizontal components recorded photographically; the vertical recorded through an electronic amplifier driving a pen-type galvanometer. From 8 May to 21 June, the vertical and east-west components were photographically recorded, and the north-south operated the pen-type galvanometer. From 21 June to 31 December, the vertical and north-south components were photographically recorded, and the east-west operated the pen-type galvanometer. The recording rate is approximately 1.5 cm/min. on the photographic recorders, 1.7 cm/min. on the pen recorder.

From 8 May to 31 December, the directional sensitivity of the instruments was set as follows:

N-S Up on paper corresponds to S velocity of ground

E-W " " " " " W " " "

Vert " " " " " upward velocity of ground

The horizontal instruments have a free period of 10 seconds. The free period of the vertical instrument is adjustable, and was set as follows:

1 Jan.-10 Nov. 15:15 GMT	No record kept
10 Nov. - 21 or 22 Dec.	1.7 sec.
21 or 22 Dec. - 31 Dec.	3.0 sec.

Damping and sensitivity were varied and no record kept of the changes.

The time is controlled by a Stromberg clock, which is compared daily with signals from radio station WWV. The time accuracy of the photographically recording instruments was about ± 1 sec. Because of mechanical difficulties, the drum speed of the recorder was not constant, and times obtained solely from the records of this instrument may have an error of several times as much.

	Phase and component		G.M.C.T.	Remarks
Jan. '51	M	E	21:25:03	Epicenter: 18°S, 169°E New Hebrides Region O = 20:16:20 Δ = 13,300 Km. Courtesy U. S. C. G. S.
3 Jan. '51	M M	N E	12:40:2- 12:42:5-	Epicenter: 18°N, 106°W Off coast of Colima, Mexico O = 12:31:31 Δ = 3,700 Km. Courtesy U. S. C. G. S.
3 Jan. '51	M M	N E	13:23:1- 13:26:1-	Epicenter: 18°N, 106°W Off coast of Colima, Mexico O = 13:04:24 Δ = 3,700 Km. Courtesy U. S. C. G. S.
5 Jan '51	iP i iS M M	N N N,E N E	00:59:19 01:00:22 01:04:38 01:11:58 01:12:56	Epicenter: 7°N, 81°W Near southern coast of Panama O = 00:52:40 Depth = 100 Km Δ = 3800 Km Courtesy U. S. C. G. S.
6 Jan. '51	iPP $i_{P}PPP$ $i^{P}SKS$ i i	N N N N,E N,E	05:34:35 05:37:48 05:40:33 05:42:03 05:42:23	Epicenter: 36.5°N, 70.5°E Hindukush region,northeast Afghanistan O = 05:17:19 Depth = 250 Km Δ = 10,900 Km Courtesy U. S. C. G. S.
6 Jan. '51	iP $i_{P}P$ $i^{P}_{S}P$ i iPP $i_{S}PP$ i^{S}	N,Z N N N,E N,E,Z N N,E,Z	07:58:06 07:58:22 07:58:46 07:59:06 07:59:21 07:59:45 08:03:30	Epicenter: 7.5°N, 81°W Southern Panama O = 07:51:31: Depth = 100 Km Δ = 3,700 Km Courtesy U. S. C. G. S.
10 Jan. '51		N,E		Seismic activity recognizable about 09:27:-
10 Jan. '51	M M	E N	11:14:35 11:16:20	Epicenter: 28°S, 177.5°W Kermadec Islands region O = 10:12:48 Depth = 50 Km Courtesy U. S. C. G. S.

Date	Phase and Component		G.M.C.T.	Remarks
10 Jan. '51		N,E		Seismic activity recorded between 19:35:- and 21:09:-
14 Jan. '51	M	E	11:19:30	Epicenter: 23°S, 176°W
	M	N	11:20:20	Tonga Islands region
				O = 10:19:24
				Depth = 100 Km
				Courtesy U. S. C. G. S.
15 Jan. '51	ePP	N	04:32:23	Epicenter: 15°S, 167°E
	ipPP	E	04:32:48	New Hebrides Islands region
	iSKS	E	04:37:12	O = 04:12:14
	iSKKS	N,E	04:38:31	Depth = 150 Km
	iS	N	04:39:32	Δ = 13,200 Km
	eSP (?)	N	04:41:30	Courtesy U. S. C. G. S.
	iPS (?)	E	04:41:51	
	iSS	E	04:47:58	
	i	N	04:49:43	
	M	N	05:07:50	
	M	E	05:20:06	
18 Jan.'51	iP	N,Z	21:26:16	Epicenter: 52°N, 177°W
	i	E,Z	21:26:24	Aleutian Islands
	i	N	21:26:56	O = 21:15:50
	iS	E	21:34:27	Depth = about 60 Km
	esS	N	21:35:13	Δ = 7,150 Km
	i	N,E	21:36:11	Courtesy U. S. C. G. S.
	eSS	E	21:39:02	
	esSS	E	21:39:05	
	iSSS	E	21:42:07	
	M	E	21:54:13	
	M	N	21:57:48	
30 Jan. '51	eP	E	07:23:18	Epicenter: 33°N,115.75°W
	e	N,E	07:25:25	Imperial Valley, Calif.
	eS	N,E	07:28:17	O = 07:17:01
	M	N	07:34:3-	Δ = 3,400 Km
	M	E	07:36:1-	Courtesy U. S. C. G. S.
30 Jan. '51	iS	N	19:12:00	Epicenter 15.5°N, 99°W
	i	E	19:12:03	Off southern coast of Mexico
				O = 19:00:30
				Δ = 3,500 Km
				Courtesy of U. S. C. G. S.
12 Feb. '51	iP	N	17:33:19	Epicenter: 66°N, 136°E
	i	N	17:33:23	Near Verkhoyanski Mountains,
	iS	N	17:42:29	Siberia
	eL	N	17:50:19	O = 17:22:02
	M	N	18:19:05	Δ = 7,800 Km
				Courtesy U. S. C. G. S.

	Phase and Component		G. M. C. T.	Remarks
1 Feb. '51		N		Seismic activity recognized around 06:32:-
[illegible] Feb. '51		N		Seismic activity recognized around 09:01:-
[illegible] Feb. '51	e	N	12:20:05	Epicenter: 15°S, 175°W
	iS	N	12:21:09	Samoa Islands Region
	isS (?)	N	12:23:11	O = 11:55:50
	iSS	N	12:28:35	Depth = 250 Km
				Courtesy U.S.C.G.S.
17 Feb. '51	iP'	N,E	21:25:57	Epicenter: 7°S, 146°E
	iPP	N,E	21:28:00	Southeastern New Guinea
	iPKS	N,E	21:29:16	O = 21:06:58
	i (pPKS?)	E	21:29:31	Depth = 100 Km.
	i	N,E	21:30:22	Courtesy U.S.C.G.S.
	iSKS	N,E	21:32:48	Δ = 14,200 Km
	i	E	21:34:33	
	M	E	22:28:45	
19 Feb. '51		N,E		Seismic activity starting at approximately 21:40:-
20 Feb. '51	M	N	16:05:20	Epicenter: 22°S, 114°W
	M	E	16:06:45	Pacific Ocean, about 450 miles NW of Easter Islands
				O = 15:24:18
				Courtesy U. S. C. G. S.
23 Feb. '51	M	N	03:10:35	Epicenter: 44.5°N, 129.5°W
				About 300 miles off coast of Oregon
				O = 02:56:42
				Courtesy U. S. C. G. S.
4 March '51	iP	N,E	11:27:02	Epicenter: 29°N, 128°E
	i	N	11:27:26	Ryukyu Islands
	isP	N	11:28:14	Depth: about 150 Km
	e	N	11:35:10	Δ = 11,900 Km
	eS	N	11:35:52	Courtesy U. S. C. G. S.
	i	N,E	11:36:18	O = 20:11:45
	i	E	11:36:41	
	e (SS?)	N	11:39:10	
9 March '51	i	N	20:05:31	Epicenter: 8°S, 124.5°E
	iPP	N	20:07:20	Flores Sea Region
	iPKS	E	20:08:32	O = 19:44:16
	i	E	20:09:28	Δ = 15,750 Km
	i	N	20:11:54	Courtesy U. S. C. G. S.
	i	E	20:13:43	
	i	N	20:14:35	
	i	N	20:15:24	
	e	N	20:17:54	
	M	E	21:02:00	
	M	N	21:02:2-	

Date	Phase and Component		G.M.C.T.	Remarks
1 March '51	i	E	22:17:19	Epicenter:15.5°S, 167.5°E
	iPP	E	22:17:30	New Hebrides Islands
	e	E	22:17:53	O = 21:57:37
	e	E	22:19:04	Courtesy U.S.C.G.S.
	iPPP	E	22:20:10	Depth: about 150 Km
	i	E	22:22:52	Δ = 13, 250 Km
	i	E	22:23:56	
	i	N,E	22:25:10	
	i	N,E	22:26:10	
	iSP	E	22:26:55	
	ipSP?	N,E	22:27:52	
	e	N	22:31:08	
	i	N	22:33:05	
	e	N	22:34:29	
12 March '51		N,E		Seismic activity recognizable between 15:56:- and 16:14:-
17 March '51		N,E		Seismic activity recognized between 0500 and 0600
17 March '51		E		Seismic activity recognized at 17:05:-
19 March '51		N,E		Seismic activity recognized at 20:36:-
23 March '51	iPP	E	21:58:30	Epicenter: 31°S, 180°
	iSKS	N,E	22:03:43	Kermadec Islands
	i	E	22:05:26	O = 21:38:54
	e	N	22:06:04	Depth: about 300 Km
	e	N	22:06:42	Δ = 13,180 Km
	i	E	22:08:21	Courtesy U. S. C. G. S.
	e	E	22:09:21	
	iSS	N	22:14:32	
	eP'P'?	N	22:17:59	
30 March '51	iP	N	20:58:34	Epicenter: 13°N, 88°W
	ipP	N,E	20:58:50	Off southern coast of
	iPP	N	20:59:23	El Salvador
	i(PcP?)	E	21:01:48	O = 20:52:36
	iS	N,E	21:03:31	Depth: about 100 Km
	isS	N,E	21:03:53	Δ = 3,250Km
	e	N	21:04:29	Courtesy U. S. C. G. S.
	i	E	21:04:39	
31 March '51	iS	N	09:35:48	Epicenter: 60.5°N, 154°W
	iScS	N	09:38:27	Southern Alaska
	e	N	09:39:29	O = 09:20:34
				Depth: about 250 Km
				Δ = 5,400 Km
				Courtesy U. S. C. G. S.

	Phase and component		G.M.C.T.	Remarks
1 April '51		N,E		Seismic activity recognizable at 19:39:-
2 April '51	eP	N,E	00:19:42	Epicenter: 13°N, 90°W
	e	N,E	00:20:31	Off coast of El Salvador
	ePP	N	00:20:42	O = 00:13:34
	e	N	00:24:22	Δ = 3,340 Km
	eS	N	00:24:38	Courtesy U. S. C. G. S.
	e	E	00:25:12	
10 April '51		N,E		Seismic activity recognizable at 12:19:-
11 April '51		N,E		Seismic activity recognizable at 23:01:-
13 April '51	iP'	N,E	10:34:19	Epicenter: 10°S, 119°E
	iPP	N	10:38:08	About 300 miles east of
	e	N	10:35:27	Java
	e	N	10:40:00	O = 10:14:38
	e	N	10:44:36	Courtesy U.S.C.G.S.
				Δ = 16,200 Km
14 April '51	iP	N	00:55:43	Epicenter: 24°S, 66.5°W
	iPcP?	N	00:56:29	Northern Argentina
	ipP	N	00:56:50	O = 00:45:28
	iS	N,E	01:04:14	Depth = about 250 Km
	eScS	N	01:05:04	Δ = 7,310 Km
	i	E	01:05:20	Courtesy U. S. C. G. S.
	eSS	N	01:08:48	
	eSSS?	E	01:11:42	
	e	E	01:13:35	
	ePKKP?	E	01:14:24	
	i	E	01:16:10	
14 April '51		N,E		Seismic activity recognizable at 05:00:-
14-15 April '51	iPP	N	00:00:35	Epicenter: 28.5°N, 94°E
	eSKS?	N	00:06:08	Assam
	iPS?	N	00:09:29	O = 23:40:51
	iPS?	N	00:09:49	Courtesy U. S. C. G. S.
	iPPS?	N	00:10:40	Δ = about 12,400 Km
	M	N	00:50:10	
	M	E	00:51:10	
22 April '51		N,E		Seismic activity recognizable about 04:45:-
22 April '51	M	N	12:57:5-	Epicenter : 76°N, 73°W Baffin Bay O = 12:36:16 Δ = 3,900 Km Courtesy U. S. C. G. S

Date	Phase and component		G.M.C.T.	Remarks
30 April '51	iPP	N	15:48:51	Epicenter: 8°S, 153°E
	eSKS	N	15:54:07	Solomon Islands region
	i	E	15:54:12	O = 15:28:00
	iPS	N	15:58:42	Δ = 13,780 Km
	M	E	16:36:00	Courtesy U. S. C. G. S.
1 May '51	iP'	Z	05:22:21	Epicenter: 50.5°S, [illegible]°E
	i	E	15:22:23	About 400 miles south of
	e	E	05:23:40	Tasmania
	M	E	06:22:30	O = 05:02:41
				Δ = 16,300 Km
				Courtesy U.S.C.G.S.
2 May '51	M	E	17:59:11	Epicenter: 42°S, 80°E
				Indian Ocean
				O = 16:17:01
				Courtesy U. S. C. G. S.
3 May '51	iS	E	04:19:24	Epicenter: 15.5°N, 61°W
	isS	E	04:20:26	(Leeward Islands)
				O = 04:08:49
				Depth = 150 Km
				Δ = 3,200 Km
				Courtesy U. S. C. G. S.
6 May '51		E		Seismic activity recog-
				nizable at 21:56:-
6 May '51	eS	E	23:14:08	Epicenter: 13.5°N, 88°W
	M	E	23:23:-	O = 23:03:35
				Depth = 150 Km
				Δ = 3,220 Km
				Courtesy U. S. C. G. S.
11 May '51		N		Seismic activity recog-
				nizable at 02:22:-
21 May '51	iPP	E	08:47:35	Epicenter: 6°S, 154.5°E
	i	E	08:48:13	Solomon Islands region
	e	E	08:48:36	O = 08:27:21
	M	E	09:35:30	Depth = about 150 Km
				Δ = 13,500 Km
				Courtesy U. S. C. G. S.
26 May '51		E		Seismic activity recog-
				nizable between 21:45:-
				and 22:03:-
27 May '51		E		Seismic activity recog-
				nizable between 04:44:-
				and 05:04:-

Da	Phase and component		G.M.C.T.	Remarks
29 May '51	iPP	E	06:24:38	Epicenter: 3°S, 138.5°E
	i	E	06:25:55	Northern New Guinea
	M	E	07:13:00	O = 06:03:06
				Δ = 14,450 Km
				Courtesy U. S. C. G. S.
30 May '51	iP'	N	20:16:20	Epicenter: 3°S, 126.5°E
	iPKS	E	20:20:17	Molucca Islands
	i	N	20:20:20	O = 19:57:01
				Δ = 15,050 Km
				Courtesy U. S. C. G. S.
31 May '51	iSKS	E	21:21:27	Pulses not distinct
	i	E	21:22:46	Epicenter: 19°N, 121°E
	eS?	E	21:23:15	Off coast of Luzon,
	ipS	E	21:24:06	Philippine Islands
	eSP	E	21:25:31	Depth = 100 Km
	esSS	E	21:32:34	Dist. = 13,100 Km
	eP'P'?	E	21:35:43	
1 June '51		E		Seismic activity recognizable at 17:27:-
2 June '51	iS	E	20:20:38	Epicenter: 52.5°N, 172°W
	esS	E	20:21:19	Aleutian Islands
				O = 20:04:53
				Depth 100 Km
				Courtesy U. S. C. G. S.
				Δ 6,750 Km
2 June '51		E		Seismic activity recognizable at 07:26:-
5 June '51		E		Seismic activity recognizable at 01:49:-
5 June '51	ipP	E	17:16:20	Epicenter: 30°N, 132°E
	eSKS	E	17:22:23	South of Kyushu, Japan
	eSKKS	E,N	17:22:44	O = 16:57:47
	iS	E	17:23:39	Depth = 100 Km
	ePS	E	17:25:17	Courtesy U. S. C. G. S.
	isPS	E	17:25:59	Δ = 11,800 Km
	M	E	18:03:50	
	M	N	18:16:-	
6 June '51	eP	E	16:19:13	Epicenter: 71.5°N, 8°W
	i(PP?)	E	16:21:14	Jan Mayen Island
	iS	E	16:25:49	O = 16:10:52
	eG	E	16:29:14	Depth 60 Km
	M	E	16:35:-	Δ = 5,050 Km
				Courtesy U. S. C. G. S.

Date	Phase and component		G.M.C.T.	Remarks
7 June '51	ePP	E	23:18:52	Epicenter: 21.5°S, 176°W
	iSKS	i	23:24:20	Kermadec Islands region
	i SKKS	E	23:25:34	O = 22:59:00
	ePS	E	23:28:04	Δ = 12,650 Km
	iSS	E	23:34:03	Courtesy U. S. C. G. S.
	M	N	00:24:-	
	M	E	00:24:-	
13 June '51		E		Seismic activity recognizable at 01:19:-
17 June '51	iS	E	00:00:18	Epicenter: 44.5°N, 130°W 300 miles off coast of Oregon O = 23:46:58 Δ = 4,150 Km Courtesy U. S. C. G. S.
17 June '51	iP	E,Z	09:47:38	Epicenter: 44.5°N, 130°W
	ePP	E	09:48:56	300 miles off coast of
	iS	E	09:53:40	Oregon
	M	E	10:03:3-	O = 09:40:15 Δ = 4,150 Km Courtesy U S. C. G. S.
18 June '51		E		Seismic activity recognizable about 07:47:-
18 June '51	iP	E,Z	17:50:37	Epicenter: 11°N, 85°W
	i	Z	17:51:54	Costa Rica-Nicaragua border
	i	S	17:55:37	O = 17:44:27 Δ = 3,400 Km
19 June '51		E		Seismic activity recognizable about 20:41:-
24 June '51		N		Weak seismic activity begins about 11:24:-
24 June '51		N		Weak seismic activity recognizable between the hours of 17:19:- and 18:26:-
25 June '51	M	N	03:50:-	Epicenter: 56°N, 154°W South of Alaska O = 03:18:23 Courtesy of U. S. C. G. S.
25 June '51	iP	N,Z	16:20:56	Epicenter: 61°N, 150°W
	ePP	N	16:23:06	Southern Alaska
	i	Z	16:23:13	O = 16:12:32
	iS	N	16:27:43	Δ = 5,150 Km
	eSS	N	16:31:16	Courtesy U. S. C. G. S.
	M	N	16:41:3-	Depth 100 Km

Date	Phase and component		G.M.C.T.	Remarks
25 June '51		N		Seismic activity recognizable between the hours of 20:30:- and 20:41:-
2 July '51	eS	N	22:13:11	Epicenter: 21°S, 176°W
	M	N	22:49:-	Tonga Islands region
				O = 21:46:30
				Δ = 12,200 Km
				Courtesy U. S. C. G. S.
8 July '51	eP'	Z	06:03:27	Epicenter: 11°N, 122°E
	e	N	06:05:05	Paway Island, Philippines
	e	Z	06:05:15	O = 05:44:20
	iPP	Z	06:05:43	Δ = 14,050 Km
	eSKS	N	06:10:40	Courtesy U. S. C. G. S.
	eSKKS	N	06:12:08	
	e	N	06:13:25	
9 July '51	eP	N,Z	00:09:54	Epicenter: 16°N, 96°W
	iPP	N,Z	00:11:05	Near coast of Oaxaca, Mexico
	iS	N	00:14:50	O = 00:03:54
	e	N	00:15:44	Depth = about 60 Km
	i	N	00:16:55	Δ = 3,300 Km
	i	N	00:17:12	Courtesy U. S. C. G. S.
11 July '51	epP	Z	18:36:59	Epicenter: 28.5°N, 139.5°E
	e	Z	18:37:09	Bonin Islands
	esP	Z	18:37:48	O = 18:22:00
	i-	Z	18:38:03	Depth = about 550 Km
	i-	N,Z	18:38:20	Δ = 11,400 Km
	e-	Z	18:38:28	Courtesy U.S.C.G.S.
	e-	Z	18:38:57	
	i-	Z	18:39:16	
	iPP	N	18:39:20	
	e-	Z	18:39:26	
	e-	N	18:39:34	
	e-	Z	18:40:34	
	epPP	N,Z	18:40:01	
	e-	Z	18:41:13	
	ePPP	Z	18:41:43	
	esPP	Z	18:42:06	
	ipPPP	N	18:43:02	
	iSKS	N,E	18:44:54	
	eS	E	18:45:54	
	esp	N,Z	18:47:30	
	i-	Z	18:47:40	
	e	Z	18:47:50	
	e	Z	18:48:13	
	ipS	N,E	18:48:22	
	iSS	Z	18:53:04	
	e-	N,E	18:53:39	
	esSS	E	18:56:06	

Date	Phase and component		G.M.C.T.	Remarks
13 July '51		N		Seismic activity recognizable about 02:22:00
13 July '51		N		Weak seismic activity recognizable about 15:01:-
13 July '51		N		Weak seismic activity recognizable about 20:24:-
14 July '51		N		Weak seismic activity recognizable about 06:55:-
16 July '51	iP'	Z	10:59:13	Epicenter: 6°S, 146°E
	i	Z	11:01:11	New Guinea
	iPP	N,Z	11:01:51	O = 10:40:23
	iSKP	Z	11:02:18	Depth = 200 Km
	eSS	N	11:18:50	Courtesy U. S. C. G. S.
				Δ = 14,600 Km
18 July '51	iP	N,E,Z	09:16:28	Epicenter: 1°N, 27°W
	i	N,Z	09:16:32	Mid-Atlantic
	ePP	E	09:18:41	O = 09:06:16
	iS	N,E,Z	09:24:48	Δ = 6,700 Km
				Courtesy U. S. C. G. S.
19 July '51	i ?	N,Z	20:52:01	Epicenter: 51.5°N, 177.5°W
	ipP	Z	20:52:29	Aleutian Islands
	isP	Z	20:52:38	O = 20:41:25
	eS	N,E,Z	21:00:42	Depth = about 60 Km
	i-	N	21:00:54	Δ = 7,100 Km
				Courtesy U. S. C. G. S.
21 July '51		N,E		Seismic activity recognizable about 02:01:-
24 July '51		N,E		Seismic activity recognizable about 17:57:-
25 July '51		N, E		Seismic activity recognizable about 12:40:-
25 July '51	iP	N,Z	18:48:09	Epicenter: 14°N, 90.5°W
	iPP	Z	18:49:05	Guatemala
	is	N	18:52:51	O = 18:42:14
				Depth = 100 Km
				Δ = 3,150 Km
				Courtesy U. S. C. G.S.
26 July '51	iP	Z	10:12:56	Epicenter: 41°N, 143°E
	i	Z	10:13:04	South of Hokkaido, Japan
	ipP	Z	10:13:28	O = 10:00:00
	i	Z	10:13:43	Depth = 100 Km
	e(S?)	N	10:23:47	Δ = 10,050 Km
	M	N,E	11:00:-	Courtesy U. S. C. G. S.

Date	Phase and component		G.M.C.T	Remarks
28 July '51		N,E		Seismic activity recognizable about 23:09:-
29 July '51		N,E		Seismic activity recognizable about 11:08:-
29 July '51		N,E,Z		Seismic activity recognizable at 23:52:-
30 July '51		N		Seismic activity recognizable about 17:10:-
1 Aug. '51	eP	Z	03:29:54	Epicenter: 3°N, 84°W
	ePP	N	03:31:26	Off coast of Columbia
	eS	N	03:35:40	O = 03:22:46
	M	N,E	03:45:30	Depth = about 100 Km Courtesy U. S. C. G. S. Δ = 4,150 Km
2 Aug. '51		E		Seismic activity recognizable from 11:45:- to 13:20:-
2 Aug. '51		N,Z		Seismic activity recognizable about 20:47:-
3 Aug. '51	iP	Z	00:29:58	Epicenter: 13°N, 87.5°W
	i	Z	00:30:06	Near south coast of
	eS	E	00:34:44	Nicaragua
	M	E	00:40:-	O = 00:23:58 Depth = about 100 Km Courtesy U. S. C. G. S. Δ = 3,250 Km
3 Aug. '51		E,Z		Surface waves recognizable at 05:38:-
3 Aug. '51		E		Seismic activity recognizable at 17:01
5 Aug. '51		E		Seismic activity recognizable at 08:24:-
13 Aug. '51	iP	N	18:45:28	Epicenter: 43°N, 32.5 E
	i	Z	18:45:33	Black Sea, off north coast
	i	Z	18:45:58	of Turkey
	ePP	N	18:48:15	O = 18:33:40
	iS	N	18:55:20	Courtesy U. S. C. G. S.
	iScS	N	18:55:50	Δ = 8,450 Km
	i	N	18:56:25	
	e	N	19:03:44	
	M	N	19:22:54	

Date	Phase and component		G.M.C.T.	Remarks
21 Aug. '51	iP	N,E	11:08:03	Epicenter: 19.8°N, 156°W
	iS	N,E	11:17:09	Near west coast of Hawaii
	eL	N	11:25:32	O = 10:56:57.5
				Δ = 7,600 Km
				Courtesy U. S. C. G. S.
22 Aug. '51	eP	N	05:49:07	Epicenter 10°N, 83°W.
	eS	N	05:53:28	Costa Rica
	e	N	05:58:25	O = 05:41:31
				Δ = 3,500 Km
				Courtesy U. S. C. G. S.
24 Aug. '51	iS	N	14:43:41	Epicenter: 47°N, 151°E
	ipS?	N	14:44.00	Kurile Islands
	iPPS	N	14:45:01	O = 14:21:15
	epPPS?	N	14:45:23	Δ = 9,100 Km
				Courtesy U. S. C. G. S.
				Deeper than normal?
25 Aug. '51	eMAX		11:00	Surface waves observed
26 Aug. '51	surface waves	N	18:51 thru 19:25	Epicenter: 24°N, 109°W
				Gulf of California
				O = 18:36.23
				Δ = 3,400 Km
				Courtesy of U. S. C. G. S
1 Sept. '51	e	N	05:24 thru 05:33	surface waves observed
1 Sept. '51	iS	N	09:11:42	Epicenter: 33°S, 110°W
	iPPS?	N	09:12:19	O = 08:49:18
	iSS	N	09:16:40	Δ = 8,850 Km
	i	N	09:18:17	Easter Islands Region
				Courtesy U. S. C. G. S.
2 Sept. '51	surface waves	N	16:45 thru 17:00	surface waves observed
5 Sept. '51	seismic activity observed	N	08:20:40 thru 09:17	O = 07:52:15
				Marianna Islands Region
				Courtesy U. S. C. G. S.
8 Sept. '51	surface waves	N	01:13 thru 01:16	seismic activity observed
8 Sept. '51	surface waves	N	12:02 thru 12:17	Epicenter: 28 1/2°N, 43°W
				N. Atlantic Ocean
				O = 11:47:23
				Courtesy U. S. C. G. S.
				Δ = 2,200 km.

Date	Phase and Component		G.M.C.T.	Remarks
9 Sept. '51	surface waves	N	05:35 thru 06:10	Epicenter: 16°S, 173°W Samoa Islands Region O = 04:43:00 Δ = 11,550 Km Courtesy U. S. C. G. S.
16 Sept. '51	seismic activity	N	12:03:25 thru 12:08	Epicenter: 20°N, 155.5°W Hawaiian Islands O = 11:42:57 Δ = 7,600 Km Courtesy U. S. C. G. S.
17 Sept. '51	seismic activity	N	12:50	Epicenter: 18°S, 173°W Tonga islands O = 11:57:39 Δ = 11, 800 Km Courtesy U. S. C. G. S.
20 Sept. '51	seismic activity	N	06:15	Epicenter: 5 1/2°S, 81°W near coast of Peru O = 05:48:03 Δ = 5, 150 Km Courtesy U. S. C. G. S.
21 Sept. '51	surface waves	N	19:50 thru 20:05	Epicenter: 28.5°S, 178°W Kermadec Islands O = 18:44:57 Δ = 13,000 Km Courtesy U. S. C. G. S.
27 Sept. '51	iP	Z	19:31:17	Epicenter: 49°N, 128°W
	iPP	Z	19:32:38	Off coast of Vancouver
	i	N	19:32:40	Island, British Columbia
	i	Z	19:33:17	O = 19:24:12
	eS	N	19:37:17	Δ = 4,000 Km
	M	N	19:46:43	Courtesy U. S. C. G. S.
28 Sept. '51		N,E		Seismic activity recognizable about 23:53:-
28 Sept. '51	eP	N	12:13:19	Epicenter: 11.5°N, 86°W
	ePP	N	12:14:31	Near coast south of
	e	N	12:18:41	Nicaragua
	M	N	12:25:-	O = 12:07:24 Depth = about 200 Km Courtesy U. S. C. G. S. Δ = 3,300 Km
28 Sept. '51	eP	N	14:57:12	Epicenter: 11.5°N, 86°N
	ePP	N	14:58:20	Near south coast of
	e	N	15:02:38	Nicaragua
	M	N	15:09:-	O = 14:51:17 Depth = about 200 Km Courtesy U. S. C. G. S. Δ = 3,300 Km

Date	Phase and component		G.M.C.T.	Remarks
1 Oct. '51	M	N	09:47:-	Epicenter: Fox Islands, Aleutian Islands O = 09:11:57 Courtesy U. S. C. G. S.
8 Oct. '51	iP	Z	04:17:30	Epicenter: 40°N, 125°W
	iS	N,E	04:23:03	Off Cape Mendocino, Calif.
	eL	N	04:25:27	O = 04:10:35
	M	N	04:30:13	Courtesy U. S. C. G. S. Δ = 3,900 Km
11 Oct. '51	iP'	Z	01:56:33	Epicenter :5°S, 152°E
	i (PP?)	Z	01:58:32	New Britain Island
	eSKS	N,E	02:03:31	O = 01:37:31
	e-	N	02:04:55	Δ = 13,650 Km
	e(PS?)	N	02:07:54	Courtesy U. S. C. G. S.
18 Oct. '51	iP	N,Z	08:39:24	Epicenter: 42°N, 142°E
	i	Z	08:39:39	Near coast of Hokkaido,
	i	Z	08:40:26	Japan
	e	N	08:49:18	O = 08:26:25
	e S	N	08:50:12	Depth = about 100 Km Courtesy U. S. C. G. S. Δ = 10,000 Km
21 Oct. '51	e-	N,Z	21:53:49	Epicenter: 24°N, 122°E
	ePP	Z	21:54:01	Off east coast of Formosa
	eppp(?)	Z	21:56:05	O = 21:34:13
	e-	N	21:57:43	Courtesy U. S. C. G. S.
	ePS	N	22:03:20	Δ = 12,600 Km
	M	N	22:44:-	
22 Oct. '51	e	N	03:48:59	Epicenter: 24°N, 122°E
	ipp	Z	03:49:13	Off east coast of Formosa
	i	Z	03:49:43	O = 03:29:25
	ePPP?	Z	03:51:23	Courtesy U. S. C. G. S.
	iSKS?	Z	03:55:37	Δ = 12,600 Km
	e	N	03:58:21	
	ePS?	Z	03:58:29	
	eL	N	04:15:58	
	M	N	04:39:-	
22 Oct. '51		N,E		Seismic activity begins about 12:08:-
22 Oct. '51		N,E		Seismic activity begins about 15:50:- and lasts for two hours
22 Oct. '51	i	N,Z	21:00:16	Sharp pulse followed by approximately an hour of weak seismic activity

Date	Phase and Component		G.M.C.T.	Remarks
23 Oct. '51		N		Seismic activity recognizable at 09:21:-
28 Oct. '51		N,Z		Seismic activity recognizable at 07:07:-
6 Nov. '51		N,E.		Weak seismic activity from 15:40:- to 16:04:-
6 Nov. '51	iP	N,E,Z	16:52:23	Epicenter: 47°N, 154°E
	i	N	16:53:08	Kurile Islands
	e	N,Z	16:53:52	O = 16:40:06
	ePP	Z	16:55:28	Δ = 9,000 km
	eS	N,E	17:02:29	Courtesy U. S. C. G. S.
	eSS(?)	N	17:07:25	
	M	E	17:31:-	
	M	N	17:38:-	
8 Nov. '51	iP	Z	13:54:36	Epicenter: 54.5°N, 160°W
	i	N,Z	13:55:00	Off coast south of Alaska
	eS	N	14:02:18	O = 13:45:09
	eScS	N,E	14:04:28	Δ = 5,950 Km
	eSS(?)	N	14:06:06	Courtesy U. S. C. G. S.
	M	N	14:15:2-	
9 Nov. '51	ipP	N,E	22:18:42	Epicenter: 22°S, 68°W
	isP(?)	Z	22:19:04	Chile-Bolivian border
	i	N,Z	22:19:25	O = 22:07:53
	i	Z	22:19:37	Depth = about 100 Km
	iPP	Z	22:20:37	Δ = 7,100 Km
	i	Z	22:21:16	Courtesy U. S. C. G. S.
	eS	N	22:26:33	
	isS(?)	N	22:27:35	
	M	N	22:48:-	
12 Nov. '51	iP	Z	08:21:47	Epicenter: 47°N, 154°E
	e	Z	08:22:05	Kurile Islands
	e	N	08:22:24	O = 09:09:26
	i	Z	08:22:19	Δ = 9,000 Km.
	iPP	Z	08:24:47	Courtesy U. S. C. G. S.
	eS	N,E	08:31:56	
	i	N	08:33:50	
	M	N	09:09:4-	
13 Nov. '51		N		Seismic activity recognizable at 08:53:-
13 Nov. '51		N		Seismic activity recognizable at 11:43:-

Date	Phase and Component		G.M.C.T.	Remarks
15 Nov. '51	eP	N,Z	19:53:47	Epicenter: 52.5°N, 160.5°E
	e	Z	19:54:12	Near east coast of
	eS	N	20:03:45	Kanchatka
	M	N	20:28:30	O = 19:42:12
				Depth = about 60 Km
				Δ = 8,350 Km
				Courtesy U. S. C. G. S.
18 Nov. '51	iPP	N,Z	09:54:35	Epicenter : 31°N, 90.5°E
	i	Z	09:57:06	Eastern Tibet
	ePS	N	10:03:54	O = 09:35:43
	M	N	10:46:-	Δ = 11,900 Km
				Courtesy U. S. C. G. S.
24 Nov. '51	i	N	19:06:46	Epicenter: 23°N, 121.5°E
	iPP	N,E.Z	19:09:54	Near east coast of Formosa
	e-	N	19:13:49	O = 18:50:19
	e-	N	19:16:09	Δ = 12,700 Km
	ePS(?)	N,E	19:19:14	Courtesy U. S. C. G. S.
	ePPS(?)	N	19:20:25	
	iSS	N,E	19:25:36	
	M	E	19:55:-	
	M	N	20:01:5-	
26 Nov. '51	e(?)	N	07:00:36	Epicenter: 23°N, 121.5°E
	M	N	07:50:-	Formosa
				O = 06:38:29
				Courtesy U. S. C. G. S.
30 Nov. '51	iP	E,Z	07:57:41	Epicenter: 52°N, 41°W
	i	Z	07:57:48	North Atlantic Ocean
	e	Z	07:58:21	O = 07:51:17
	eS	E	08:02:50	Δ = 3,250 Km
	M	E	08:07:43	Courtesy U. S. C. G. S.
	M	N	08:09:2-	
5 Dec. '51		N,E		Seismic Activity recognizable about 08:00
5 Dec. '51		N,E,Z		Seismic activity recognizable between 16:00 and 17:00
5 Dec. '51		N, E,Z		Seismic activity recognizable around 19:00
6 Dec. '51	iP	Z	14:36:16	Epicenter: 5.5°N, 77.5°W
	eS	E	14:41:50	Near coast of Colombia
	e	N	14:41:58	O = 14:29:18
	M	E	14:49:3-	Δ = 3,900 Km
				Courtesy U. S. C. G. S.

Date	Phase and Component		G.M.C.T.	Remarks
8 Dec. '51	iP'	N,E,Z	04:33:46	Epicenter: 34°S, 56.5°E
	e	N	04:33:59	Indian Ocean about 900
	iPP	N,E,Z	04:37:12	miles southeast of
	e	N	04:38:46	Madagascar
	ePPP	E	04:40:13	O = 04:14:20
	e	Z	04:41:50	Depth = 100 Km
	e	Z	04:44:58	Δ = 16,000 Km
	M	N	05:41:-	Courtesy U. S. C. G. S.
10 Dec. '51	i	Z	18:47:02	Pulses all sharp on ver-
	i	Z	18:47:24	tical. No pulses recog-
	i	Z	18:47:50	nizable on horizontal
	e	Z	18.50:26	seismometers. Period about
	e	Z	18:51:06	3 1/2 seconds. (Blasting
	i	Z	18:52:43	on campus?)
	i	Z	18:52:53	
	e	Z	18:53.06	
	i	Z	18:53:55	
	i	Z	18.54:03	
	i	Z	18.54:32	
	i	Z	18:55:48	
	i	Z	18:59:57	
	i	Z	19:02:11	
	i	Z	19:22:33	
	i	Z	19:27:37	
12 Dec. '51	iP	N,E,Z	01:43:22	Epicenter: 17°N, 94.5°W
	ipP	N	01:43:38	Oaxaca, Mexico
	esP(?)	E	01:43:44	O = 01:37:34
	iPP	Z	01:44:13	Depth = about 100 Km
	iS	N,E	01:47.59	Courtesy U. S. C. G. S.
	M	N	01:49:-	Δ = 3,050 Km
	M	E	01:49:-	
21 Dec. '51		N,E		Seismic activity recog-
				nizable about 09:35:-
23 Dec. '51		E		L waves between 01:20:-
				and 01:40:-
24 Dec. '51		N		Seismic activity begins
				at 06:05:-
26 Dec. '51		N,E,Z		Seismic activity between
				02:00:- and 03:00:-
26 Dec. '51		N		Seismic activity recog-
				nizable at 17:30:-

Date	Phase and Component		G.M.C.T.	Remarks
28 Dec, '51	iP	N,E,Z	09:26:32	Epicenter: 17°N, 98.5°W
	i	Z	09:30:26	Guerrero, Mexico
	eS	N,E,Z	09:31:32	O = 09:20:25
	M	E	09:43:-	Δ = 3,300 Km
				Courtesy U. S. C. G. S.
30 Dec. '51		N,E,Z		Seismic activity recognizable at 18:06:-
30 Dec. '51	eP	Z	22:34:57	Epicenter: 28°S, 114.5°W
	i	Z	22:35:52	Pacific Ocean, west of
	e	Z	22:36:47	Easter Island
	e	N,E	22:39:21	O = 22:23:05
	eS	N,E	22:44:34	Courtesy U. S. C. G. S.
	e	N	22:48:31	Δ = 8,400 Km
				Some of these pulses may be from foreshock
				O = 22:17:51
31 Dec. '51		N,E		Seismic activity recognizable at 20:22:-

We acknowledge with thanks receipt of the following bulletins and other publications between February 13 and November 8, 1952:

Arkansas, Univ. of, Seismological Bulletin	Jan. - March, Jul, Aug, 1952
Barcelona Resume	Year, 1950
Bruselles, Burear Central International de Seismologic	1951
California, Univ. of, Bulletin	Jan. to March, 1945
Canada, Dominion Observatory Seismological Bulletin	
Ottawa	Oct. to Dec., 1951
	Jan. to June, 1952
Victoria	Apr. to June, 1952
Cleveland Seismological Observatory Bulletin	Oct., 1951
Coimbra Instituto Geofisico	year 1945
Czechoslovakia, Institut Geophysique National	
Bulletin Seismique Preliminaire de Cheb	Nov. to Dec., 1951
	Jan. to June, 1952
Hurbanova	Nov. to Dec., 1951
	Mar. to June, 1952
Ksava	Jan. to March, 1952
Praha	Nov. to Dec., 1951
	Jan. to June, 1952
Skalnate Pleso	Nov. to Dec., 1951
	March to June, 1952
Djarkata Seismological Bulletin	April to Dec., 1951
	Jan. to March, 1952
Granada, Observatorio de Cartuja	
Boletin Mensual	Jan. to Dec., 1950
Boletin Seismico Provisional	Feb. to July, 1952
Harvard University Bulletin	Jan. to June, 1952
Helwan Seismological Bulletin	Oct. to Dec., 195?
	Feb. to April, 1952
Seismological, Magnetic and Meteorological Report-	year 1941, 1942
Istanbul, Preliminary Seismic Bulletin	Nov. to Dec, 1951
	Jan. to May, 1952
Japan, Geophysical Magazine	Aug., 1952
Meteorological Research Institute	June, Dec., 1951
Meteorological Society	
Journal	Jan. to Sept., 1952
Oceanographical Magazine	Dec, 1951
Seismological Bulletin	Dec.,'51, Jan, Feb. '52
Papers on Meteorology and Geophysics	March, 1952
Jesuit Seismological Bulletin	May to July, 1951
Lamont Geological Observatory Bulletin	May to Dec., 1951
Madagascar Seismic Bulletin	Jan, July, Sep, 1951
Manila Seismic Bulletin	Oct. to Dec., 1951
	Jan. to July, 1952
Mexico, Universidad Nacional, Instituto de Geofisica	Dec, 1951
	Jan. to Aug., 1952
Pasadena (Calif.) Seismological Preliminary Bulletin	March to June, 1952
Seismological Bulletin	1951
Perth Observatory, W. Australia	Dec., 1951
	Jan. to March, 1952

Rathfarnham, Ireland, Seismic Bulletin	Oct. to Dec., 1951
	Jan. to June, 1952
Rome, Institute Nazionale de Geofisica	Nov,, Dec., 1951
	Jan. to June, 1952
Santa Clara (Calif.) Seismic Bulletin	Feb. to Sept., 1952
Schweizerisches Erdbebunbulletin	Jan. to July, 1952
Strasbourg,	
B. C. I. S.	Nov. to Dec., 1951
	Jan. to May, 1952
Institut de Physique du Globe	
Annales	1944, 1945, 1946
Seismic Bulletin	March to July, 1952
U. S. Coast and Geodetic Survey	
Seismological Bulletin	July to Dec., 1949
	Jan to March, 1950
Prelim. Det. Epicenter	Nos. 18-52 to 148-52
	S6-52 to S17-52
	S19-52 to S44-52
Uppsala, Observatoire Meteorologique de l'universite	July, 1950 to Dec., 1951
Washington Seismic Bulletin (Seattle)	April, 1952
Wellington Seismological Observatory	
Provisional Seismological Bulletin	Aug. to Dec., 1951
	Jan. to March, 1952
Seismological Report	July to Dec., 1949
West Virginia Univ. Seismograph Report II	Jan. to June, 1952
Western Samoa Preliminary Seismic Bulletin	Oct. to Dec., 1951
	Jan. to March, 1952
Wurttembergischen Erdbebendiesntes, Seismischer Bericht -	year 1951
Zurich Jahresbericht	Jan., 1950

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