

THE UNIVERSITY OF PITTSBURGH
PITTSBURGH PENNSYLVANIA



SEISMOLOGICAL OBSERVATORY BULLETIN FOR January 1941

Lat. 40 26.7'N. Long. 79°57.2'W. Elevation - 273 meters

Lithologic Foundation - Birmingham shale

INSTRUMENTS

Two Wenner horizontal seismographs (Orientation N30W and N60E)

One Benioff vertical seismograph

Two special horizontal seismographs (mechanical recording) (Orientation NS and EW)

COMPONENT	DATE FROM WHICH CONSTANTS APPLY	GALVANOMETERS FREE PERIOD, T ₁	PENDULUM FREE PERIOD, T ₀	DAMPING CONSTANT	V
Wenner N60E	January 1, 1941	12.1 secs.	10 secs.	critical	566
Wenner N30W	January 1, 1941	13.0 secs.	10 secs.	critical	710
Benioff Z	To be determined	12.5 secs.	1 secs.		
Special NS	To be installed				
Special Ew	To be installed				

TIME SERVICE: U. S. Naval Observatory signals automatically recorded several times daily. Secondary signals manually recorded from land line to radio station KDKA, Pittsburgh.

GNWCH DATE	COMPNT.	PHASE	GMT	PERIOD	AMPLITUDE	Δ	REMARKS
Jan. 3	NE	e	09h-27m-13s				
	NE	eS	09h-27m-20s				
	NE	eL	09h-33m-50s				
Jan. 6	Z	e	09h-54m-36s				
	NE-NW	eL	10h-06m-02s				
Jan. 11	Seismic activity centering about			09h-07m-	(GMT)		

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GNWCH. DATE	COMPNT.	PHASE	GMT	PERIOD	AMPLITUDE	Δ	REMARKS
Jan. 14	Z	eP ₁	16h-47m-61s		U.S.C.G.S gives H = 16h-27.7m (GMT) Epicenter = 3° S. Lat., 144° E. Long. Depth = 100 Km Δ = 13,990 kms.		
Jan. 17							Possible seismic activity of high frequency centering about 12h-45m (GMT)
Jan. 19							Seismic activity centering about 03h-07m (GMT)
Jan. 21							Seismic activity centering about 13h-59m (GMT)
Donald C. Bradford Director Eugene L. Sulkowski Assistant							

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SEISMOLOGICAL OBSERVATORY BULLETIN FOR _____ 19____

Lat. 40 26.7'N. Long. 79°57.2'W. Elevation - 273 meters

Lithologic Foundation - Birmingham shale

INSTRUMENTS

- Two Wenner horizontal seismographs (Orientation N30W and N60E)
- One Benioff vertical seismograph
- Two special horizontal seismographs (mechanical recording) (Orientation NS and EW)

COMPONENT	DATE FROM WHICH CONSTANTS APPLY	GALVANOMETERS FREE PERIOD T_1	PENDULUM FREE PERIOD T_0	DAMPING CONSTANT	V

TIME SERVICE: U. S. Naval Observatory signals automatically recorded several times daily. Secondary signals manually recorded from land line to radio station KDKA, Pittsburgh.

GNWCH DATE	COMPNT.	PHASE	GMT	PERIOD	AMPLITUDE	Δ	REMARKS

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PITTSBURGH PENNSYLVANIA

SEISMOLOGICAL OBSERVATORY BULLETIN FOR February 419

Lat. 40 26.7'N. Long. 79°57.2'W. Elevation - 273 meters

Lithologic Foundation - Birmingham shale

INSTRUMENTS

Two Wenner horizontal seismographs (Orientation N30W and N60E)

One Benioff vertical seismograph

Two special horizontal seismographs (mechanical recording) (Orientation NS and EW)

COMPONENT	DATE FROM WHICH CONSTANTS APPLY	GALVANOMETERS FREE PERIOD T_1	PENDULUM FREE PERIOD T_0	DAMPING CONSTANT	V
Wenner N60E	February 1, 1941	12.1 secs.	10 secs.	critical	566
Wenner N30W	February 1, 1941	16.0 secs.	10 secs.	critical	710
Benioff Z	To be redetermined	12.3 secs.	1 secs.		
Special NS	To be installed				
Special EW	To be installed				

TIME SERVICE: U. S. Naval Observatory signals automatically recorded several times daily. Secondary signals manually recorded from land line to radio station KDKA, Pittsburgh.

GNWCH DATE	COMPNT.	PHASE	GMT	PERIOD	AMPLITUDE	Δ	REMARKS
Feb. 2	NE-NW	Seismic activity centering		about 0h-4m (GMT)			
Feb. 7	NE-NW	Seismic activity centering		about 11h-20m (GMT)			
Feb. 9	Z	eP	09h-50m-51s	$\Delta(iS-eP) = 33.9^\circ = 3765$ Kms.			
	Z	i	09h-50m-54s	H = 09h-44m-04s (GMT)			
	Z	i	09h-50m-57s	U.S.C.G.S. gives $\Delta = 3760$ kms.			
	NW-NE	eS	09h-51m-19s	H = 09h-44.1 m (GMT)			
	NW-NE	iS	09h-56m-24s	Epicenter = 40.7 N. Lat. 125.4 W. Long.			

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GNWCH. DATE	COMPNT.	PHASE	GMT	PERIOD	AMPLITUDE	Δ	REMARKS
Feb. 9	Z	i	19h-27m-32s				
	Seismic activity centering about 20h-23m (GMT)						
Feb. 11	NW-NE	eP	14h-41m-26s		$\Delta(S-P) = 28.8^{\circ} = 3200\text{kms.}$		
	NW-NE	eS	14h-46m-17s		H = 14h-35m-24s (GMT) U.S.C.G.S. gives $\Delta = 3200\text{ kms.}$ H = 14h-35.4m (GMT) Epicenter = 14.5 ^o N. Lat. 94.0 W. Long.		
Feb. 13	Seismic activity centering about 15h-12m (GMT).						
					Donald C. Bradford Director		
					Eugene L. Sulkowski Assistant		

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SEISMOLOGICAL OBSERVATORY BULLETIN FOR _____ 19____ 41
March

Lat. 40°26.7'N. Long. 79°57.2'W. Elevation - 273 meters

Lithologic Foundation - Birmingham shale

INSTRUMENTS

Two Wenner horizontal seismographs (Orientation N30W and N30E)

One Benioff vertical seismograph

Two special horizontal seismographs (mechanical recording) (Orientation NS and EW)

COMPONENT	DATE FROM WHICH CONSTANTS APPLY	GALVANOMETERS FREE PERIOD T_1	PENDULUM FREE PERIOD T_0	DAMPING CONSTANT	V
Wenner N30E	March 1, 1941	12.1 secs.	10 secs.	Critical	565
Wenner N30W	March 1, 1941	16 secs.	10 secs.	Critical	710
Benioff Z	To be determined	12.3 secs.	1 secs.		
Special NS	To be installed				
Special EW	To be installed				

TIME SERVICE: U. S. Naval Observatory signals automatically recorded several times daily. Secondary signals manually recorded from land line to radio station KDKA, Pittsburgh.

GNWCH DATE	COMPNT.	PHASE	GMT	PERIOD	AMPLITUDE	Δ	REMARKS
Mar. 10	Seismic Activity centering about 04h-28m. (G.M.T.)						
Mar. 15	Z	eP	05h-52m-30s				$\delta (S_e - P_e) = 33.6^\circ = 3735 \text{ Km.}$ H : 05h-05m-46 s (GMT) U.S.G.G.S. gives $\Delta = 5955 \text{ km.}$ $H = 05h-46.3 \text{ m}$ Epicenter = 28.1° N. Lat. 113.6° W. Long.
	Z	iP	05h-52m-31s				
	NW-NE	eS	05h-58m-01s				
Mar. 16	Z	e	07h-54m-15s				
	NE	i	08h-03m-58s				

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GNWCH. DATE	COMPNT.	PHASE	GMT	PERIOD	AMPLITUDE	Δ	REMARKS
Mar. 21	Z NW-NE	iP iS	08h-07m-17s 08h-14m-45s		$\Delta(S-P) = 51.9^\circ$ H = 07h-58m-10s U.S.C.G.S. gives $\Delta = 5955$ km. H = 07h-58.4m Epicenter = 7.3° N. Lat. 36.6° W. Long. Depth = 100 kms. (uncertain)	5765 km. (GMT)	
Mar. 23	Seismic activity		centering about 09h-19m (GMT)				
Mar. 28	Seismic activity		centering about 23h-11m (GMT)				

Donald C. Bradford, Director
 Eugene L. Sulkowski, Assistant

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PITTSBURGH PENNSYLVANIA

SEISMOLOGICAL OBSERVATORY BULLETIN FOR _____ 19____

Lat. 40°26.7'N. Long. 79°57.2'W. Elevation - 273 meters

April

41

Lithologic Foundation - Birmingham shale

INSTRUMENTS

- Two Wenner horizontal seismographs (Orientation N30W and N60E)
- One Benioff vertical seismograph
- Two special horizontal seismographs (mechanical recording) (Orientation NS and EW)

COMPONENT	DATE FROM WHICH CONSTANTS APPLY	GALVANOMETERS FREE PERIOD T_1	PENDULUM FREE PERIOD T_0	DAMPING CONSTANT	V
Wenner N60E	April 1, 1941	12.1 secs	10 secs.	Critical	565
Wenner N30W	April 1, 1941	16.0 secs.	10 secs.	Critical	710
Benioff Z	To be determined	12.6 secs.	1 secs.		
Special NS	To be installed				

Special TIME SERVICE: ~~Up~~ ~~Special~~ ~~Naval~~ ~~Observatory~~ signals automatically recorded several times daily. Secondary signals manually recorded from land line to radio station KDKA, Pittsburgh.

GNWCH DATE	COMPNT.	PHASE	GMT	PERIOD	AMPLITUDE	Δ	REMARKS
April 1	Z NW-NE	iP eS	10 h-49m-50s 10h-56m-48s			$\Delta(S-P) = 47.1^\circ = 5235 \text{ km.s}$ $H = 10h-41m-19s \text{ (GMT)}$	
April 1	Seismic activity centering about 22h-37m (GMT)						
April 3	Z NW-NE NW-NE NW-NE	iP ipP eS iS isS	15h-31m-44s 15h-32m-02s 15h-40m-04s 15h-40m-08s 15h-40m-28s			$\Delta(eS-iP) = 60.7^\circ \text{ (calc)}$ Distance = 6745 kms. $H = 15h-21m-37s \text{ (GMT)}$ Depth = 100 kms. U.S.G.G.S. gives $H = 15h-21m$ Distance = 7550 kms. Depth = 200 kms. (approx.) Epicenter = 25° S. Lat. 69° W. Long.	

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GNWCH. DATE	COMPNT.	PHASE	GMT	PERIOD	AMPLITUDE	Δ	REMARKS
April 6			Seismic activity centering about 23h-15m (GMT)				
April 7	Z NW-NE	iP iS	23h-34m-21s 28h-04m-09s				$\Delta(S-P) = 22.8^\circ$ H = 23h-29m-18s Distance = 2535 kms. U.S.C.G.S. gives H = 23h-29m-13s Distance = 2530 km.s Epicenter = 17.6° N. Lat. 78.3° W. Long.
April 8			Seismic activity centering about 10h-20m (GMT)				
April 15,	Z	iP	19h-15m-55s				After the first phase, the amplitudes were too large to read. U.S.C.G.S. gives H = 19h-09m-53.0s Distance = 3280 km.s Epicenter = 18.8° N. Lat. 103.0° W. Long.
April 15			Seismic activity centering about 23h-48m (GMT)				U.S.C.G.S. gives Epicenter = 19° N. Lat. 103° + W. Long. After shock 23h-42.6m.
April 16	Z	i	01h-14m-22s				U.S.C.G.S. gives after-shock 01h-37.9m Epicenter = 19° + N. Lat. 103° + W. Long.
April 19			Seismic activity centering about 08h-53m (GMT)				
April 20	NW-NE	iS _c P _c S	18h-02m-31s			$\Delta = 11,010$ kms. (Calc)	U.S.C.G.S. gives H = 17h-38.3m (GMT) Distance = 10900 km.s Epicenter = 37° N. Lat. 69° E. Long

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GNWCH. DATE	COMPNT.	PHASE	GMT	PERIOD	AMPLITUDE	Δ	REMARKS
April 21		Seismic activity centering about 02h-32m Seismic activity centering about 22h-44m			(GMT) (GMT)		U.S.C.G.S. gives H = 02h-54.1m Distance = 6300 kms. Epicenter = 55° N. Lat. 166° W. Long.
April 24		Seismic activity centering about 01h-15m			(GMT)		
April 27		Seismic activity centering about 01h-43m Seismic activity centering about 09h-45m			(GMT) (GMT)		
April 28	Z NW-NE		iP cS	01h-50m-31s 01h-55m-16s			$\Delta(S-P) = 27.2^{\circ} = 3020\text{kms.}$ H = 01h-44m-44s (GMT)

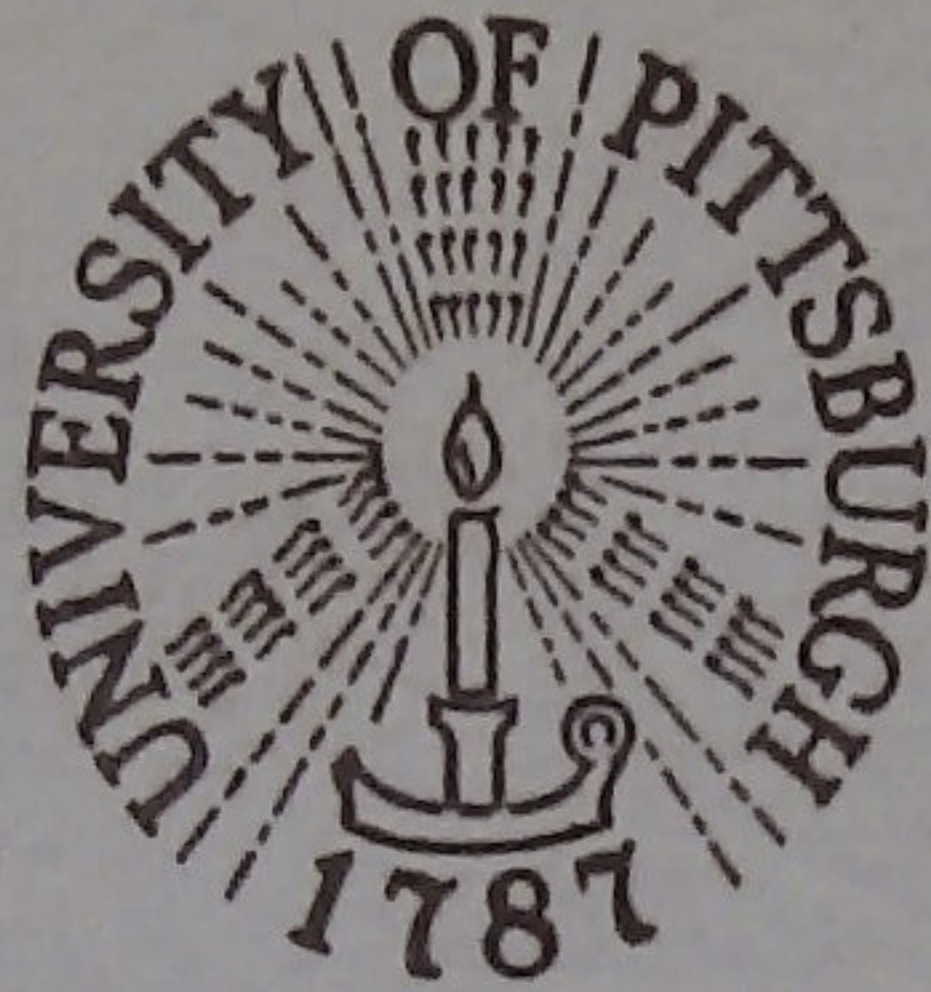
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SEISMOLOGICAL OBSERVATORY BULLETIN

UNIVERSITY OF PITTSBURGH

May - Dec. 1941



PITTSBURGH, PENNSYLVANIA

SEISMOLOGICAL OBSERVATORY BULLETIN

UNIVERSITY OF PITTSBURGH



VOLUME I

NO. 1

MAY - DECEMBER, 1941

DONALD C. BRADFORD, *Director*

EUGENE L. SULKOWSKI, *Assistant*

PITTSBURGH, PENNSYLVANIA

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(This Bulletin will hereafter be issued yearly,
at about this time of year)

(manuscript 1942)



STATION CONSTANTS AND INSTRUMENTS



Latitude— $40^{\circ} 26.7'$ North

Longitude— $79^{\circ} 57.2'$ West

Lithological foundation—Birmingham Shale—Pennsylvania age.

Elevation—273 meters above sea level.

INSTRUMENTS

Two Wenner horizontal seismographs (Orientation $N30^{\circ}W$ and $N60^{\circ}E$)

One Benioff vertical seismograph (long period recording only)

(The above instruments operate with photographic recording)

Two Pittsburgh Type horizontal seismographs (mechanical recording)

(Orientation N-S and E-W)

TIME SERVICE AND CONTROL

Time marks are given by two Observatory master clocks; one is a special astronomical type (used as stand-by), while the other is a Frodsham astronomical clock, (used for routine work).

Time signals are recorded automatically (or manually, depending on the weather conditions) several times daily. These signals are transmitted from the Naval Observatory via stations NSS and NAA.

The average clock drift is one-half second per day.

INSTRUMENTAL CONSTANTS

Magnification curves for the Wenner seismographs are given on the next page. Magnification curve for the Benioff is not completed. The nominal magnification of the Benioff is approximately 24,000.

THE NEW INSTRUMENT VAULT

A new instrument vault is being built to house the mechanically recording pendula. Included in this vault will be an interferometer type tiltmeter and well gage recorder. Constants for these instruments will be published in a later number of this Bulletin.

MICROSEISMIC ACTIVITY

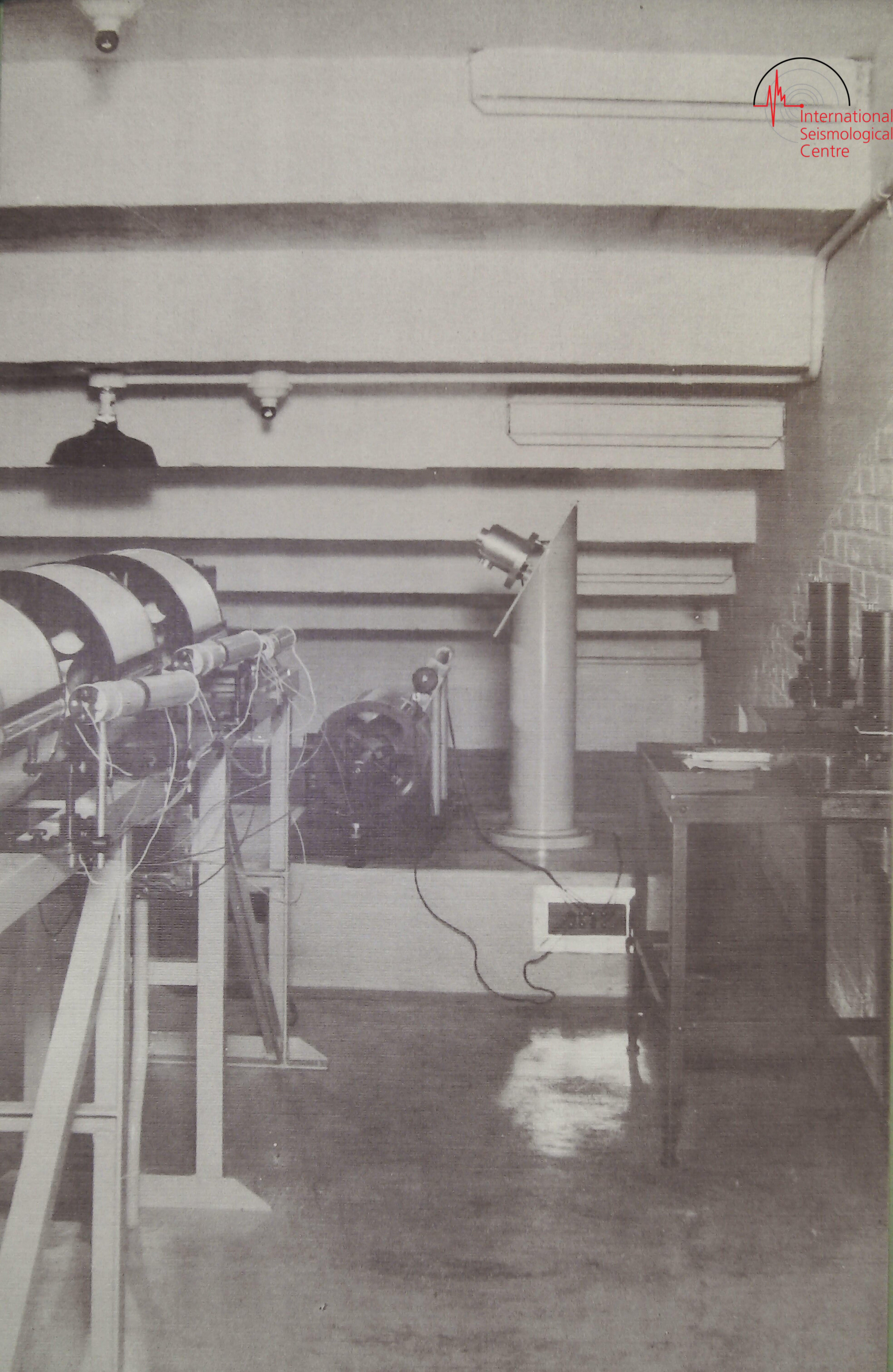
These data have been evaluated according to the following scale

HORIZONTAL AMPLITUDE	DESIGNATION
Less than 2 microns	below normal
Between 2 and 3 microns	normal
More than 3 microns	above normal

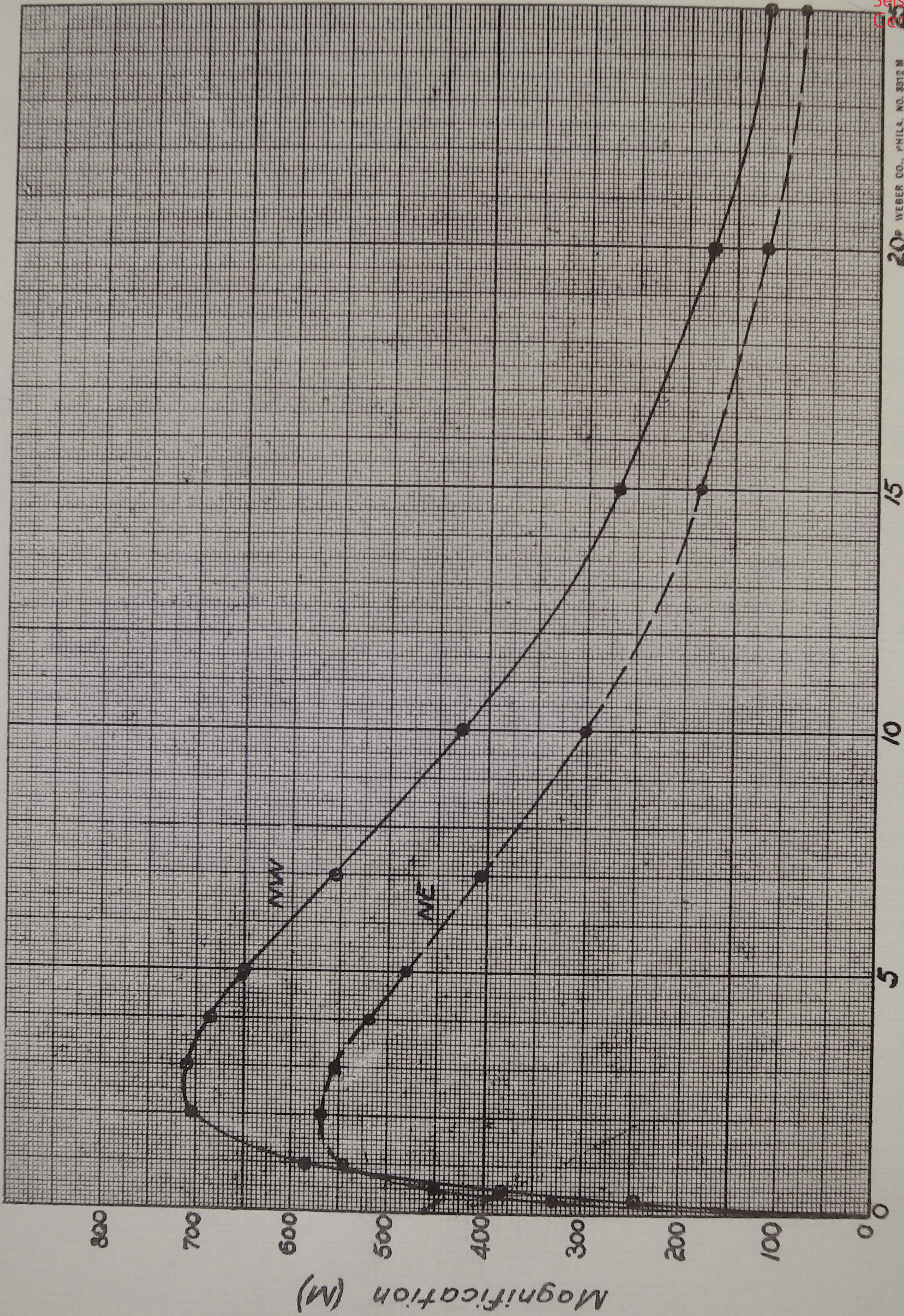
	DATE	EVALUATION
May	1 - 11	Above normal
	11 - 18	Normal
	18 - 22	Slightly above normal
	22 - 28	Normal
	28 - 31	Above normal
June	1 - 5	Slightly above normal
	5 - 8	Above normal
	8 - 13	Normal
	13 - 25	Below normal
	25 - 28	Slightly above normal
	28 - 30	Below normal
July	1 - 3	Below normal
	3 - 6	Above normal
	6 - 17	Below normal
	17 - 20	Normal
	20 - 31	Below normal
August	1 - 13	Below normal
	13 - 15	Normal
	15 - 17	Below normal
	17 - 19	Above normal
	19 - 27	Below normal
	27 - 31	Normal

MICROSEISMIC ACTIVITY (Cont'd)

DATE		EVALUATION
September	1 - 8	Normal
	8 - 12	Below normal
	12 - 16	Normal
	16 - 18	Below normal
	18 - 25	Normal
	25 - 27	Above normal
	27 - 30	Normal
October	1 - 3	Normal
	3 - 5	Below normal
	5 - 8	Slightly above normal
	8 - 13	Above normal
	13 - 16	Normal
	16 - 25	Above normal
	25 - 31	Slightly above normal
November	1 - 4	Normal
	4 - 7	Above normal
	7 - 17	Normal
	17 - 20	Considerably above normal
	20 - 28	Slightly above normal
	28 - 30	Normal
December	1 - 4	Slightly above normal
	4 - 7	Normal
	7 - 12	Above normal
	12 - 19	Considerably above normal
	19 - 21	Above normal
	22 - 24	Considerably above normal
	24 - 31	Above normal



Magnification Curves for Wenner Seismographs



20P WEBER CO., PHILA. NO. 8812 M



Period of Earth Motion (T_e) Seconds

SECTION ON SEISMIC DATA

(Earthquakes for which preliminary phases have been identified, or for which preliminary epicenters have been worked out, are numbered in the left hand column as of No. 1, September 8, 1939.)

GNWCH. DATE	COMPNT.	PHASE	GMT	PERIOD	AMPLITUDE
May 5					Seismic activity centering about 21h-32m., G.M.T.
May 8	NW-NE	e	10-39-41		
	NW-NE	i	10-39-44		
	Z	i	10-39-44		
May 9					Seismic activity centering about 07h-20m., G.M.T.
May 11					Seismic activity centering about 13h-47m., G.M.T.
May 12					Seismic activity centering about 05h-04m., G.M.T.
May 16					Seismic activity centering about 00h-05m., G.M.T.
					Seismic activity centering about 08h-30m., G.M.T.
37 May 17	Z	ePR ₁	02-44-29		U.S.C. & G.S. gives
	NW	iS _c P _c P _c S	02-51-35		H = 02h-24.7m. (GCT)
	NE	iPS	02-54-14		Δ = 12,980 kms.
	NE	i	02-55-56		Lat. 12°9 South
	NE	e	03-00-20		Long. 166°7 East
	NE	iSR ₁	03-00-33		
May 22					Seismic activity centering about 18h-12m., G.M.T.
					Seismic activity centering about 19h-33m., G.M.T.
May 23					Seismic activity centering about 00h-03m., G.M.T.
					Seismic activity centering about 18h-10m., G.M.T.
May 30					Seismic activity centering about 18h-32m., G.M.T.
June 3					Seismic activity centering about 15h-25m., G.M.T.
June 4					Seismic activity centering about 17h-32m., G.M.T.
June 8					Seismic activity centering about 00h-20m., G.M.T.
38 June 9	Z	eP	06-24-13	Δ(S-P) =	34°1
	NE	eS	06-29-47		= 3,790 kms.
	NE	iS	06-29-50	H =	06h-17m-25s.
39 June 9	Z	iP	08-50-34	Δ(S-P) =	34°0
	NE	eS	08-56-07		= 3,780 kms.
				H =	08h-43m-47s.
June 10					Seismic activity centering about 10h-35m., G.M.T.
June 16					Seismic activity centering about 21h-32m., G.M.T.

SEISMIC DATA



GNWCH. DATE	COMPNT.	PHASE	GMT	PERIOD	AMPLITUDE
40	June 18	Z	iP	11-15-50	$\Delta(S-P) = 32^{\circ}.3$
		NE	iS	11-21-12	$= 3,590$ kms.
					H = 11h-09m-17s.
					U.S.C. & G.S. gives
					$\Delta = 3,800$ kms.
					H = 11h-09.0m
					Lat. $51^{\circ}.5$ North
					Long. $32^{\circ}.0$ West
	June 20	Seismic activity centering about 10h-02m., G.M.T.			
41	June 26	Z	i	12-11-06	U.S.C. & G.S. gives
		Z	iP' ₁	12-11-13	H = 11h-52.1m.
		NW	i	12-13-12	$\Delta = 126^{\circ}.5$ (measured)
		NE	iS	12-21-02	Lat. $13^{\circ}.0$ North
					Long. $93^{\circ}.0$ East
		(Amplitudes too large to be read accurately)			
42	June 27	Z	iP _n	08-15-33	$\Delta(S_n-P_n) = 1^{\circ}.2$
		NE	iS _n	08-15-49	$= 127$ kms.
					H = 08h-15m-12s.
		(No reports have been received of earthquake being felt)			
43	June 27	Z	iP	17-17-30	$\Delta(S-P) = 30^{\circ}.1$
		Z	ipP	17-17-46	$= 3,345$ kms.
					H = 17h-11m-17s
		NE	iS	17-22-36	D = 100 kms.
		NW	isS	17-23-04	U.S.C. & G.S. gives
					H = 17h-11.3m
					$\Delta = 3,100$ kms.
					Lat. $16^{\circ}.0$ North
					Long. $93^{\circ}.0$ West
	June 29	Seismic activity centering about 23h-06m., G.M.T.			
	June 30	NE-NW	e	16-27-16	

GNWCH. DATE	COMPNT.	PHASE	GMT	PERIOD	AMPLITUDE
44 July 1	Z	iP	07-57-22	$\Delta(S-P) =$	$31^{\circ}.1$
	NW	iS	08-02-35		$= 3,455$ kms.
					H = 07h-51m-00s.
					U.S.C.G.S. gives
					$\Delta = 3,650$ kms.
					H = 07h-50.9m
					Lat. $34^{\circ}.1$ North
					Long. $119^{\circ}.8$ West
45 July 3	Z	eP	07-23-08	$\Delta(S-P) =$	$74^{\circ}.0$
	NW-NE	iS	07-32-45		$= 8,220$ kms.
					H = 07h-11m-36s.
					U.S.C.G.S. gives
					$\Delta = 8,200$ kms.
					H = 07h-11.7m.
					Lat. 33° South
					Long. 68° West
July 8					Seismic activity centering about 01h-02m. G.M.T.
July 10					Seismic activity centering about 04h-27m., G.M.T.
July 10	NE-NW	i	09-47-30		
	NE-NW	i	09-48-11		
46 July 11	Z	eP	01-23-32	$\Delta(S-P) =$	$34^{\circ}.4$
	NE-NW	iS	01-29-08		$= 3,820$ kms.
					H = 01h-16m-41s.
					U.S.C.G.S. gives
					$\Delta = 3,925$ kms.
					H = 01h-16.6m.
					Lat. $5^{\circ}.5$ North
					Long. 83° West
47 July 16	NE-NW	eP	03-18-35	$\Delta(S-P) =$	$28^{\circ}.5$
	NE-NW	eS	03-24-24		$= 3,165$ kms.
					H = 03h-13m-30s.

SEISMIC DATA

GNWCH. DATE	COMPNT.	PHASE	GMT	PERIOD	AMPLITUDE
July 19	NE-NW	i	09-10-35		
July 20	Seismic activity centering about 07h-06m., G.M.T.				
July 21	Seismic activity centering about 17h-04m., G.M.T.				
July 23	Seismic activity centering about 01h-42m., G.M.T.				
July 23	NE-NW	i	09-53-36		
July 23	Seismic activity centering about 22h-31m., G.M.T.				
July 26	Seismic activity centering about 21h-10m., G.M.T.				
48 July 30	Z	iP	01-59-54	$\Delta(S-P) =$	46°.1
	Z	i	02-00-03		= 5,120 kms.
	NE-NW	iS	02-06-46	H =	01h-51m-30s.
	U.S.C.G.S. gives				
	$\Delta =$ 5,125 kms.				
	H = 01h-51.5m.				
	Lat. 60°.9 North				
	Long. 149°.2 West				
49 Aug. 2	NE-NW	eP	11-56-28	$\Delta(\text{meas}) =$	115°.2
	NE-NW	ePR ₁	12-01-07		= 12,800 kms.
	H = 11h-41m-30s				
	NE-NW	e	12-06-44	U.S.C.G.S. gives	
	NE-NW	iS _c P _c S	12-06-59	$\Delta =$	12,800 kms.
	NE-NW	iS _c P _c P _c S	12-08-10	H =	11h-41.5m.
	NE-NW	eS	12-09-00	Lat. 30° South	
	NE-NW	iPS	12-10-47	Long. 178°.5 West	
Aug. 4	Seismic activity centering about 00h-16m., G.M.T.				
50 Aug. 4	NE-NW	eP	11-03-52	$\Delta(S-P) =$	63°.4
	NE-NW	i	11-07-57		= 7,045 kms.
	NE-NW	iS	11-12-32	H =	10h-53m-21s.
	NE-NW	i	11-13-42	U.S.C.G.S. gives	
	$\Delta =$ 7,040 kms.				
	H = 10h-53m-00s.				
	Lat. 52° North				
	Long. 176°.5 West				

GNWCH. DATE	COMPNT.	PHASE	GMT	PERIOD	AMPLITUDE
51 Aug. 6	Z	iP	06-24-18	$\Delta(S-P) =$	$50^{\circ}6$
	NE-NW	eS	06-31-38		$= 5,620$ kms.
	NE-NW	i	06-31-41	H =	06h-15m-21s.
	NE-NW	e	06-33-52	U.S.C.G.S. gives	
	NE-NW	i	06-33-56	$\Delta =$	$5,850$ kms.
				H =	06h-15m-18s.
				Lat. $55^{\circ}5$ North	
				Long. 160° West	
Aug. 10	Seismic activity centering about 05h-28m., G.M.T.				
52 Aug. 15	Z	iP	06-18-21	$\Delta(S-P) =$	$49^{\circ}5$
	NE-NW	ipP	06-18-35		$= 5,500$ kms.
	NE-NW	iS	06-25-34	H =	06h-09m-32s.
	NE-NW	isS	06-25-55	D =	50 kms. (approx)
				U.S.C.G.S. gives	
				$\Delta =$	$5,500$ kms.
				H =	06h-09.5m.
				Lat. 19° North	
				Long. 27° West	
Aug. 19	Seismic activity centering about 01h-48m., G.M.T.				
Aug. 27	Seismic activity centering about 18h-58m., G.M.T.				
Aug. 28	Seismic activity centering about 07h-11m., G.M.T.				
Sept. 1	Seismic activity centering about 07h-19m., G.M.T.				
53 Sept. 4	NE-NW	iP	10-41-59	$\Delta(S-P) =$	$76^{\circ}2$
	NE-NW	iS	10-51-47		$= 8,465$ kms.
				H =	10h-37m-14s.
Sept. 5	NE-NW	i	19-05-19		
Sept. 7	NE-NW	i	22-41-11		
54 Sept. 9	NE-NW	eP	07-35-06	$\Delta(S-P) =$	$122^{\circ}9$
	NE-NW	ePR ₁	07-40-02		$= 13,655$ kms.
	NE-NW	iS _c P _c S	07-45-27	H =	07h-19.6m.

SEISMIC DATA



GNWCH. DATE	COMPNT.	PHASE	GMT	PERIOD	AMPLITUDE
	NE-NW	eS	07-48-04	U.S.C.G.S. gives	
	NE-NW	ePS	07-50-02	$\Delta =$	13,660 kms.
				H =	07h-19.6m.
					Lat. 7° South
					Long. 153° East
Sept. 10	NE-NW	i	22-17-03		
55 Sept. 12	NE-NW	eP	07-18-09	$\Delta(S-P) =$	130°5
	NE-NW	eS _c P _c P	07-24-29	=	14,500 kms.
	NE-NW	eS _c P _c P _c S	07-30-11	H =	07h-02m-00s.
	NE-NW	eS	07-35-27	U.S.C.G.S. gives	
	NE-NW	ePPS	07-35-09	$\Delta =$	14,500 kms.
				H =	07h-02m-00s.
					Lat. 2° North
					Long. 130° East
56 Sept. 13	NE-NW	iP	18-21-18	$\Delta(S-P) =$	31°7
	NE-NW	iS	18-26-35	=	3,520 kms.
				H =	18h-14m-50s.
				U.S.C.G.S. gives	
				$\Delta =$	3,525 kms.
				H =	18h-14.8m.
					Lat. 18°7 North
					Long. 106°9 West
Sept. 14	NE-NW	i	04-31-19		
57 Sept. 16	NE-NW	eP	21-53-55	$\Delta =$	113°4
	NE-NW	eS _c P _c S	22-04-26	=	12,600 kms.
	NE-NW	eS _c P _c P _c S	22-05-34	H =	21h-39.1m
	NE-NW	e	22-05-51	U.S.C.G.S. gives	
	NE-NW	eS	22-06-22	$\Delta =$	12,600 kms
	NE-NW	e	22-08-20	H =	21h-39.1m.
	NE-NW	e	22-09-25		Lat. 28°5 South
					Long. 178° West

GNWCH. DATE	COMPNT.	PHASE	GMT	PERIOD	AMPLITUDE
58 Sept. 17	NE-NW	eP	07-10-01	$\Delta(S-P) =$	$37^{\circ}9$
	NE-NW	epP	07-10-13		$= 4,210$ kms.
	NE-NW	ePR ₁	07-11-37	H =	07h-02m-42s.
	NE-NW	iS	07-16-00	D =	100 kms.
	NE-NW	esS	07-16-26		
	NE-NW	eSR ₁	07-18-17		
Sept. 18	Seismic activity centering about 14h-22m., G.M.T.				
59 Sept. 24	NE-NW	iP	01-13-05	$\Delta(S-P) =$	76°
	NE-NW	epP	01-13-13		$= 8,445$ kms.
	NE-NW	iS	01-22-48	H =	01h-01m-21s.
	NE-NW	esS	01-23-02	D =	40 kms.
				U.S.C.G.S. gives	
				$\Delta =$	8,350 kms.
				H =	01h-01m-01s.
				Lat. 52° North	
				Long. 158° East	
Sept. 25	Seismic activity centering about 18h-02m., G.M.T.				
Oct. 1	Seismic activity centering about 03h-11m., G.M.T.				
60 Oct. 3	NE-NW	e	16-19-52	$\Delta(\text{meas}) =$	$33^{\circ}7$
	NE-NW	ipP	16-20-04		$= 3,745$ kms.
	NE-NW	iS	16-25-16	H =	16h-13m-10s.
	NE-NW	isS	16-25-34	D =	95 kms.
				U.S.C.G.S. gives	
				$\Delta =$	3,750 kms.
				H =	16h-13.2m.
				Lat. $40^{\circ}6$ North	
				Long. $124^{\circ}6$ West	
Oct. 5	NE-NW	i	10-27-33	U.S.C.G.S. gives	
	NE-NW	iS	10-35-46	$\Delta =$	11,400 kms.
				H =	10h-11.2m.
				Lat. 15° South	
				Long. 173° West	

SEISMIC DATA

GNWCH. DATE	COMPNT.	PHASE	GMT	PERIOD	AMPLITUDE
Oct. 6	Seismic activity centering around 07h-23m., G.M.T.				
Oct. 8	Seismic activity centering about 04h-48m., G.M.T.				
Oct. 8	Seismic activity centering about 06h-22m., G.M.T.				
Oct. 31	Seismic activity centering about 07h-13m., G.M.T.				
Oct. 31	Seismic activity centering about 13h-07m., G.M.T.				
Nov. 5	Seismic activity centering about 14h-30m., G.M.T.				
61 Nov. 6	Z	iP	12-39-11	$\Delta(S-P) =$	54°9
	NE-NW	eS	12-47-25		= 6,100 kms.
				H =	12h-29m-43s.
				U.S.C.G.S. gives	
				$\Delta =$	6,100 kms.
				H =	12h-29.7m.
				Lat.	54° North
				Long.	163° West
62 Nov. 8	Z	eP	23-56-41	$\Delta(S-P) =$	70°4
	Z	iPR ₁	23-59-22		= 7,820 kms.
	NW	iS	00-05-57	H =	23h-45m-30s
	NW	i	00-06-59		
	NW	i(SR ₁)	00-10-42		
	NW	i	00-11-14		
	NE-NW	i(SR ₂)	00-13-20		
Nov. 14	Seismic activity centering about 09h-02m., G.M.T.				
63 Nov. 16	Z	iP	09-45-38	$\Delta(S-P) =$	27°7
	Z	i	09-46-28		= 3,080 kms.
	NE-NW	iS	09-50-27	H =	09h-39m-42s.
				U.S.C.G.S. gives	
				$\Delta =$	3,100 kms.
				H =	09h-39.7 m.
				Lat.	13°5 North
				Long.	88° West

GNWCH. DATE	COMPNT.	PHASE	GMT	PERIOD	AMPLITUDE
Nov. 18					Seismic activity centering about 17h-32m., G.M.T. Phases large but not readable because of intense microseismic activity.
Nov. 24					Seismic activity centering about 22h-35m., G.M.T.
64 Nov. 25	Z	iP	18-12-27	$\Delta(S-P) = 45^{\circ}7$	
	NE-NW	iS	18-19-26	=	5,080 kms.
					H = 18h-04m-06s.
					Preliminary epicenter determined from the records of one station; Latitude $35^{\circ}5$ North, Longitude $13^{\circ}5$ West. Strongly felt in the Azores, the Madeiras, and in western Portugal. Other phases too large to be readable.
65 Nov. 27	Z	iP	08-56-11	$\Delta(S-P) = 34^{\circ}6$	
	NE-NW	eS	09-01-49	=	3,850 kms.
					H = 08h-49m-19s.
66 Dec. 5	Z	iP	20-53-28	$\Delta(S-P) = 33^{\circ}6$	
	Z	iPR ₁	20-54-26	=	3,735 kms.
	Z	iPR ₂	20-54-45		H = 20h-46m-44s.
	NE-NW	iS	20-58-59		U.S.C.G.S. gives
				$\Delta =$	3,730 kms.
					H = 20h-46.9m.
					Lat. 8° North
					Long. 83° West
Dec. 6					Seismic activity centering about 01h-45m., G.M.T.
Dec. 6	Z	iP	21-31-13		
Dec. 7					Seismic activity centering about 12h-03m., G.M.T.
Dec. 8					Seismic activity centering about 07h-08m., G.M.T.
Dec. 20					Seismic activity centering about 13h-09m., G.M.T.
Dec. 20					Seismic activity centering about 15h-20m., G.M.T.
Dec. 24					Seismic activity centering about 03h-50m., G.M.T.
Dec. 24					Seismic activity centering about 12h-24m., G.M.T.
Dec. 26					Seismic activity centering about 15h-59m., G.M.T.
Dec. 31					Seismic activity centering about 07h-09m., G.M.T.
Dec. 31	Z	iP	18-44-13	$\Delta(S-P) = 38^{\circ}5$	
	Z	i	18-44-19	=	4,280 kms.
	NE-NW	eS	18-50-18		H = 18h-42m-55s.