H A R V A R D U N I V E R S I T Y
Division of Geological Sciences
Cambridge, Massachusetts, U.S.A.

SEISMOGRAPH STATION--Oak Ridge Observatory, Harvard, Mass.

Latitude 42° 30' 26" North ± 1"
Longitude 71° 33' 45" West ± 15"
Foundation Micaceous Schist
Height 180 meters
Time: Mean Greenwich, midnight to midnight.
E. Howard pendulum clock corrected by radio time signals from NAA.
Accuracy: ± .05 sec.

BULLETIN NO. 2

1934 January 1 to 1934 June 30
by L. Don Leet, seismologist in charge

INSTRUMENTS--FIXED CONSTANTS

Instrument	Symbol	Registration	Damping	Paper Speed	Mass
Milne-Shaw 43	NW-SE	photographic	magnetic	15 mm per min	1 lb
Milne-Shaw 44	NE-SW	photographic	magnetic	15 mm per min	1 lb
Wood-Anderson[1]	N-S	photographic	magnetic	15 mm per min	15 g
Wood-Anderson[1]	E-W	photographic	magnetic	15 mm per min	15 g
Benioff (Moll)[2]	Z	galvanometric	magnetic	15 mm per min	112.7 kg.
Benioff (L-N)[2]	Z_{13}	galvanometric	magnetic	15 mm per min	112.7 kg

[1] See Bulletin Seis. Soc. Am., Vol. 15, No. 1, 1925.
[2] See Bulletin Seis. Soc. Am., Vol. 22, No. 2, 1932

INSTRUMENTS--NORMAL OPERATING CONSTANTS

Instrument	T_o	T_g	V	ε	Displacement for 1" arc tilt	Displacement for accel'n = .00001 g
NE-SW	12		250	20:1	44 mm	
NW-SE	12		250	20:1	44 mm	
N-S	1		2800	20:1	18 mm	
E-W	1		2800	20:1	18 mm	
Z	.85	.2		20:1		60 to 80 mm
Z_{13}	.85	13.3		20:1		60 to 80 mm

TABLES USED: J. B. Macelwane's "Preliminary Table of Observed Travel Times of Earthquake Waves for Distances between 10° and 180° Applicable Only to Normal Earthquakes," St. Louis University, 1933 November.

For local quakes: travel time data based on preliminary results of the registration of quarry blasts.

NOTE ON SYMBOLS: In designating displacements registered on the vertical components, + is used to indicate that the ground moved upward, - downward.

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PHASE	Z	Z_{13}	NE-SW	NW-SE	N-S	E-W
1934 Jan. 1						
	i 06-36-08					
				e 06-49.5		
			e 06-58			
L				e 07-37		
	i+ 08-16-40					
Jan. 2						
L			e 21-52	e 21-41		
Jan. 3						
H = 09-42-32	Δ = 71.°2 = 7910 km.					
	+ 5° for depth of focus (Gutenberg)					
	S-P = 9-21					
	Depth = .05R			St. Louis: H = 09-42-42		
				φ = 53.6° N		
				λ = 157.3° E		
				"poor agreement"		
P	i 09-53-49	i 09-53-49		i 09-53-49	i 09-53-49	i 09-53-49
pP	i 54-57	i 54-57		e 54-58		
sP	i 55-27	i+ 55-27				
	i 56-43	i 56-45		e 56-45		
		i 59-31		e 59-23		
S		e 10-03-20	i 10-03-08	e 10-03-08	i 10-03-08	i 10-03-08
sS			i 05-07	e 04-22	e 05-04	e 05-04
PS			e 07.0			
SR_1			e 09.5	e 10-06		
SR_2			e 11-16			
			e 12.5			
L			e 16.5	e 17 ca		
Jan. 3						
H = 12-45-59	Δ = 30.8° = 3420 km.			S-P = 5-11		
P	i 12-52-19					
S			e 12-57-30			
L			e 13-01	e 13-02		
Jan. 6						
				e 13-54-37		
				e 14-00-21		
			e 14-09-03	e 08-23		
			e 19-27			
L				e 30.0		
Jan. 7						
L			e 14-20.5			
Jan. 11						
H = 10-22-08	Δ = 64.6° = 7180 km.			S-P = 8-47		
P	i 10-32-41					
	i+ 55					
S			e 10-41-38	e 10-41-38		
L		e 11-02	e 49	e 56		
Jan. 12						
L			e 14-23.0			
			e 30	e 14-29		
Jan. 14						
L			e 12-20	e 12-19		

PHASE	Z	Z_{13}	NE-SW	NW-SE	N-S	E-W
1934 Jan. 15						
H = 08-43-20	$\Delta = 111.5^{\circ} = 12{,}400$ km.					
	PS-P = 13-59					
St. Louis:	H = 08-43-16		USCGS:	H = 08-43.3		
	$\varphi = 25.6^{\circ}$ N			$\varphi = 25^{\circ}$ N		
	$\lambda = 85.7^{\circ}$ E			$\lambda = 86^{\circ}$ E		
P			e 08-58-01			
P'	i 09-00-57		e 09-01-08			
PR_1	i 02-17	e 09-02-20	i 02-24			
		i 03-49				
PR_2		e 04-42	e 04-52			
ScPcS		e 09-36	e 08-04			
S			e 10-00			e 09-10-0(
PS		e 12-02	i 12-00			
PPS		e 13-00				
SR_1		e 17-32	e 17-16			e 17-12
		e 18-12				
SR_2		e 22-20	e 21-30			e 21-4(
			e 24-12			
L			e 28.0			e 30.0
Jan. 16			e 19-18.0	trace		
				e 19-20.9		
L			e 41.0			
Jan. 19						
P?	i 01-51-03					
L			e 02-07-16	e 02-11-00		
H = 09-56-19	$\Delta = 33.3^{\circ} = 3700$ km.		S-P = 5-29			
P	i 10-03-01					
	i 07 (three times the amplitude of P)					
S			e 10-08-30 (low amplitude; poor)			
L			e 14-20	e 10-12.9		
Jan. 20						
	i 18-09-40					
	i 49					
L			e 18-50.0	e 18-52.0		
L			e 23-49 ca	e 23-52 ca		
Jan. 21						
L			e 07-54 ca	e 07-55 ca		
L			e 23-57.9	e 23-58.2		
Jan. 22						
L			e 08-52 ca	e 08-56 ca		
H = 10-07-20	$\Delta = 30.2^{\circ} = 3355$ km.		S-P = 5-07			
P	i 10-13-34					
S			e 10-18-41			
L			e 22-37	e 10-23 ca		
Jan. 23						
L			e 05-31 ca	e 05-35 ca		

PHASE	Z	Z_{13}	NE-SW	NW-SE	N-S	E-W
1934 Jan. 27						
	i 13-07-32	i 13-07-32			i 13-07-32	trace
	i 37	(double trace amplitude of first iZ = 17 mm				
	i 08-18	yet later phases and surface waves lacking)				
	e 09-18					
Jan. 28						
H = 14-41-34	$\Delta = 25.1^\circ$ = 2790 km.		S-P = 4-28			
P	i 14-47-02			e 14-47-00		
S				e 51-28		
L			e 14-54.0	e 53-35		
L				e 15-13.3		
H = 19-10-16	$\Delta = 33.5^\circ$ = 3720 km.	S-P = 5-30 Az. SW		St. Louis: H = 19-10-03	$\varphi = 16.8^\circ$ N	$\lambda = 99.6^\circ$ W
P	i 19-16-58	i 19-16-58	i 19-16-59	e 19-16-59	e 19-16-58	trace
PR_1			i 18-07			
PcP			i 19-25			
S		e 22-30	i 22-28	e 22-28	e 22-29	trace
SR_1				e 25-27		
L		e 32.0	e 27.0			
Jan. 30						
L			e 19-42.0	e 19-42.4		
H = 20-16-40	$\Delta = 33.9^\circ$ = 3765 km.	S-P = 5-33		St. Louis: (Nevada)	H = 20-16-27	$\varphi = 37.8^\circ$ N	$\lambda = 118.2^\circ$ W
P	i 20-23-27					
S			e 20-29-00			
L			e 31.0	e 20-32.5		
Jan. 31						
L			e 04-13.9			
			e 10-34-56			
			e 40-53			
L			e 57.5	e 10-58.0		
Feb. 1						
L			e 11-19.9			
L			e 11-33.8			
L			e 12-04.0	e 12-04.5		
Feb. 2						
L			e 16-15 ca			
Feb. 3						
H = 14-33-11	$\Delta = 126^\circ$ = 14,000 km.	$PR_1 - P' = 1\text{-}48$		(Interpretation doubtful)		
P'	i 10-52-15					
	i 19					
	i 53-13					
PR_1				e 14-54-03		
				e 55-37		
PPS				e 15-05-43		

PHASE	Z	Z_{13}	NE-SW	NW-SE	N-S	E-W
1934 Feb. 3 (cont'd)						
SR_1			e 15-11.0	e 15-10-51		
SR_2				e 16-29		
			e 18-35	e 19-25		
				e 23-00		
L			e 26 ca	e 30 ca		
Feb. 4						
P	i 09-46-00					
	i 08					
L			e 10-09 ca	e 10-08.5		
			e 13-50-54	e 13-51-00		
			e 57-08	e 58-34		
			e 14-00-22			
				e 14-02-30		
L			e 09.3	e 08 ca		
early phases, if any, lost in changing records						
L			e 22-58 ca	e 23-06.8		
Feb. 9						
L			e 09-38-16	e 09-38-28		
	i 09-47-52					
			e 10-06-56	e 10-06-38		
L			e 22.0	e 28-14		
				e 11-48-00		
			e 11-54-00			
L				e 12-15 ca		
	e 20-38-21					Local
Feb. 11						
	i 09-18-29					
L			e 09-55.8	e 09-59 ca		
Feb. 12						
L			e 03-46-09	e 03-47 ca		
H = 06-43-28		Δ = 32°.8 = 3645 km.		S-P = 5-25		
P	i 06-50-06		i 06-50-07			
S			e 55-31	e 06-55-33		
L			e 59.8	e 58.8		
			e 12-25 ca	e 12-29 ca		
Feb. 13			trace	e 10-05-32		
L			e 10-11.4	e 14.4		
Feb. 14						
L			e 02-50 ca			
Manila: H = 03-59-38			Δ_{meas} = 120°.6 = 13,400 km.			
φ = 17° 30' N			Azimuth N 10° W			
λ = 119° 25' E			(Obscured by heavy microseisms)			
P'	i 04-18-27					
PR_1	i 19-49		e 04-19-49	e 04-19-51		
PR_2			e 22-31			
ScPcPcS			e 26-47			
S?			e 27-31			
PS			e 29-39	e 29-23		

PHASE	Z	Z_{13}	NE-SW	NW-SE	N-S	E-W
1934 Feb. 14 (continued)						
SR_1			e 04-36-14			
SR_2			e 40-47			
				e 04-44-53		
L	e 55.4					
L			e 22-39.1	i 22-42-10		
Feb. 19				e 10-44-02		
	out of order		e 10-47-00	e 47-00		
			e 59-40			
				e 11-05-28		
				e 07-46		
				e 09-16		
				e 10-48		
				e 12-40		
L			e 11-37.4	e 43.6		
Feb. 20			e 03-36-19			
			e 40-03			
L			e 45-40	trace		
L				e 03-51-15		
Feb. 22						
L			e 08-48-ca	trace		
Feb. 24						
L	e 01-04-04		e 01-04-10	e 01-05-08		
P	i_+ 05-39-45	(1 cm. double trace amplitude)				
L?			trace			

St. Louis: H = 06-23-35
φ = 15°.3 N
λ = 146°.2 E (Island of Saipan, Marianne Archipelago)
Δ_{meas} = 112°.5 = 12,500 km.

PR_1			e 06-42-50	e 06-42-56		
			e 48-34	e 48-36		
ScPcPcS			e 49-58	e 49-26		
				e 51-34		
PS			e 52-58	e 52-46		
SR_1			e 57-38	e 57-46		
SR_2			e 07-02-06	e 07-01-54		
				e 04.9		
L			e 07.6			
				e 11-30		
L				e 14-34		
Feb. 28						
	e 14-41-17					
	e 44-08		trace	e 14-44-32		
				e 56-00		
			e 15-00-28	e 15-01-30		
			e 03-54			
L			e 14-32			
March 1						
	i 20-03-44					
L			e 20-34.2	e 20-48.2		

PHASE	Z	Z_{13}	NE-SW	NW-SE	N-S	E-W

1934 March 1
H = 21-45-24 $\Delta = 81.^{\circ}0 = 9000$ km.
S-P = 10-10
USCGS: H = 21-45.4, φ = 39° S, λ = 73° W
St. Louis: focal depth = 140 km.

P	i_+ 21-57-40	i_- 21-57-37	e 21-57-48			
pP	e^+ 58-06	e^- 58-00				
S			i 22-07-48	i 22-07-47		
PS			i 08-39	i 08-39		
SR_1				e 13-04		
L	poorly developed--beginning indeterminate					

March 4
i 06-29-01
e 06-25-33
e 32-48
e 47-56
L e 06-53.2 e 53.3

e 11-38-53
e 42-33
e 45-55
L e 11-48.7 e 51.8

March 5
L e 01-31.0
e 35 ca

St. Louis: H = 11-46-04, φ = 42.°7 S, λ = 173.°7 E (Pegasus Bay, S. Island, New Zealand)
$\Delta_{meas} = 135^{\circ} = 15{,}000$ km.

P_1'	e 12-05-26			
PR_1	e 08-32	e 12-07-42		
ScPcP		e 08-36		
ScPcPcS		e 14-25	e 12-14-25	
PPS		e 19-30		
			e 24-40	
SR_1		e 25-36		
L		e 49 ca	e 47 ca	

L e 15-11 ca

March 7
H = 22-42-01 $\Delta = 31.^{\circ}2 = 3465$ km.
S-P = 5-14
USCGS: H = 22-41.8, φ = 14° N, λ = 88° W
St. Louis: H = 22-41-35, φ = 11° N, λ = 86° W, Depth = 80 km.

P	i_+ 22-48-24	trace		
S			i 22-53-36	
L		e 22-56.0	e 56.0	

March 9
L e 14-33 no trace

March 10
i 19-44-36 (faint) local

PHASE	Z	Z_{13}	NE-SW	NW-SE	N-S	E-W
1934 March 12					St. Louis: H = 15-05-42	
H = 15-05-52		$\Delta = 29^{\circ}2 = 3255$ km.			$\varphi = 41^{\circ}7$ N	
		S-P = 5-00			$\lambda = 113^{\circ}6$ W (Utah)	
P	i 15-11-57		i 15-11-57	e 15-11-58		
	i 12-19					
	i 12-25					
S			i 16-57	i 16-57		
SR_1			e 18-10			
L			e 20.3	e 19-10		
H = 18-20-21		$\Delta = 29^{\circ}3 = 3255$ km.	S-P = 5-01			
P	i 18-26-27		e 18-26-28	e 18-26-28		
	i 55					
			e 28-29	e 28-26		
			e 30-50	e 30-49		
S			i 31-28	i 31-31		
L			e 34 ca	e 35.5		
March 13			e 13-33-20			
			e 42-06			
SR_1?			e 49-08	e 13-49-40		
L			e 14-02-16	e 14-11 ca		
March 15			e 11-09-06	out of		
SR_1?			e 26-10	order		
L			e 48 ca			
L			e 14-03	"		
L			e 14-12	"		
March 16						
(L)			e 09-24	"		
(L)			e 15-11	"		
			e 17-18-50			
			e 26-00			
L			e 31.1			
March 18					St. Louis: H = 04-33-12	
H = 04-33-28		$\Delta = 76^{\circ}2 = 8465$ km.			$\varphi = 50^{\circ}$ N	
		S-P = 9-48			$\lambda = 158^{\circ}$ E	
					Depth about 80 km.	
P	i 04-45-13		i 04-45-13	e 04-45-13		
	i 25					
	i 35					
S			i 04-55-05	i 55-01		
March 20				e 03-17-15		
			e 03-27-00			
L			e 31 ca	e 44 ca		
March 24						
St. Louis: H = 12-04-34				$\Delta_{meas} = 124^{\circ}2$	Az. N 70° W	
		$\varphi = 9^{\circ}3$ S		(Western end, Island of Malayta,		
		$\lambda = 161^{\circ}5$ E		Solomon Archipelago)		
P'	i 12-23-29					
	i 32		i 12-23-32			
	i 24-20					

PHASE	Z	Z_{13}	NE-SW	NW-SE	N-S	E-W
1934 March 24 (continued)						
PR_1	e 12-25-11		e 12-25-09	trace		
ScPcP	i 26-20					
SR_1			e 42-00 i 58	e 12-42-00 e 56		
SR_2			e 47-00 i 56-18			
L				e 13-02 ca		
	i 23-03-05 (2.1 cm double trace amplitude)	i 23-03-05		no trace		i 23-03-05 no trace (toward South)
L	(very low amplitude)		e 00-26			
March 27						
L			e 04-20 ca			
March 29						
H = 20-07-00	Δ = 63°.5 = 7055 km.		S-P = 8-40			
P	i 20-17-25					
PcP	i 52 (larger amplitude than P)					
S			i 20-26-05			
L			e 37 ca			
March 30						
L			e 04-30 ca			
L			e 06-08 ca			
March 31						Local
H = 03-04-07	Δ = 120 km. = 75 mi.		S-P = 14.5 secs. (Based on preliminary results of registration of New England quarry blasts. See Apr. 27, May 4, et seq)			
P	i 03-24-07					
S	i 21.5	i 03-24-21.5				i 03-24-22.0
April 3						
H = 07-36-18	Δ = 38°.8 = 4310 km.		S-P = 6-07			
P	e 07-43-53 i 44-09 i 14		e 07-43-44			
S			e 49-51	e 07-49-51		
SR_1			e 52-28			
L			e 54.7	e 57 ca		
L			e 09-32 ca			
			e 17-56-12			
L			e 18-02			
April 3, 21-50 to April 5,21-15, no Z record						
April 7						
L			e 02-30-10	e 02-30-10		
April 9						
H = 15-29-33	Δ = 80°.6 = 8960 km.		S-P = 10-09			
P	e 15-41-43					
S			e 15-51-59	e 15-51-52		
PS				e 52-45		
L				e 16-03.5		

PHASE	Z	Z_{13}	NE-SW	NW-SE	N-S	E-W

1934 April 10
(H = 10-22-59) (Δ = 143°.7 = 15,965 km.) (PR_1 - P' = 3-07)

(P')	i 10-42-33	i 10-42-33				
(PR_1)		i 45-40				
(PPS)			e 10-57.2			
(SR_1)			e 11-04.5			
(SR_2)			e 10.2			
L			e 26.8			

H = 19-22-23.4 Δ = 126 km. = 78 mi. S-P = 15.0 secs. Local

P	i 19-27-44					
S	i 59	trace			trace	

April 14

	e 21-42-10		e 21-42-16			
	i 21			e 21-42-21		
	i 40					
	i 53					
		e 21-44-46		e 44-45		

April 15 Local
H = 02-58-41.3 Δ = 187 km. = 116 mi. S-P = 21.5 secs.
Vicinity of Lake George, or Green Mts. of Vermont?

Reported felt in Barre, Rutland, and other Vermont towns. By comparison with blast records, this quake shows a marked predominance of motion in the S group, with relatively an extremely small displacement for P. Many characterless foreshocks and aftershocks appear to have no P large enough to record and, with a few exceptions, are of a nature suggesting multiple breaks, or chattering displacements, rather than sharp, isolated fractures.

P	e 02-59-02.0					
	i 05.8					
S	i 23.5	trace		trace	trace	trace

(Max. double trace amplitude after S_Z = 6.1 cm.)

H = 22-15-24 Δ = 128°.8 = 14,310 km. SR_1 - P' = 19-20
H = 22-15-27 Δ = 127°.4 = 14,155 km. PR_1 - P' = 1-56

St. Louis: H = 22-15-19
φ = 11°.5 N
λ = 121°.8 E Δ_{meas} = 13,900 km.

P'	i 22-34-23	i 22-34-23				
PR_1	i_+ 36-21	e 36-19	e 22-36-21	e 22-36-19	trace	trace
SR_1			e 53-33	e 53-43		
L			e 23-05 ca			

April 16
H = 15-42-34 Δ = 126 km. = 78 mi. S-P = 15 secs. Local

P	i 15-42-55					
S	i 43-10	trace			trace	

April 17

L	e 15-01.8	trace	e 15-01.9	e 15-02.0		

PHASE	Z	Z_{13}	NE-SW	NW-SE	N-S	E-W
1934 April 18			e 12-28-32			
	e 12-50-22					
L			e 13-01 ca			
Apr. 19						
H = 15-46-12.6	Δ = 122 km. = 76 mi.		S-P = 14.4 secs.		Local	
P	i 15-46-32.6					
S	i 47.0	trace			trace	
L			e 19-12.5			
Apr. 20						
L			e 15-23 ca			
Apr. 21						
H = 06-43-51.5	Δ = 133 km. = 83 mi.		S-P = 15.8 secs.		Local	
P	i 06-44-13.3	i 06-44-13.7	(P amplitude abnormally large			
S	i 29.1	i 30.1	relative to S)			
H = 21-04-09.2	Δ = 101 km. = 63 mi.		S-P = 12.0 secs.		Local	
P	i 21-04-24.8					
S	i 36.8	trace				
Apr. 24			e 18-01-31			
			e 04-46			
SR_1?			e 11-05			
L		e 18-29 ca	e 22-11			
Apr. 25						
H = 19-26-17.7	Δ = 118 km. = 73 mi.		S-P = 14.0 secs.		Local	
P	i 19-26-37.0	no				
S	i 51.0	record			no record	trace
Apr. 26			e 05-52-29			
L			e 06-24 ca			
L			e 14-33 ca			
	i 21-19-19					
			e 21-26-19			
			e 38.0	e 21-38.0		
L		e 22-00 ca	e 56.5	e 22-02 ca		
Apr. 27						
	25-ton blast at York Hill Quarry, Meriden, Connecticut. Timed at origin by L. B. Slichter, Mass. Inst. Tech., by oscillogram of Western Union absolute time and instant of blast.					
H = 19-01-01.7	Δ = 144.45 km. = 89.76 mi.		S-P = 17.4 secs.			
	φ = 41° 33' 27" N					
	λ = 72° 45' 15" W		Azimuth = S42° 41' 35" W from Oak Ridge			
P	i 19-01-25.1	(Max. double trace amp. 3 cm.)	i 19-01-25.2			
S	i 42.5		i 42.8			
			e 21-08.6	e 21-09.0		
			e 14.7			
			e 18.0			
			e 23.6			
L			e 39.2	e 48.7		

PHASE	Z	Z_{13}	NE-SW	NW-SE	N-S	E-W
1934 Apr. 28						
L			e 16-00 ca			
L			e 18-55 ca e 19-08 ca			
L			e 22-37 ca			
Apr. 30						
L			e 08-55 ca			
May 1						
L			e 04-34 ca			
(P')	i 07-23-59	i 07-23-59				
(PR_1)	i 27-13	i 27-13	e 07-27-13		trace	
			i 26			
			e 39-23			
			e 44-55			
			e 49-20			
May 2						
(H = 09-46-04)			($\Delta = 31.^{\circ}7 = 3520$ km.) (S-P = 5-17)		Very low amplitudes-- Interpretation questionable	
P	i 09-52-32	i 09-52-32	e 09-52-32			
	i 40					
	i 44					
(S)			e 57-49			
L			e 06.3			
H = 18-44-45.5			Δ = 114 km. = 71 mi.	S-P = 13.4 secs.		Local
P	i 18-45-04.2					
S	i 17.6					
H = 20-02-12.1			Δ = 112 km. = 70 mi.	S-P = 13.2 secs.		Local
P	i 20-02-30.4					
S	i 43.6					
H = 21-06-26.5			Δ = 144 km. = 89 mi.	S-P = 17.0 secs.		Local
P	i 21-06-50.0					
S	i 07-07.0					
May 3						
	i 00-19-41	i 00-19-41				
May 4						
H = 04-36-19			$\Delta = 45.^{\circ}7 = 5080$ km. S-P = 6-49		St. Louis: H = 04-36-15 $\varphi = 61^{\circ}$ N $\lambda = 145.^{\circ}1$ W (Beaver Dam, Alaska)	
P	i 04-44-40	i 04-44-40 (double trace amp. 7.6 cm)	e 04-44-41	i 04-44-41 (northwest)	i 04-44-40 (north)	e 04-44-41
	i 52			i 58		
PR_1	i 46-21			e 46-25		
S	i 51-29	i 51-35 (SW 2.5 mm)		i 51-31 (NW 9.5 mm)	e 51-34	
PS		i 51		i 52		
L	i 55-15	i 54-53		i 55-05		

PHASE	Z	Z_{13}	NE-SW	NW-SE	N-S	E-W
1934 May 4						
H = 09-42-34.3	Δ = 56 km. = 35 mi.	S-P = 6.6 secs.			Local	
P	e 09-42-43.5					
S	i 50.1	trace				
18-ton quarry blast at N. Branford, Connecticut. Timed at origin by L. B. Slichter, Mass. Inst. Tech., by oscillogram of Western Union absolute time and instant of blast.						
H = 16-15-06.0	Δ = 165.33 km. = 102.73 mi.	S-P = 19.4 secs.	φ = 41°20'10" N	λ = 72°47'34" W		
P	i 16-15-32.4					
	i 33.5					
S	i 51.8					
	i 52.8	trace			trace	e 16-15-53.
May 5			e 01-28-32			
			e 33-20			
	no Z_{13}			e 01-36.5		
L	record		e 39 ca	e 41 ca		
	18h May 4		e 12-47-13	trace		
	to		e 15-03.0			
	20h May 6		e 09-33	e 15-09.6		
L			e 28 ca			
H = 19-36-47.8	Δ = 103 km. = 64 mi.	S-P = 12.2 secs.			Local	
P	i 19-37-04.7					
S	i 16.9				trace	
May 6						
H = 08-09-49	Δ = 30°.1 = 3345 km.	S-P = 5-06			Reported felt in northern Utah and SE Idaho	
P	i 08-16-02					
S			e 08-21-08			
L			e 25.0	e 08-25.5		
May 9						
H = 16-13-36	Δ = 80°.9 = 8990 km.	S-P = 10-10				
P	i 16-25-48					
S			e 16-35-58			
			e 49-06			
L			e 51.8			
H = 21-04-38.3	Δ = 147 km. = 91 mi.	S-P = 17.4 secs.				
P	i 21-05-02.3					
S	i 19.7	trace			trace	
May 11--16h to May 12--01h	All instruments except Z out of service					
May 11						
	i 17-23-30					
	i 41					
	i 46					

PHASE	Z	Z_{13}	NE-SW	NW-SE	N-S	E-W

1934 May 11
H = 18-30-41.6 Δ = 118 km. = 73 mi. S-P = 14.0 Secs. Local

P	i 18-31-01					
S	i 15					

May 13
H = 09-02-01 Δ = 126° = 14,000 km. PR_1-P' = 1-49
USCGS: H = 09-01.9, φ = 5° S, λ = 154° E

P'	i 09-21-05	trace				
PR_1		i 09-22-54				
	i 23-14	i 23-14				
SR_1			e 09-39-38	e 09-39-43		
L		e 59.5	e 54-40	e 59.5		

May 14 Pasadena: H = 13-14.9 (Δ = about 36° = 4000 km.) About φ = 31°N, λ = 114°5 W (Felt at Yuma, Arizona)

L	e 13-33.5	e 13-33.5	e 13-33.0	e 13-33.5

H = 22-12-53 Δ = 49°8 = 5535 km. S-P = 7-15 (S. of Alaska)
St. Louis: H = 22-13-02, φ = 56°.2 N, λ = 150°7 W, Depth = about 70 km.

P	i_- 22-21-44	i_- 22-21-44	trace		i_{NW} 22-21-48	
pP	i_+ 22-01	i_+ 22-01				
S			i 22-29-00	i 28-59		
sS			i 21			
SR_1			e 32.5			
L		e 39.4		e 38.5		

May 15

L	e 15-38.0	e 15-38.0	e 15-38.0	e 15-38.0

H = 16-04-28.8 Δ = 174 km. = 108 mi. S-P = 20.6 secs. Local

P	i 16-04-56.6			
S	i 05-17.2			
L			e 23-52.0	e 23-52.0

May 16
H = 14-55-39.4 Δ = 125 km. = 78 mi. S-P = 14.8 secs. Local

P	i 14-55-59.9	
S	i 56-14.7	trace

May 19
H = 10-47-53 Δ = 29°8 = 3290 km. S-P = 5-04
(Uncorrected for focal depth)
Depth from (sP-P) - (pP-P) = .015 R (95 km.)
St. Louis: H = 10-47-28, φ = 13°3 N, λ = 92° W, Depth = 100 km. (SW of Guatemala)
USCGS: H = 10-47.8, φ = 16° N, λ = 90° W

P	i_+ 10-54-04	i_+ 10-54-04	i_{NE} 10-54-05	
pP	i_+ 27	i_+ 27		
sP	i^+ 38	i^- 38		
PR_2	e 55-16	e^- 55-20		

PHASE	Z	Z_{13}	NE-SW	NW-SE	N-S	E-W
1934 May 19 (continued)						
S		e 10-59-08	i 10-59-16			
sS			e 56			
L			e 11-02			
May 21						
P	i 10-15-28	i 10-15-28				
	i 35					
			e 10-22-09	trace		
L			e 30.0	e 10-27 ca		
May 22				St. Louis: H = 11-01-45		
H = 11-01-47		$\Delta = 55^{\circ}.5 = 6165$ km.		$\varphi = 190$ N		
		S-P = 7-50		$\lambda = 30^{\circ}.7$ W		
P	i 11-11-19	i 11-11-19		trace		
	i 27					
S			e 11-19-09	e 11-19-09		
L			e 24.5	e 26.5		
H = 14-49-28.2		Δ = 126 km. = 78 mi.	S-P = 15.0 secs.	Local		
P	i 14-49-48.9	trace				
S	i 50-03.9	trace				
May 23--00h to 03 h no records						
00h to May 25--01.8h, Benioffs and Wood-Andersons out of servic						
May 27						
Δ = about 194 km. = 120 mi. Local						
(S-P = 23.0 secs., beyond range of blasts used as reference)						
P	i 11-33-56.7					
S	i 34-19.7					
May 28						
Δ = about 250 km. = 155 mi. (S-P = 30.4 secs.) Local						
P	i 19-23-34.8					
S	i 24-05.2					
			e 23-31.1	e 23-31.1		
L			e 40 ca	e 40 ca		
May 29						
H = 18-28-14.0		Δ = 133 km. = 83 mi.	S-P = 15.8 secs.	Local		
P	i 18-28-35.8					
S	i 51.6					
May 30			trace	e 12-17.4		
			trace	e 19.7		
June 1						
H = 15-33-59.2		Δ = 132 km. = 82 mi.	S-P = 15.6 secs.	Local		
P	i 15-33-59.2					
S	i 34-14.8					

PHASE	Z	Z_{13}	NE-SW	NW-SE	N-S	E-W
1934 June 2					St. Louis: H = 13-42-46	
H = 13-42-32	Δ = 36°.5 = 4055 km (Iceland) S-P = 5-51				φ = 65° N λ = 20° W ca	
P	i+ 13-49-39		i+ 13-49-39			
	i 46					
	i 58					
	i 50-04					
	i 11					
PR_2	e 51-06		i 51-06		e 13-51-08	
S					e 55-34	e 13-55-30
L			e 14-00		e 59.5	e 58.0
H = 16-45-23	Δ = 46°.3 = 5145 km.		S-P = 6-53			
P	e 16-53-48		i 16-53-49			
	i 50					
PR_1	i 55-17					
S					e 17-00-41	trace
L			e 17-10		e 09	(poorly developed)
June 5						
H = 20-03-59.1	Δ = 102 km. = 63 mi.		S-P = 12.1 secs.		Local	
P	i 20-04-15.9					
S	i 28.0					
June 6						
P?	i 08-35-20					
L					e 21-34 ca	e 21-36 ca
June 8						
L					e 04-50.2	e 04-50.1
Pasadena: H = 04-47-48 φ = 35°54' N λ = 120° 27' W (Δ = about 4200 km. = 38°.7)					Damage to structures at and near Parkfield, Monterey County, Cal.	
SR_1					e 05-03-30	
L			e 05-06.0		e 06.0	
H = 14-33-19.8	Δ = 88 km. = 55 mi.		S-P = 14.4 secs.		Local	
P	i 14-33-44.6					
S	i 59.0					
June 9						
H = 13-03-34	Δ = 105°.1 = 11,680 km.		S-P = 11-58			
P	i+ 13-17-44		i+ 13-17-44			
	i+ 54					
PcP	i 18-35					
	i 19-55	i+	19-55	trace	e 13-19-52	
	i 20-03					
	i 31					
PR_1	e 52	i	20-57	e 13-21-06	e 21-06	
	i 21-50	i	21-50			
					e 23-36	
					e 25-08	
S				trace	e 29-42	
ScS					e 30-34	

PHASE	Z	Z_{13}	NE-SW	NW-SE	N-S	E-W
1934 June 9 (continued)						
PS	i 13-31-08	i 13-31-08		e 13-31-28		
				e 32-22		
			e 13-33-06			
	trace	i 34-42				
				e 37-06		
SR_1				e 48		
SR_2				e 42-28		
				e 44-16		
L		e 58.0	e 55.0	e 59.0		
W		e 14-55	trace	e 14-54		
June 11						
P?	i 03-18-50					
	i 06-12-13					
	i 22-58-57					
June 12						
H = 09-32-41	$\Delta = 32^{\circ}.1 = 3565$ km.	S-P = 5-20				
P	i 09-39-12	i 09-39-14				
S			e 09-44-32	e 09-44-40		
L			e 51			
June 13						
H = 01-51-13	$\Delta = 82^{\circ}.5 = 9165$ km. S-P = 10-18					
St. Louis:	H = 01-51-09 $\varphi = 45^{\circ}$ N $\lambda = 149^{\circ}.5$ E Depth = 95 km.					
USCGS:	H = 01-51-22 $\varphi = 44^{\circ}$ N $\lambda = 147^{\circ}$ E Depth = 240 km.					
P	i 02-03-33	i 02-03-33	trace	e 02-03-34		
	i 38	i 41				
	i 58	i 55				
S			i 02-13-52	i 02-13-51		
		i 15-01				
L		e 33.0		e 33.0		
	St. Louis: H = 22-10-35 $\varphi = 29^{\circ}.5$ N $\lambda = 63^{\circ}.5$ E		Destructive in Afghanistan and Baluchistan $\Delta_{P-H} = 95^{\circ}.2 = 10,580$ km.			
P	i 22-23-58	i 22-23-58	trace			
PR_1			e 22-27-57			
ScPcS			i 34-27	e 22-34-31		
ScPcPcS			i 57			
PS		i 36-41	i 36-41			
June 14						
H = 16-19-26.8	$\Delta = 12$ km. = 7.5 mi.	S-P = 1.8 secs.	Local			
P	i 16-19-28.8					
S	i 30.6					
H = 16-21-23.4	$\Delta = 132$ km. = 82 mi.	S-P = 15.6 secs.	Local			
P	i 16-21-45.0					
S	i 22-00.6					

PHASE	Z	Z_{13}	NE-SW	NW-SE	N-S	E-W

1934 June14--21h to June15--22h No Records on Z, Z_{13}, N-S, E-W

June 15
H = 06-34-34 Δ = 20° = 2220 km. S-P = 3-43

P		e 06-39-07		trace
S		e 42-50		trace
L		e 46 ca	e 06-46.5	

June 16

	i 05-23-22			
	i 43			

June 17

L		e 05-36-ca	e 05-36-ca	

June 18
H = 09-14-00 Δ = 47°.5 = 5280 km. S-P = 7-00 Depth = .01 R ca

USCGS : H = 09-13.8 φ = 62° N λ = 150° W

St. Louis: H = 09-13-59 φ = 59°.2 N λ = 149°.5 W Depth = 70 km.

Southern Alaska; felt in Seward

P	i 09-22-34	i 09-22-34		i 09-22-34
pP	i 49	i 49		
sP	i 53	i 55		
		i 23-40		
PR_1	i 24-15	i 24-15		
	i 50	i 42		e 24-44
		e 28-11		
S		e 29-37	i 09-29-36	i 29-34
L	e 39.0	e 39-11		e 39 ca

June 19

	i 06-05-25			

June 20 Heavy microseisms obscure locals and small traces

June 22
H = 18-33-54 Δ = 36°.8 = 4090 km. S-P = 5-53

USCGS: H = 18-33.8 φ = 19° N λ = 105° W

St. Louis: H = 18-33-48 φ = 18° N λ = 105° W SW of Manzanillo, Mexico

P	i 18-41-04	i 18-41-04		trace
	i 12			
	i 29			
PR_1		e 18-42-29		
S		e 46-57		
L		e 54.9		

June 23

L		e 06-08 ca	e 06-07 ca	

June 24
H = 05-59-44 Δ = 63°.0 = 7000 km. (From S-P = 8-37)
Δ = 67°.0 = 7445 km. (from P'P'-P = 28-42)
h/r = .04 h = 260 km. (from P'P'-H)

USCGS: H = 06-00.0 φ = 23° S λ = 66° W (Depth = 400 km ?)

St. Louis: H = 05-59-39 φ = 22° S (Depth = 100 km) λ = 68° W

PHASE	Z	Z_{13}	NE-SW	NW-SE	N-S	E-W
1934 June 24 (continued)						
P	i_ 06-10-06	i_ 06-10-06	i 06-10-06	i 06-10-06	i 06-10-06	
pP		i+ 32	i 32	i 32		
			e 14-30			
S		e 18-44	i 18-43	i 18-43		
			i 19-26			
			i 52			
SR_2			e 26-04			
P'P'	i 38-48					
	i+ 39-19					
	i 10-21-19					
	i 57					
P	i 14-10-55	trace				
L			e 14-21.5			
June 27						
L			e 12-03 ca	e 12-04 ca		
June 28						
H = 15-39-38.6	Δ = 93 km. = 58 mi.	S-P = 11.0 secs.	Local			
P	i+ 15-39-53.9					
S	i+ 40-04.9	trace				
June 29						
P?	i_ 08-43-31	i_ 08-43-31	i 08-43-33	i 08-43-32	i 08-43-31	e 08-43-31
		e 46-01				
		e 23				
		i 48				
P_{II}?	i_ 54-29	i+ 54-28				
				e 57-03		
	e 58-17	i+ 58-17				
	i_ 26	i+ 26				
				e 09-04-31		
				e 09-41		
	very small surface waves					
P_I?	i+ 12-53-03	i+ 12-53-04				
	(Max trace amplitude on Z = 6.5 mm)					
P_{II}?	i+ 55-44	i_ 55-45				
			no trace			
June 30						
	i_ 13-22-49					

End of Bulletin No. 2
Oak Ridge

HARVARD UNIVERSITY
Division of Geological Sciences

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BULLETIN NO. 3

1934 July 1d to December 31d

By L. D. Leet, Seismologist in Charge

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Paper no. 18 published under the auspices of the Committee on Geophysical Research and of the Division of Geological Sciences at Harvard University.

One object of this station's bulletins is to give, in readily accessible form, a summary of the outstanding features of the records of its seismographs. Interpretations are given for some of the larger earthquakes, in the form of phase identifications and distance computations. These are necessarily tentative, designed to give seismologists a clue to the character of the records, and others a general picture of the range of seismic activity which has been recorded. Particularly in the case of local earthquakes, distance computations do not necessarily give a measure of the space separating this station from the epicenter, since the depth of focus is unknown.

The readings here reported are selected primarily for their possible usefulness to the compilers of the International Seismological Summary at Oxford, England. Another consideration is potential assistance to investigators of particular earthquakes in cases where it is not feasible to collect original seismograms from a large number of stations. In line with these objectives, the direction of motion, where it can be determined with certainty, has been added to data previously published. A request for international cooperation in this matter was made by the Seismology Section of the International Geodetic and Geophysical Union as early as the Madrid meetings in 1924, and has since been repeated by Professor Ishimoto, director of the Earthquake Research Institute, of Tokyo, in 1934, but still does not seem to have enlisted widespread response from active stations. The direction of first motion, particularly in P, has been used as a basis for deductions concerning mechanisms at earthquake foci,

on which striking results have been reported, notably in Japan. The relatively small addition to the labor of preparing bulletins, which its inclusion represents, seems to be more than justified by such applications.

TABLES USED: J. B. Macelwane's "Preliminary Table of Observed Travel Times of Earthquake Waves for Distances between 10° and 180° Applicable Only to Normal Earthquakes," St. Louis University, 1933 November.

For Local Earthquakes: travel time data based on preliminary results of the registration of quarry blasts.

DIRECTION OF MOTION: Displacements of the ground upward, or toward the North or East, are designated by +, downward or toward the South or West, by -.

INSTRUMENTS--FIXED CONSTANTS

Instrument	Symbol	Registration	Damping	Paper Speed	Mass
Milne-Shaw 43	NW	photographic	magnetic	15 mm per min	1 lb
Milne-Shaw 44	NE	photographic	magnetic	15 mm per min	1 lb
Wood-Anderson	N-S	photographic	magnetic	15 mm per min	15 g
Wood-Anderson	E-W	photographic	magnetic	30 mm per min	15 g
Benioff vertical					112.7
Short Period	Z-SP	galvanometric	magnetic	30 mm per min	
Long Period	Z-LP	galvanometric	magnetic	15 mm per min	

INSTRUMENTS--NORMAL OPERATING CONSTANTS

Instrument	T_o	T_g	V	ε	Displacement for 1" of arc tilt	Displacement for accel'n = 10^{-5}g
NW	12		250	20:1	44 mm	
NE	12		250	20:1	44 mm	
N-S	1		2800	20:1	18 mm	
E-W	1		2800	20:1	18 mm	
Z-SP	1	.2		20:1		60 to 80 mm
Z-LP	1	13		20:1		30 to 40 mm

PHASE	Z-SP	Z-LP	NE	NW
July 20d H = 02-11-04 Δ = 62.5° = 6945 km. S-P = 8-34				
P	i 02-21-23	i 02-21-24	no trace	e 02-22-01 (L from nearby?)
S			i 02-29-57	i 30-00
			e 31-17	
L		e 47.0	e 42.5	e 47.0
L		e 04-57	e 04-54	e 04-58
L		trace	e 08-59	e 08-59
L		trace	e 14-06	e 14-06
L		e 17-49	e 17-49	e 17-49
			e 18-40-40	e 18-40-47
			e 47.2	e 47-14
L			e 19-06	e 19-15.5
July 21d H (St. Louis) = 06-17-59 φ = 18.2 S λ = 164 E			USCGS: H = 06.17.9 φ = 20 S λ = 167 E	Δ_{meas} = 127.8° = 14,200 km
P'	e 06-37-20			
PR_1		e 06-38-51	e 06-38-51	e 06-38-52
			e 49-01	e 48-55
SR_1			e 55-43	e 55-33
L				e 07-15-17
H = 10-39-18 Δ = 34.5° = 3835 km. S-P = 5-37			St. Louis: H = 10-39-13 φ = 8.2 N λ = 82.2 W	
P	e 10-46-09	i 10-46-09	i 10-46-10	i 10-46-10
	i 10			
PR_2			i 47-32	i 47-34
S			e 51-46	i 51-56
SR_1				i 54-18
July 22d				
	i 03-16-47			trace
	i 17-04			
	i 12			
			e	e 03-23-49
			e 03-28-09	e 28-09
			e	e 31-23
			e 35-33	e 35-25
L		e 03-59	e 59	e 59
P'?	i 20-09-55			
PR_1?	i 10-58			
			e 20-20-03	
			e 22-03	
			e 23-25	
July 23d H = 18-21-36 Δ = 47.3° = 5255 km. S-P = 6-59				
P	i 18-30-09	i 18-30-09		trace
S			e 18-37-08	e 18-37-08
L				e 43

PHASE	Z-SP	Z-LP	NE	NW
1934 July 24d				
	i 02-54-26		e 02-54-26	
			e 55-22	trace
L			e 03-00	trace
July 27d				
H = 02-25-57	Δ = 30.8° = 34-20 km.		S-P = 5-11	
P	i 02-32-17	no record	i 02-32-17	
S			i 37-28	
L			e 41	
L			e 13-21	e 13-26
L			e 16-59	trace
July 28d				
L			e 02-56	e 02-57
L			e 16-19	e 16-20
	i 17-37-06			
	i 10			
	i 18			
H = 21-37-05	Δ = 53.2° = 5910 km. S-P = 7-36		St. Louis: H = 21-37-12	
USCGS: H = 21-37.0	φ = 56 N		φ = 55.1 N	
	λ = 157 W		λ = 154.8 W	
			Depth = 30 km	
P	i_+ 21-46-21	i_+ 21-46-21	traco	i_{SE} 21-46-23
S			i 21-53-57	53-57
			i 56-08	
SR_1			e 57-34	
L			e 59	e 22-06
July 30d				
L			e 03-15	
L			e 04-25	
July 31d				
Very doubtful interpretation:		PR_1? - P'? = 3-21	H = 11-48-57 ca	Δ = 146.8 km = 16,310 km
P'?	i 12-08-35			
PR_1?	i 11-56			
L			e 13-03-ca	

1934 August 1d

quarry blast of approximately 1200 lbs of dynamite at Concrete Materials Co., 509 Main St., Saugus, Mass. Timed by Ottawa 7335 kc signal from point 1000 ft from the blast.

H = 15-15-01.5 ± .1 Δ = 43.51 km = 27 mi. φ = 42-28-49 N λ = 71-02-04 W

S	i	15-15-13.6
L	i	16.1

PHASE	Z-SP	Z-LP	NE	NW
1934 Aug. 2d				
H = 07-13-19	Δ = 46.4° = 5155 km.		S-P = 6-53	
P	i 07-21-45			trace
S			e 07-28-38	trace
SR_1			e 31-34	
L	i 37-55	i 07-37-55	e 34.6	e 07-38
Aug. 2d				
H = 19-35-5[illegible].2	Δ = 94 km. = 58 mi		S-P = 11.2 secs Local	
P	i 19-36-13.6			
S	i 24.8			
August 2d note: small shocks reported felt throughout the day and night along the coast of Maine, N. H., and Mass., from Portland to Marblehead. There was no general agreement as to the time of any one shock, and the above does not fit any time reported.				
Aug. 3d				
L			e 19-45.7	e 19-44.8
Aug. 4d				
L			e 14-05.3	e 14-09.3
Aug. 6d				
H = 12-07-21	Δ = 38.1° = 4235 km.		S-P = 6-02	
P	i 12-14-41	trace	e 12-14-41	
		i 12-14-46		e 12-14-47
PR_2			e 16-23	e 16-21
S			e 20-43	e 20-47
			e 21-21	
Aug. 7d				
St. Louis: H = 03-39-08			USCGS: H = 03-40.0	
φ = 31.1 S			φ = 14 S	
λ = 178.0 E			λ = 167 E	
$\Delta_{PR_1 - H}$ = 130.8°			Δ_{PR_1-H} = 123°	
In both cases, Δ_{meas} = about 126° = 14,000 km.				
PR_1	trace	e 04-00-32	e 04-00-35	e 04-00-32
PS		e 10-28	e 10-16	e 09-52
		e 13-20		e 13-00
				e 16-06
SR_1			e 17-16	
SR_2			e 21-40	
L		e 32-40	e 30-52	e 30-48
L			e 12-42.3	e 12-41.3
Aug. 9d				
	i 06-06-22			
				e 20-00-03
				e 01-41
			e 20-12-01	
			e 29-29	
			e 32-45	
I			e 37.4	e 40.5

PHASE	Z-SP	Z-LP	NE	NW
1934 Aug. 9d				
H = 18-57-23.5	Δ = 93 km = 58 mi.	S-P = 11.0 secs	Local	
P i	18-57-38.8			
S i	49.8			
H = 19-13-14.3	Δ = 104 km. = 65 mi.	S-P = 12.4 secs.	Local	
P i	19-13.31.4			
S i	43.8			
Aug. 11d				
L	trace from about	e 05-30	e 05-30	
			e 08-48-08	
			e 51-46	
L		e 09-08.6	e 09-05.0	
			e 12-18-47	
			e 25-08	
		e 12-26-58		
		i 35-46	e 36-54	
L			e 49-26	
P? i	15-22-18			
			e 15-26-13	
		i 15-27-51		
L		e 29-33	e 27.7	
Aug. 12d				
	trace from about	14-58	14-54	
St. Louis:	H = 23-49-15			$\Delta_{P'-H} = 127.7^{o}$
	φ = 7.6 N	Off Island of		
	λ = 126.2 E	Mindanao, P.I.		
Aug. 13d				
P'	e 00-08-23	trace		
PR_1	e 10-21	e 00-10-21 e 00-10-20	e 00-10-20	
PS		e 20-17	e 20-13	
SR_1		e 27-23		
L		e 48.5	e 50.5	
Aug. 13d				
H = 11-33-32.2	Δ = 135 km. = 84 mi.	S-P = 16.0 Secs.	Local	
P i	11-33-59.4			
S i	34-15.4			
H = 11-34-43.0	Δ = 145 km. = 90 mi.	S-P = 17.2 secs.	Local	
P i	11-35-06.2			
S i	23.4			
H = 12-49-59.0	Δ = 154 km. = 96 mi.	S-P = 18.2 secs.	Local	
P i	12-50-24.0			
S i	42.2			
H = 12-52-49.4	Δ = 168 km. = 104 mi.	S-P = 19.8 secs.	Local	
(The first of a group of at least five, so close together in time that the phases overlap)				
P i	12-53-16.4			
S i	36.2			

PHASE	Z-SP	Z-LP	NE	NW
1934 Aug. 13d				
H = 12-55-42.6	Δ = 160 km. = 99 mi.	S-P = 19.0 secs.	Local	
P i	12-56-08.4			
S i	27.4			
Aug. 14d				
	S-P = 38 secs.	Δ = about 320 km. = 200 mi.	Local	
P i	23-36-45			
S i	37-23			
P i	23-38-54			
S i	39-32			
Aug. 15d				
H = 11-04-40	Δ = 30.3° = 3365 km.	S-P = 5-08		
P i	11-10-55	trace	e 11-10-57	
PR_2			e 12-02	
S			e 16-03	trace
L			e 20.6	e 11-20.6
Aug. 16d				
H = 14-37-30.7	Δ = 81 km. = 50 mi.	S-P = 9.6 secs	Local	
P i	14-37-44.0			
S i	53.6			
			e 14-48-42	e 14-48-44
L			e 57.6	
Aug. 17d				
H = 17-00-22.2	Δ = 134 km. = 83 mi.	S-P = 15.8 secs.	Local	
P i	17-00-44.2			
S i	01-00.0			
H = 20-05-39.0	Δ = 110 km. = 68 mi.	S-P = 13.0 secs.	Local	
P i	20-05-57.0			
S i	06-10.0			
H = 21-07-38.5	Δ = 147 km. = 91 mi.	S-P = 17.4 secs.	Local	
P i	21-08-02.6			
S i	20.0			
Aug. 18d				
	Δ = about 300 km. = 186 mi.	S-P = 35.4 secs.	Local	
P i	19-58-07.2			
S i	42.0			
Aug. 19d				
P?			e 23-48-21	
S?			e 51-41	e 23-51-43
				e 53-05
L			e 55.5	e 54.5

PHASE	Z-SP	Z-L	NE	NW
1934 Aug 20d				
H = 00-47-21 Δ = 14.7° = 1635 km. = 1015 mi. S-P = 2m 52s				
St. Louis: H = 00-47-27 φ = 36.95 N λ = 89.2 W (See Bulletin of the Seismological Society of America, Vol. 25, No. 2, p. 154, 1935 Apr.)				
Reported felt in Reelfoot Lake district, Kentucky, Tennessee line; zone of the New Madrid earthquakes of 1811; towns of Mayfield, Fulton, Union City, and Tiptonville; Charleston, Mo., Cairo, Ill., Wickliffe, Ky.				
P	i 00-50-50			
S	e 53-42	e 00-53-43		
L	i 55-00	i 55-00	trace	trace N-S, E-W trace
Aug. 21d				
L	trace from about		07-08	07-07
L	trace from about			10-45.5
L	trace from about		18-11.5	18-08.5
	i 19-45-37			
	i 46			
L			e 20-35.5	e 20-34.8
Aug. 22d				
Quarry blast, 1800 lbs dynamite, Lawrence Crushed Stone Co., Lawrence, Mass. Fired by NAA time signal (Leet and Gibbs)				
H = 16-59-40.0 Δ = 38 km. = 24 mi. φ = 42-41-04 N λ = 71-10-00 W				
S	i 16-59-50.9			
L	i 52.4			
Aug. 24d				
				e 00-07-47
			e 00-20-49	
			e 26-47	e 26-09
L		e 00-31.7	e 32.0	e 34.0
Aug. 26d				
H = 01-31-42 Δ = 34.3° = 3810 km. S-P = 5-36				
P	i 01-38-32			
	i 38	i 01-38-38		
S			traco	
L			traco	
			e 01-44-08	e 01-44-13
			e 50.5	e 50.5
Δ = about 230 km. = 143 mi. S-P = 27 secs. Local				
P	e 11-39-17			
S	i 44		traco	
L	i 52		traco	
Aug. 28d				
H = 11-23-29 Δ = 35.3° = 3920 km. S-P = 5-43				
P	i 11-30-27			
S			out of order	
L			e 11-36-10	e 11-36-10
			e 44.0	e 43.5

PHASE	Z-SP	Z-LP	NE	NW
1934 Aug. 31d				
H = 00-50-56.6	Δ = 169 km. = 105 mi.	S-P = 20.0 secs.	Local	
P	i 00-51-23.8			
S	i 43.8			
H = 00-51-56.6	Δ = 169 km. = 105 mi.	S-P = 20.0 secs.	Local	
P	i 00-52-25.8			
S	i 45.8			
H = 05-02-52	Δ = 29.6° = 3290 km. S-P = 5-03	St. Louis: H = 05-02-54 φ = 71.7 N λ = 70 W		
Baffin Bay	USCGS: H = 05-02.8 φ = 72 N λ = 70 W			
P	i 05-09-01	i 05-09-02	i 05-09-02	
S		i 14-04	i 14-04	
SR_1		e 15-28		
		e 16-26		
L		e 17-24	e 17.0	
	Δ = about 192 km. = 119 mi.	S-P = 22.7 secs.	Local	
P	i 18-20-20.2			
S	i 42.9			
		e 15-23-11		
L	from about	37	15-36	
1934 September 1d				
	i 07-10-02			
	i 04			
	i 06			
		e 07-20-27	e 07-20-21	
		e 25-59		
L		e 35.0	e 32.5	
P?	i 11-49-20			
	i 25			
	i 36			
		e 11-57-24	e 11-57-24 (low amplitude)	
L		e 12-03.5	e 12-04	
Sept. 2d				
		e 09-16-07		
		e 20-21		
L		e 28.5	e 09-28 ca.	
L		e 09-45.5	trace	
	i 11-34-02			
		e 11-42-09	e 11-42-15	
Sept. 3d				
H = 04-18-01.3	Δ = 106 km. = 66 mi.	S-P = 12.5 secs.	Local	
P	i 04-18-18.7			
S	i 31.2			
Sept. 4d				
L		e 17-30	e 17-27	

(earlier phases, if any, lost in changing records)

PHASE	Z-SP	Z-LP	NE	NW
1934 Sept. 5d				
L	trace from about		07-38	
Sept. 8d				
L		e 12-12	e 12-12	e 12-11
Sept. 12d				
	i_- 19-51-40			
	i_+ 42			
Sept 14d				
P	i_- 17-16-54	trace		
	i_+ 17-01			
L		e 17-33 ca	e 17-32 ca	e 17-33 ca
Sept. 15d				
L		trace	e 00-57	e 00-58

H = 06-57-20 $\Delta = 32.1^\circ = 3565$ km. S-P = 5-20

St. Louis: H = 06-56-50, φ = 19.9 N, λ = 104.7 W, Depth = 50 km

USCGS: H = 06-56.9, φ = 20 N, λ = 105 W, (Δ_{meas} = 4000km = 36°)

P	i_- 07-03-51	i_- 07-03-51	e_{SW} 07-03-51	trace
	i 53			
pP	i_+ 58	i_+ 58	i 58	
S			e 09-11	e 07-09-22
L		e 16.0	e 15.0	
Sept. 18d				
			e 10-18.5	
L		e 10-26.5	e 25-40	e 10-24.5
Sept 19d				

H = 03-56-19.0 Δ = 90 km. = 56 mi. S-P = 10.6 secs. Local

P	i 03-56-33.8			
S	i 44.4			
L	i 46.1			
Sept. 20d				
	e 21-27-54			
Sept. 21d				
	e 12-58-00	i_- 12-58-07		
	e 13-00-52	e 13-00-43		
		e 01-11		
	i_- 01-30			
	i_+ 35			
Sept. 23d				
			e 08-29-00	
			e 36-08	
L				e 08-51
L		e 09-05	e 09-05	e 09-05
	i_- 11-16-31			
	i_+ 36			
Sept. 24d				
			e 10-59-05	
			e 11-05-43	e 11-05.7
L			e 22.5	e 22

PHASE	Z-SP	Z-LP	NE	NW
1934 Sept. 25d				
	i_- 19-33-23			
			e 19-52	
L		from about		20.4
H = 20-13-50.1	Δ = 100 km. = 62 mi.	S-P = 11.8 secs.		Local
P	i 20-14-06.5			
S	i 18.3			
H = 20-50-34	Δ = 170 km. = 105 mi.	S-P = 20 secs.		Local
P	i 20-51-01			
S	i 21			
Sept. 26d				
H = 07-27-30	Δ = 51.2° = 5690 km.	S-P = 7-24		
P	e 07-36-32	e 07-36-35		
S			e 07-43-56	e 07-43-56
L			e 49	e 51
	e 13-18-11			
	i 34	traco		
	e 22-41			
1934 October 5d				
	i_+ 20-38-57			
	e^+ 39-09			
			e 20-49-43	
			e 21-02-08	
			e 09 ca	
			e 13 ca	
L		e 21-24	e 16.5	e 21-17
L		2 22-25	e 22-23	
Oct. 6d				
H = 12-47-49	Δ = 56.3° = 6255 km.	S-P = 7-55		
P	i_+ 12-58-26			
	i^+ 32			
S			e 13-06-21	e 13-06-21
				e 08-05
L				e 12-23
Oct. 8d				
	i_+ 06-08-21			
	i_+ 30			
H = 21-07-14.0	Δ = 110 km. = 68 mi.	S-P = 13.0 secs.		Local
P	i_+ 21-07-32.0			
S	i^+ 45.0	traco		faint trace on N-S
Oct. 10d				
	USCGS: H = 15-42.2			
	φ = 23 S		Δ_{meas} = 117° = 13,000 km	
	λ = 176 W			
	i_+ 15-59-57	i_+ 15-59-58		
	i^+ 16-00-01	i^+_+ 16-00-02		
	i^- 11			
	i_+ 23			

PHASE	Z-SP	Z-LP	NE	NW
1934 Oct. 10d continued				
	i_+ 16-00-31			
	i_+ 46			
PR_1	i_+ 01-25	i_+ 16-01-26		
PR_2			e 16-04-34	
ScFcS			e 06-08	
ScFcFcS			i 07-34	
S			i 08-38	e 16-08-32
	e 10-19			
FS			e 11-20	
SR_1			i 17-16	e 17-05
				i 15
Oct. 11d	Quarry blasts, General Crushed Stone Co., Winchester, Mass. Δ = 35.2 km. (see 1934 July 13d)			
	All records on Z-SP			
P	i_+ 16-35-11.6		i_+ 16-42-22.7	
S	i_+ 16.0	i_+ 16-39-20.0	i_+ 27.0	i_+ 16-47-12.0
L	i_+ 18.0	i_+ 22.0	i_+ 29.0	i_+ 14.0
1934 Oct 18d				
	i_- 07-41-52			
	i_- 59			
	e 08-18.7	trace	e 08-18.7	
		trace	e 25.4	
L	e 47.6	e 08-49	e 48	
1934 Oct 24d				
	i_+ 04-02-11			
Oct. 24d 17h 50m to 21h 30m	no records			
Oct. 25d				
L		e 09-12		
Oct. 26d				
	e 15-02-49	i_- 15-02-50		
	i_+ 51			
	i_- 03-23			
	i_+ 05-26	e 05-06		
L	about 18h (beginning lost in changing records)			
Oct. 27d				
L		e 10-42		
Oct. 28d				
	i_+ 14-56-22			
	i_+ 38			
Oct. 29d				
(H= 02-35-03)	Δ = 33.1° = 3680 km. S-P = 5-21			
	(low amplitudes render beginning times of all phases uncertain)			
P	i_+ 02-41-43			
	i_+ 50			
	i_- 54			
	i_+			
S			e 02-47-10	
L			e 51-10	e 02-51-10
M	e 02-52.6		e 52-50	e 52.6

PHASE	Z-SP	Z-LP	NE	NW

1934 October 29d
H = 20-07-29 Δ = 5.6° = 622 km = 387 mi. (Turner Tables)
S-P = 1-07 Reported felt in Erie, Pa. (430 mi)

P	i_ 20-08-56			
S	i+ 10-03			
L	o 22			
	i_ 23-33-42			

1934 November 3d

	i_ 12-36-49	traco		
	i+ 42-31			

Nov. 4d

L		o 02-54.5	o 02-48	o 02-54.5
L		o 04-15	o 04-15	o 04-15

Nov. 5d
H = 23-02-33 Δ = 64° = 7110 km. S-P = 8-43
USCGS: H = 23-02.4 St. Louis:
φ = 52 N H = 23-02-28
λ = 178 W φ = 53.2 N
(Δ_{meas} = 7300 km) λ = 176.7 W
Depth = 50 km

P	i_ 23-13-05	o 23-13-02		traco
	i_ 13			
	i+ 15			
	i_ 18	i+ 18		
	i+ 42			
S			o 23-21-45	o 23-21-45
L		o 39	o 29	o 38.5

Nov. 9d

	i_ 13-52-04.5	(See Ottawa bulletin, Correlation Table
	i+ 34	between 5522 and 5523)

Nov. 10d
H = 15-39-45 Δ = 29.5° = 3210 km. S-P = 4-58

P	o 15-45-48			
S			o 15-50-46	traco
L		o 15-54.5	o 53.5	o 15-55

Nov. 12d

			traco	o 07-41-13
L			o 07-55.5	o 55.5
	i+ 08-40-30			

Nov. 16d

		o 14-21-40	
L		o 36	o 14-52

Nov. 18d

	i_ 03-34-21	
	i_ 09-30-10	
	i+ 23	See Ottawa bulletin, Correlation Table
	i+ 31	5533

PHASE	Z-SP	Z-LP	NE	NW	
1934 Nov. 18d					
P? e	15-10-42				(confused by microseisms)
L	e 15-24 ca		e 15-22 ca	e 15-22 ca	
	i_+ 22-18-26				
	e 22-59-12				
L	e 23-48 ca		e 23-18 ca e 31 ca	e 23-18 ca e 38 ca	
Nov. 19d					
	i_+ 04-31-32	traco			
Nov. 21d					
	i_- 22-37-52				
Nov. 22d					Local
S?	i 22-09-02.4				
L	i 04.9				
Nov. 24d					
	e 12-54-00				
L		traco	e 13-48	traco	
Nov. 27d	USCGS: H = 06-14.0 φ = 10 N λ = 127 E		St. Louis: H = 06-14-16 φ = 2.7 N λ = 128 E		
	Press reports give approximately 35 mi. S. of Manila, P. I. Δ_{meas} = 135° Azimuth approximately N 25° W				
P'	i 06-33-24				
	i 30				
	e+ 47	no			
				i_{NW} 06-35-46	
PR_1	i+ 36-17			i_{SE} 36-10	
ScPcP	i+ 44	record	traco	e 41	
	e+ 37-15			e 37-20	
PR_2	e 38-27				
ScPcS				i 40-28	
ScPcPcS			i_{SW} 06-42-34	i_{SE} 42-35	
PR_4			i 43-34		
			e 45-28	e 45-54	
PPS				e 47-42	
PR_2 maj				e 48-46	
PR_3 maj			e 52-20		
SR_1			e 53-28	e 53-26	
SPS			e 54-56		
PPSS			e 55-16		
PR_4 maj			e 56-08		
SR_2			e 58-18		
				e 07-00-08	
PPSS maj			e 07-00-48		
L			e 10 ca	e 15 ca	(low amps.)
H = 21-24-30.3	Δ = 17 km. = 11 mi.	S-P = 2 secs.			Local
P	i 21-24-33				
S	i 35				
L	i 36				
Nov. 29d					
L	traco		e 05-34.5	traco	

PHASE	Z-SP	Z-LP	NE	NW
1934 Nov. 30d			USCGS: H = 02-05-20	
H = 02-05-20	Δ = 36°		φ = 20 N	
	S-P = 5-47		λ = 104.5 W	
P	i_+ 02-12-23			
	i_+ 27		i 02-12-26	i 02-12-30
PR_1			i 13-52	
			i 14-54	
			i 15-34	
			i 16-38	
S			i 18-10	i 18-10
SR_2			o 20-40	3 20-42
				i 22-14
L			c 22.5	c 22.5
M			i 26.0	i 25.8
	i_- 03-08-20			

1934 December 3d				
H = 01-35-36	Δ = 31.1° = 3455 km.		S-P = 5-13	
P	i_+ 01-41-58			
S			o 01-47-11	
L		o 01-54	c 51	o 01-50
H = 02-38-42	Δ = 29.6° = 3290 km.		St. Louis: H = 02-38-23	
	S-P = 5-03		φ = 14.3 N	
			λ = 88.8 W	
			"Surface waves very small in spite of apparent shallow focus."	
P	i_+ 02-44-52	i_+ 02-44-53	iSW02-44-52	
S		o 49-55	o 49-58	trace
		o 52.3	o 53.3	
L		o 55		
	i_+ 11-50-00		Record character indicates distant origin	
	i_+ 19			

Dec. 4d			St. Louis: H = 17-24-53	
H = 17-24-47	Δ = 59.6° = 6620 km.		φ = 19.7 S	
	S-P = 8-16		λ = 69.5 W	
	Δ_{meas} = 62.1°		Depth = 200 km	
	Destructive at Zapiga, Tarapaca Province, Chile			
P	i_+ 17-34-47	i_+ 17-34-48	o 17-34-48	i_{NW} 17-34-48
	i_+ 49			
	i_- 51			
	i_- 54			
	i_+ 57.4			
	i_+ 35-01	o 35-03		
	i_- 07			
	o 14	o 13		
	i_+ 32	i_+ 32		
	i_+ 44			
	i_- 50			
	i_+ 54			
	i_-			
S	i 43-04	i 43-03	i 43-04	
PS		i 31	i 37	
		i 45-06	i 45-10	

PHASE	Z-SP	Z-LP	NE	NW
1934 Dec. 5d				
	o 21-59-24			
Dec. 6d				
	i_ 05-00-27			
Dec. 8d				
L		e 09-59	o 09-57.2	o 09-57.3
H = 14-51-59	Δ = 143 km. = 89 mi.	S-P = 17 secs.	Local	
P	o 14-52-22			
S	i 39			
Dec. 9d				
	i_+ 11-38-39	i_+ 11-38-39		
Dec. 15d				
			o 02-25-17	
			e 28-00	
			o 29-00	
			e 30-27	o 02-30.9
L		o 02-43.0	o 42.5	o 40.0
	i_+ 19-32-18			
Dec. 16d				
	i_- 16-41-56			
	i_- 42-23			
Dec. 17d				
			e 16-30-30	
			o 31-40	traco
			e 33-26	
L		o 16-56 ca	o 42.5	o 16-55 ca
Dec. 22d				
H = 14-28-54	Δ = 38.1° = 4235 km.	S-P = 6-02	USCGS: H = 14-29.0	φ = 8 N, λ = 89 W
P	i_ 14-36-14 (followed by a number of phases within 2 minutes, exact beginnins indeterminate)			
		o 14-37-44	o 14-37-46	
S			i 42-16	o 14-42-18
L	e 46.5	o 45	e 45	o 43.5
Dec. 23d				
H? = 09-52-51	Δ = 59.8° = 6645 km.	S-P = 8-18	deep focus? interpretation doubtful	
P?	i_+ 10-02-52			
	i^- 57			
	o 03-05			
	i_- 20			
	i_+ 04-03			
S?			e 10-11-10	o 10-11-12
				o 16
	no surface waves			
Dec. 24d				
H = 14-35-38	Δ = 31.8° = 3535 km.	S-P = 5-18		

PHASE	Z-SP	Z-LP	NE	NW
1934 Dec. 24d continued				
P	i_ 14-42-07			
S			e 14-47-25	e 14-47-25
L		e 14-50.5	e 51	e 50.5
Dec. 25d				
			e 16-05-19	e 16-05-14
			e 07-31	
L		e 16-10 ca	e 08.5	e 09.5
Dec. 28d				
			e 11-59-20	
L		e 12-25 ca	e 12-23	trace
Dec. 30d				St. Louis: H = 13-52-11
H = 13-52-21	Δ = 35° = 3890 km			φ = 32 N
	S-P = 5-40			λ = 115.5 W
	Felt in Southern California and Arizona			
P	e 13-59-18	e 13-59-16	(confused by large microseisms)	
S			e 14-04-56	i 14-04-56
			e 07-12	e 07-44
			e 08-26	
L		e 14-07.5	e 08.9	e 09.5
	e 14-10-32		i 10-44	i 10-46
Dec. 31d				
	i_ 06-45-10	(maximum double trace amplitude, second complete oscillation = 6.5 cm. T = 1 sec.)		
	e 28			
	i_ 47-15			
H = 18-46-05	Δ = 33.4° = 3710 km. S-P = 5-29			
	Amplitudes for P disproportionately small in comparison with S and L. Small traces confused by large microseisms.			
	St. Louis: H = 18-45-38, φ = 31.8 N., λ = 115 W			
	Felt in Southern California and Arizona			
P	e 18-52-48		e 18-53-17	
S			e 58-17	
L	e 19-03.5		e 19-00	e 19-00

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