

THE PANAMA CANAL
DEPARTMENT OF OPERATION AND MAINTENANCE
SECTION OF SURVEYS

SEISMOLOGICAL RECORD AT BALBOA HEIGHTS, CANAL ZONE

Lat. 8° 57' 39" N.

Long. 79° 33' 29" W.

h = 36 meters.

Lithologic foundation: Basalt.

Time Correction: Within 1.0 sec.

INSTRUMENTS—FIXED CONSTANTS

INSTRUMENTS	SYMBOL	REGISTRATION	DAMPING	PAPER SPEED	MASS
Wood-Anderson	I	Photographic	Magnetic	60 mm. per min.	1.3 gr.
Bosch-Omori	II	Smoked Sheet	Air	15 mm. per min.	100 kg.

INSTRUMENTS—DETERMINED CONSTANTS

INSTRUMENTS	COMPONENT	T ₀	V	h	DETERMINED
Wood-Anderson	N-S	0.80	2740	8 to 1	August 24, 1939.
Wood-Anderson	E-W	0.80	2740	12 to 1	August 24, 1939.
Bosch-Omori	Not operating				
Bosch-Omori					

Month January, 1943.Page No. 1

No. and Date	Phase	Time G. M. T.			Period	AMPLI- TUDE mm	REMARKS
		h	m	s			
<u>Notes on entries in "Period", "Amplitude", and "Remarks" columns.</u>							
Length of periods apply to waves showing maximum trace amplitudes.							
Maximum trace amplitudes are tabulated for each phase when the maximum for either component is in excess of 3.0 millimeters.							
When the seismograph record shows the beginning of the "P" or "S" phases indistinct, earthquakes are roughly classified as "Nearby" and "Distant" depending upon whether the character of the record indicates an epicenter distant less or more respectively than 300 statute miles.							
All earthquakes felt in any degree by residents of the Canal Zone are rated on the Modified Mercalli Scale, with quakes reliably reported as felt by any one rated at Intensity I.							
# 1 Jan. 5	eP 1S F	20:05:43 20:06:28 20:09				4.3 N-S 3.5 E-W	Approximate distance 215 miles.
# 2 Jan. 13	eP eS F	22:54:46 22:55:19 22:57					Approximate distance 160 miles.
# 3 Jan. 13	eP eS F	23:37:41 23:38:14 23:42				4.5 N-S 3.5 E-W	Approximate distance 160 miles.



SEISMOLOGICAL RECORD AT BALBOA HEIGHTS, CANAL ZONE

Month January, 1945.Page No. 2.

No. and Date	Phase	Time G. M. T.			Period s	AMPLI- TUDE mm	REMARKS
		h	m	s			
Jan. 19		No record from 12:41 to 21:38					
Jan. 20		No record from 13:33 to 21:03					
Jan. 21		No record from 14:02 to 20:37					
Jan. 22		No record from 13:30 to 21:16					
Jan. 22		Both components of the Wood-Anderson seismometers were re-adjusted and new constants for each were determined as follows:					
		<u>Component</u>	<u>To</u>	<u>V</u>	<u>h</u>		
		E-S	0.85	1370	8 to 1		
		E-W	0.85	1370	10 to 1		
Jan. 23		No record from 12:39 to 15:09					
# 4 Jan. 24	e F	9:29:44 9:34				Distant	
# 5 Jan. 24	e F	20:44:35 20:51				No record on E-W component Distant	
# 6 Jan. 25	iP i eS F	4:00:04 4:00:10 4:00:48 4:06			4.5	No record on E-W component Approximate distance 210 miles	
# 7 Jan. 30	ePN iPE iSN iSE F	5:35:41 5:35:38 5:37:49 5:37:46 5:50	3.0		3.5 N-S 7.5 E-W	Approximate distance 790 miles Maximum amplitudes for both components occurred in the P phase.	
# 8 Jan. 31	e i F	8:32:44 8:35:52 8:40				Distant	

 L. T. Chapel,
Acting Chief Hydrographer.

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SEISMOLOGICAL RECORD AT BALBOA HEIGHTS, CANAL ZONE

Lat. 8° 57' 39" N.

Long. 79° 33' 29" W.

h = 36 meters.

Lithologic foundation: Basalt.

Time Correction: Within 1.0 sec.

INSTRUMENTS—FIXED CONSTANTS

INSTRUMENTS	SYMBOL	REGISTRATION	DAMPING	PAPER SPEED	MASS
Wood-Anderson	I	Photographic	Magnetic	60 mm. per min.	1.3 gr.
Bosch-Omori	II	Smoked Sheet	Air	15 mm. per min.	100 kg.

INSTRUMENTS—DETERMINED CONSTANTS

INSTRUMENTS	COMPONENT	T ₀	V	h	DETERMINED
Wood-Anderson	N-S	0.85	1370	8 to 1	January 22, 1943
Wood-Anderson	E-W	0.85	1370	10 to 1	January 22, 1943
Bosch-Omori)	Not operating.				
Bosch-Omori)					

Month February, 1943

Page No. 3

No. and Date	Phase	Time G. M. T.			Period	AMPLI- TUDE mm	REMARKS
		h	m	s			
In regard to entries in columns, PERIOD, AMPLITUDE, and REMARKS see notes on January report.							
Feb. 3		No record from 18:42 to 19:00					
#9 Feb. 7	eP IS F	9:42:45 9:43:12 9:46				4.0 N-S 3.7 E-W	Approximate distance 130 miles
#10 Feb. 10	e F	21:33 21:42					Nearby
#11 Feb. 11	eP IS F	8:29:42 8:30:05 8:34				18.5 N-S 15.5 E-W	Approximate distance 110 miles
#12 Feb. 16	1P IS 1 F	7:33:49 7:38:04 7:44:32 7:50					Approximate distance 1660 miles
#13 Feb. 22	eP eS F	9:25:50 9:30:24 10:13					Approximate distance 1830 miles Destructive earthquake reported from southern Mexico

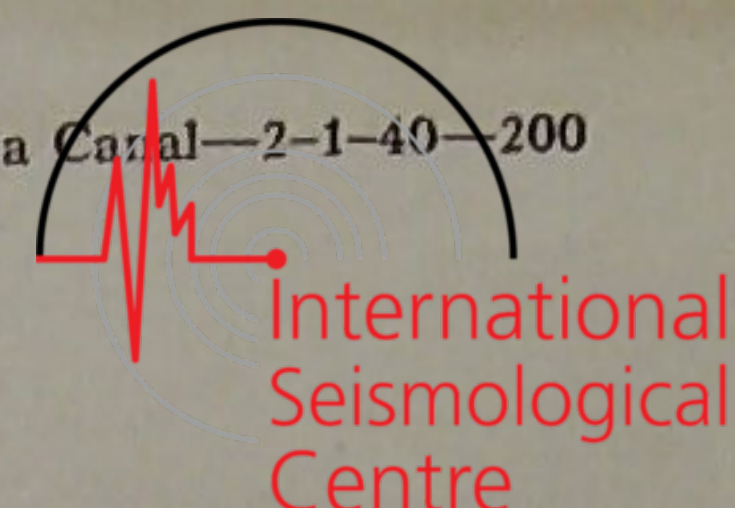
SEISMOLOGICAL RECORD AT BALBOA HEIGHTS, CANAL ZONE

Month February, 1945Page No. 4

No. and Date	Phase	Time G. M. T.			Period s	AMPLI- TUDE mm	REMARKS
		h	m	s			
# 14 Feb. 22	● 1S F	14:00:30				6.0	No record on N-S component Nearby
Feb. 24		No record from 14:55:08 to 15:04:28 and from 16:03:44 to 16:18:07					
							G. E. Matthew, Chief Hydrographer.

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MR 69138—Panama Canal—2-1-40—200



SEISMOLOGICAL RECORD AT BALBOA HEIGHTS, CANAL ZONE

Lat. 8° 57' 39" N.

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INSTRUMENTS—FIXED CONSTANTS

INSTRUMENTS	SYMBOL	REGISTRATION	DAMPING	PAPER SPEED	MASS
Wood-Anderson	I	Photographic	Magnetic	60 mm. per min.	1.3 gr.
Bosch-Omori	II	Smoked Sheet	Air	15 mm. per min.	100 kg.

INSTRUMENTS—DETERMINED CONSTANTS

INSTRUMENTS	COMPONENT	T _c	V	h	DETERMINED
Wood-Anderson	N-S	0.85	1370	8 to 1	January 22, 1943
Wood-Anderson	E-W	0.85	1370	10 to 1	" " "
Bosch-Omori)	Not operating				
Bosch-Omori)					

Month March 1943Page No. 5

No. and Date	Phase	Time G. M. T.			Period	AMPLI- TUDE mm	REMARKS
		h	m	s			
In regard to entries in Columns, PERIOD, AMPLITUDE, and REMARKS see note on January report							
Mar. 3		No record from 18:06:29 to 18:14:49 GMT					
#15 Mar. 5	eP i iS F	0:32:45 0:32:54 0:33:48 1:12			8.0 8.0	5.0 5.0 24.0 23.0	Approximate distance - 300 miles (N-S) U.S.C & G.S locates (E-W) epicenter at 5.8° N. Lat., (N-S) 82.8 W. Long. (E-W)
#16 Mar. 8	e i F	6:44:20 6:44:34 6:46					Nearby
#17 Mar. 8	e e F	22:33:00 22:33:42 22:36					Nearby
Mar. 12	No record from 14:06:17 to 14:14:26 GMT						
#18 Mar. 14	iP iS i i F	18:44:05 18:49:00 18:54:34 18:55:24 19:00					Approximate distance 2050 miles
Mar. 15	No record from 17:24:40 to 17:31:15						

SEISMOLOGICAL RECORD AT BALBOA HEIGHTS, CANAL ZONE

Month March 1943Page No. 6

No. and Date	Phase	Time G. M. T.	Period	AMPLI- TUDE	REMARKS
		^h ^m ^s	^s	mm	
#19 Mar. 16	e e e F	8:50:45 8:54:06 8:55:54 9:05			Distant
Mar. 17	i	23:14:46			
#20 Mar. 18	eP iS F	0:17:10 0:17:33 0:19			Nearby
#21 Mar. 22	e F	8:43:51 8:47			Nearby
Mar. 22	No record from 19:48:52 to 19:56:12 No record from 20:02:40 to 20:03:08				
#22 Mar. 26	e e F	11:39:40 11:40:33 11:44			Nearby
#23 Mar. 26	iP iN iE F	16:55:41 16:56:33 16:56:48 17:04		6.5 9.0	(N-S) (E-W)
#24 Mar. 26	e F	17:41 17:44			Nearby
#25 Mar. 31	iP eS F	21:50:37 21:52:27 22:05			Approximate distance -660 miles

G. E. MATTHEW
Chief Hydrographer

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INSTRUMENTS—FIXED CONSTANTS

INSTRUMENTS	SYMBOL	REGISTRATION	DAMPING	PAPER SPEED	MASS
Wood-Anderson	I	Photographic	Magnetic	60 mm. per min.	1.3 gr.
Bosch-Omori	II	Smoked Sheet	Air	15 mm. per min.	100 kg.

INSTRUMENTS—DETERMINED CONSTANTS

INSTRUMENTS	COMPONENT	T.	V	h	DETERMINED
Wood-Anderson	N-S	0.85	1370	8 to 1	January 22, 1943.
Wood-Anderson)	E-W	0.85	1370	10 to 1	January 22, 1943.
Bosch-Omori)	Not Operating				
Bosch-Omori					

Month April, 1943Page No. 7

No. and Date	Phase	Time G. M. T.			Period	AMPLI- TUDE mm	REMARKS
		h	m	s			
In regard to entries in Columns, PERIOD, AMPLITUDE, and REMARKS see note on January report.							
#26	i P	16:14:57					Approximate distance 2800 miles
Apr. 6	i S	16:21:07			1.0		(N-S) Press reports show quake
					2.0		(E-W) in Central Chile at about
	i	16:24:10		15.0	2.0		(N-S) 11:08 A.M., 75th Meridian Time.
				15.0	2.0		(E-W)
	F	17:30					
# 27	i P	20:38:00			10.0		(N-S) Approximate distance 180 miles.
Apr. 10					6.0		(E-W)
	i S	20:38:38			16.0		(N-S)
					16.0		(E-W)
	F	20:44					
# 28	e	1:21:34					Distant.
Apr. 19	e	1:23:56					
	F	1:30					

G. E. MATTHEW
Chief Hydrographer

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INSTRUMENTS—FIXED CONSTANTS

INSTRUMENTS	SYMBOL	REGISTRATION	DAMPING	PAPER SPEED	MASS
Wood-Anderson	I	Photographic	Magnetic	60 mm. per min.	1.3 gr.
Bosch-Omori	II	Smoked Sheet	Air	15 mm. per min.	100 kg.

INSTRUMENTS—DETERMINED CONSTANTS

INSTRUMENTS	COMPONENT	T.	V	h	DETERMINED
Wood-Anderson	N - S	0.85	1370	8 to 1	January 22, 1943
Wood-Anderson	E - W	0.85	1370	10 to 1	January 22, 1943
Bosch-Omori)	Not operating				
Bosch-Omori)					

Month May, 1943

Page No. 8

No. and Date	Phase	Time G. M. T.	Period	AMPLI- TUDE	REMARKS
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In regard to entries in Columns, PERIOD, AMPLITUDE, and REMARKS see note on January report.

# 29	iP	2:12:50			Approximate distance 45 miles.
May 2	iS	2:12:59		22.0 (N-S)	
	F	2:15		28.0 (E-W)	

30
May 2

This shock as felt at Balboa Heights was rated at Intensity V, Modified Mercalli Scale and was the heaviest shock in the Canal Zone since May 6, 1936. The time of the first onset as recorded on the seismographs was 17:18:47 GMT. The pendulum clock used as a time marker for the seismograph record was stopped one minute and one second later at 17:19:48 GMT. Out of seven pendulum clocks in the Administration Building, Balboa Heights, five were stopped and two continued to run. A six pin seismometer installed at Miraflores Locks, consisting of six steel pins one fourth inch in diameter and ranging in height from six to 15 inches, had all six pins knocked over. The shock was generally felt by residents of the Canal Zone and many were alarmed and ran out doors. Some dishes and mirrors were broken but there was no material damage. The U. S. C. & G. S. accelerograph installed in the basement of the Administration Building, Balboa Heights was not operated. Following this shock the adjustment of this instrument was changed in an effort to secure a record of all quakes of this intensity.

The first two minutes of record on the seismograph is very indistinct on account of the rapid vibrations and it is impossible to identify the onset of the "S" waves. However the seismograph record shows that the main shock (#30) was followed within the next 12 hours by nine aftershocks (Nos. 31 to 39 inclusive), in some of which the "P" and "S" waves are clearly shown. None of these aftershocks were strong enough to be felt in the Canal Zone.

The E-W component was not recording from 12:35, May 2 to 13:41, May 3. As the time marking clock was stopped all times between 17:18:47, May 2 and 13:41, May 3 are estimated, and some may be in error as much as 10 seconds. This applies to Nos. 30 to 39 inclusive. However the S-P intervals are probably correct within one second.

SEISMOLOGICAL RECORD AT BALBOA HEIGHTS, CANAL ZONE

Month May, 1943

Page No. 9

No. and Date	Phase	Time G. M. T.			Period	AMPLITUDE	REMARKS
		h	m	s			
# 30 May 2 Cont.	1PN	17	18	47			Original onset of P waves show trace amplitude of 5.0 millimeters toward the South. Vibrations are so rapid that periods and amplitudes of P waves and the beginning of the S waves were not distinctly recorded. Intensity V. Distance estimated as 125 miles (From Nos. 31 and 38 below)
	SN	Beginning lose				44.0 (N-S)	
	F	17	45				
# 31 May 2	1PN	17	59	00			Aftershock of # 30 9.0 (N-S) Approximate distance 125 miles
	1SN	17	59	26			
	F	18	02				
# 32 May 2	ePN	18	02	54			Aftershock of No. 30 9.0 (N-S) Nearby
	1N	18	03	14			
	1N	18	03	26			
	F	18	07				
# 33 May 2	ePN	18	12	12			Aftershock of #30 Nearby
	eSN	18	12	35			
	F	18	14				
# 34 May 2	ePN	18	29	30			Aftershock of # 30 Nearby
	1SN	18	29	48			
	F	18	31				
# 35 May 2	ePN	18	50	15			Aftershock of #30 Nearby
	1SN	18	50	41			
	F	18	53				
# 36 May 2	ePN	22	52	53			Aftershock of # 30 Nearby
	1SN	22	53	21			
	F	22	55				
# 37 May 2	e	22	18	48			Aftershock of #30 Nearby
	F	22	22				
# 38 May 3	1PN	4	43	27			Aftershock of # 30 8.0 (N-S) Approximate distance 125 miles.
	1SN	4	43	53			
	F	4	46				
# 39 May 3	ePN	4	54	09			Aftershock of # 30 5.5 (N-S) Nearby
	1SN	4	54	34			
	F	4	56				

SEISMOLOGICAL RECORD AT BALBOA HEIGHTS, CANAL ZONE

Month May 1943.

Page No. 10

No. and Date	Phase	Time G. M. T.			Period s	AMPLI- TUDE mm	REMARKS
		h	m	s			
#40 May 4	1P 1S F	00:05:53 00:06:16 00:09					Approximate distance 110 miles.
					13.5 (N-S) 6.0 (E-W)		
#41 May 8	e i F	3:10:46 3:11:09 3:14					Nearby
#42 May 9	i i F	7:20:31 7:21:17 7:23					Nearby
#43 May 10	e i F	10:15:24 10:15:31 10:17					Nearby
#44 May 11	i F	2:24:26 2:28					Nearby
#45 May 11	1P 1S F	9:05:31 9:06:00 9:12				4.5 (N-S) 6.0 (E-W)	Approximate distance 140 miles
#46 May 13	eP 1S F	9:12:27 9:12:54 9:14				4.0 (N-S) 3.5 (E-W)	Approximate distance 130 miles
#47 May 19	1P 1S F	1:37:49 1:38:09 1:41				4.0 (N-S) 3.5 (E-W)	Approximate distance 100 miles
#48 May 21	i F	7:33:07 7:40					Distant
#49 May 21	e i F	20:55:32 20:55:50 20:58					Nearby
#50 May 23	1P 1S F	16:47:12 16:47:30 16:50					Approximate distance 85 miles

4059-3-Continued

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MR 69139—Panama Canal—1-30-40—400

SEISMOLOGICAL RECORD AT BALBOA HEIGHTS, CANAL ZONE

Month May 1943

Page No. 11

No. and Date	Phase	Time G. M. T.			Period s	AMPLI- TUDE mm	REMARKS
		h	m	s			
#51 May 25	i	23	27	26		Distant	
	e	23	41	10			
	e	00	16	00			
	e	00	22	00			
	F	01	10				

<p>G. E. MATTHEW Chief Hydrographer</p>							

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INSTRUMENTS—DETERMINED CONSTANTS

INSTRUMENTS	COMPONENT	T ₀	V	h	DETERMINED
Wood-Anderson	N - S	0.85	1370	8 to 1	January 22, 1943
Wood-Anderson	E - W	0.85	1370	10 to 1	January 22, 1943
Bosch-Omori					
Bosch-Omori	Not operating				

Month June, 1943

Page No. 12

No. and Date	Phase	Time G. M. T.	Period	AMPLI- TUDE	REMARKS
#52 June 1	e	h m s 14:16:25		mm	Nearby
	F	14:19			
#53 June 2	e	5:26:30			Distant
	e	5:28:18			
	F	5:36			
#54 June 8	e	21:03			Distant
	F	23:00			
#55 June 9	e	3:26:47			Distant
	F	6:00			
#56 June 10	iP	3:46:00			Approximate distance 190 miles
	i	3:46:30			
	iS	3:46:39		5.0(N-S) 6.5(E-W)	
	F	3:51			
#57 June 15	e	18:25:00			Distant
	e	18:30:00			
	F	19:15			
#58 June 15	e	19:49:00			Distant
	F	21:00			
#59 June 18	iP	19:28:34			Approximate distance 115 miles
	iS	19:28:58		3.0(E-W)	
	F	19:31			

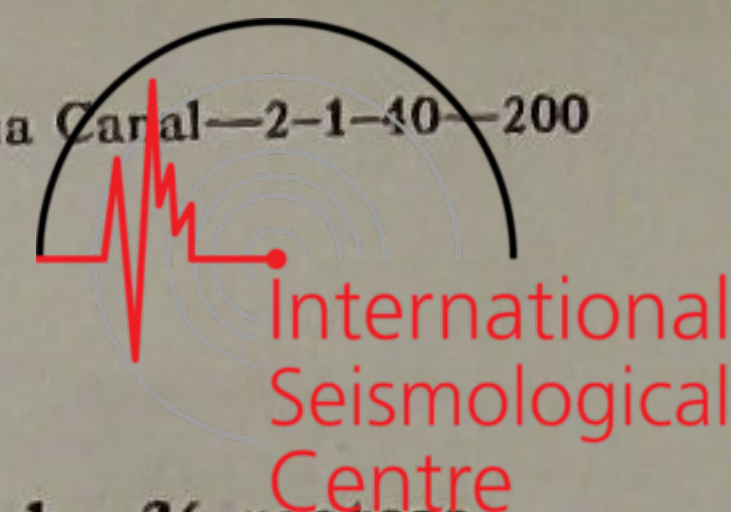
SEISMOLOGICAL RECORD AT BALBOA HEIGHTS, CANAL ZONE

Month June, 1943Page No. 13

No. and Date	Phase	Time G. M. T.			Period s	AMPLI- TUDE mm	REMARKS
		h	m	s			
#60 June 19	iP iS F	2:03:49 2:04:31 2:08					Approximate distance 200 miles.
#61 June 23	e i F	5:50:08 5:50:26 5:52			3.5(E-W)		Nearby
#62 June 30	e i i F	13:40:03 13:40:18 13:40:20 13:42			4.5(N-S)		Nearby
#63 June 30	e F	20:18:21 20:27					Distant

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Bosch-Omori)	Not operating				
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Month July, 1943

Page No. 14

No. and Date	Phase	Time	Period	AMPLI-	REMARKS
		G. M. T.		TUDE	
		h m s		mm	
#64	eP	09:53:17			Nearby
July 4	e	09:54:18		4.0 (N-S)	
	F	10:16		9.0 (E-W)	
#65	e	10:52:30			Nearby
July 4	F	10:57			
#66	e	11:24:13			Nearby
July 4	i	11:25:07			
	F	11:31			
#67	e	11:34:15			Nearby
July 4	i	11:35:11			
	F	11:40			
#68	e	22:02:03			Nearby
July 4	F	22:08			
#69	e	21:13:21			Nearby
July 5	F	21:22			
#70	i	11:31:19			Nearby
July 6	i	11:32:16			
	F	11:36			

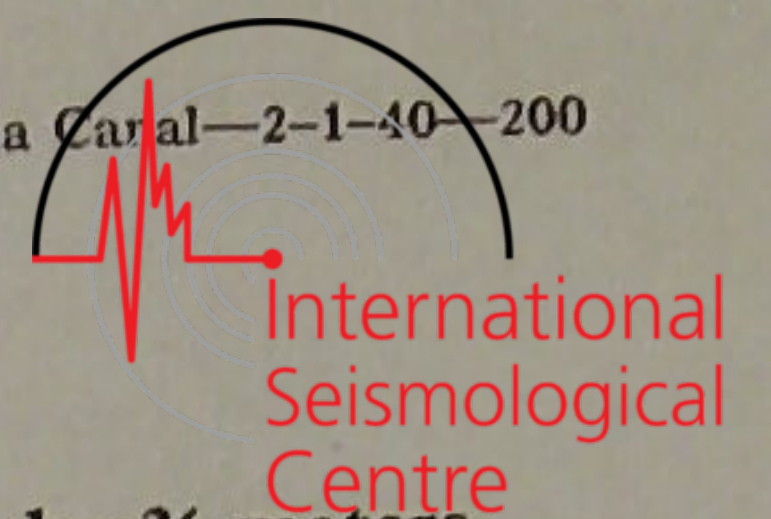
SEISMOLOGICAL RECORD AT BALBOA HEIGHTS, CANAL ZONE

Month July, 1943Page No. 15

No. and Date	Phase	Time G. M. T.			Period s	AMPLI- TUDE mm	REMARKS
		h	m	s			
#71 July 9	e	03:17:00				Nearby	
	e	03:17:56					
	F	03:21					
#72 July 18	e	17:50:45				Nearby	
	e	17:51:02					
	F	17:53					
#73 July 22	e	2:11:37				Distant	
	i	2:13:16					
	eL	2:14:10					
	F R	2:30					
#74 July 23	e	15:13:15				Distant	
	F	15:36					
#75 July 29	iP	3:05:58			8.0 (N-S)	Severe earthquake reported in West Indies, but no serious damage seems to have occurred in any locality. Approximate distance from Balboa Heights 1050 miles.	
	i	3:08:50			7.5 (E-W)		
	eL	3:10:22		20.0	7.0 (N-S)		
	F	4:50		20.0	8.0 (E-W) 6.5 (N-S) 6.5 (E-W)		
#76 July 30	i	1:06:17				Distant	
	e	1:09:14					
	F	1:22					
#77 July 31	e	19:12:51				Distant	
	F	19:17					

 G. E. MATTHEW
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Time Correction: Within 1.0 sec.

INSTRUMENTS—FIXED CONSTANTS

INSTRUMENTS	SYMBOL	REGISTRATION	DAMPING	PAPER SPEED	MASS
Wood-Anderson	I	Photographic	Magnetic	60 mm. per min.	1.3 gr.
Bosch-Omori	II	Smoked Sheet	Air	15 mm. per min.	100 kg.

INSTRUMENTS—DETERMINED CONSTANTS

INSTRUMENTS	COMPONENT	T ₀	V	h	DETERMINED
Wood-Anderson	N - S	0.85	1370	8 to 1	January 22, 1943
Wood-Anderson	E - W	0.85	1370	10 to 1	January 22, 1943
Bosch-Omori)	Not operating				
Bosch-Omori)					

Month August, 1943Page No. 16

No. and Date	Phase	Time G. M. T.			Period	AMPLI- TUDE	REMARKS
		h	m	s			
#78 Aug. 1	o	3	39	30			Nearby
	i	3	39	44		4.0N 3.5E	
	F	3	41				
#79 Aug. 4	o	23	07	41			Nearby
	F	23	12				
#80 Aug. 13	iP	00	06	37		5.0N 3.5E	Approximate distance 145 miles Felt by few
	iS	00	07	07		17.6N 22.0E	Intensity I.
	F	00	11				
#81 Aug. 13	o	00	13	07			Nearby
	i	00	13	41			
	F	00	16				
#82 Aug. 15	o	00	16	53			Nearby
	F	00	23				

SEISMOLOGICAL RECORD AT BALBOA HEIGHTS, CANAL ZONE

Month August, 1943Page No. 17

No. and Date	Phase	Time G. M. T.			Period s	AMPLI- TUDE mm	REMARKS
		h	m	s			
#83 Aug. 27	iP	17:	52:	36			Approximate Distance 110 miles
	iS	17:	52:	59		26.6N 32.8E	Felt by few
	F	17:	56				Intensity I.
#84 Aug. 31	•	16:	13:	47			Distant
	F	16:	27				

G. E. MATTHEW,
Chief Hydrographer.

THE PANAMA CANAL
DEPARTMENT OF OPERATION AND MAINTENANCE
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SEISMOLOGICAL RECORD AT BALBOA HEIGHTS, CANAL ZONE

Lat. 8° 57' 39" N.

Long. 79° 33' 29" W.

h = 36 meters.

Lithologic foundation: Basalt.

Time Correction: Within 1.0 sec.

INSTRUMENTS—FIXED CONSTANTS

INSTRUMENTS	SYMBOL	REGISTRATION	DAMPING	PAPER SPEED	MASS
Wood-Anderson	I	Photographic	Magnetic	60 mm. per min.	1.3 gr.
Bosch-Omori	II	Smoked Sheet	Air	15 mm. per min.	100 kg.

INSTRUMENTS—DETERMINED CONSTANTS

INSTRUMENTS	COMPONENT	T.	V	h	DETERMINED
Wood-Anderson	N-S	0.85	1370	8 to 1	January 22, 1943
Wood-Anderson	E-W	0.85	1370	10 to 1	January 22, 1943
Bosch-Omori)	Not operating				
Bosch-Omori)					

Month September, 1943

Page No. 18

No. and Date	Phase	Time G. M. T.			Period	AMPLI- TUDE	REMARKS
		h	m	s			
#85 Sept. 6	e e eL F	04:01:08 04:11:00 04:28:28 05:30					Distant
#86 Sept. 7	iP iS F	18:15:14 18:15:41 18:18			6.5E 7.0H		Approximate distance 160 miles
#87 Sept. 10	i e F	2:35:24 2:38:21 2:42					Distant
#88 Sept. 14	eL F	2:49:45 3:43					Distant
#89 Sept. 17	iP iS F	6:48:34 6:49:17 6:51					Approximate distance 200 miles
#90 Sept. 23	e i F	15:03:50 15:16:15 15:24					Distant
#91 Sept. 23	i e F	15:32:23 15:34:07 15:39					Distant
#92 Sept. 26	iP iS F	22:39:25 22:40:22 22:48					Approximate distance 275 miles

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Lat. 8° 57' 39" N.

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h = 36 meters.

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Time Correction: Within 1.0 sec.

INSTRUMENTS—FIXED CONSTANTS

INSTRUMENTS	SYMBOL	REGISTRATION	DAMPING	PAPER SPEED	MASS
Wood-Anderson	I	Photographic	Magnetic	60 mm. per min.	1.3 gr.
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INSTRUMENTS—DETERMINED CONSTANTS

INSTRUMENTS	COMPONENT	T.	V	h	DETERMINED
Wood-Anderson	N-S	0.85	1370	8 to 1	January 22, 1943.
Wood-Anderson	E-W	0.85	1370	10 to 1	January 22, 1943.
Bosch-Omori	} Not Operating				
Bosch-Omori					

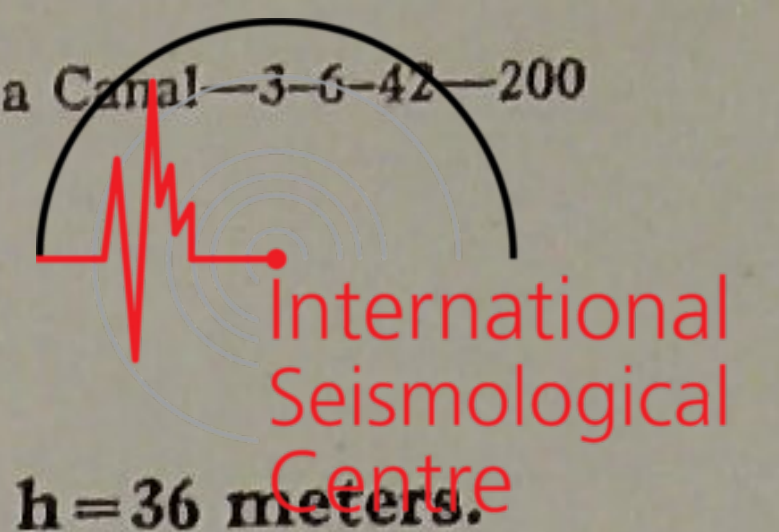
Month October, 1943.

Page No. 19

No. and Date	Phase	Time G. M. T.			Period	AMPLI- TUDE mm	REMARKS
		h	m	s			
# 93 Oct. 8	e P 1 S F	18:	38:	24			Approximate distance 230 miles
# 94 Oct. 23	e P F	17:	42:	56			Distant.
# 95 Oct. 25	1 P 1 S F	9:	40:	57			Approximate distance 150 miles
# 96 Oct. 25	e P 1 S F	9:	45:	57			Approximate distance 150 miles

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SEISMOLOGICAL RECORD AT BALBOA HEIGHTS, CANAL ZONE

Lat. 8° 57' 39" N.

Long. 79° 33' 29" W.

h = 36 meters.

Lithologic foundation: Basalt.

Time Correction: Within 1.0 sec.

INSTRUMENTS—FIXED CONSTANTS

INSTRUMENTS	SYMBOL	REGISTRATION	DAMPING	PAPER SPEED	MASS
Wood-Anderson	I	Photographic	Magnetic	60 mm. per min.	1.3 gr.
Bosch-Omori	II	Smoked Sheet	Air	15 mm. per min.	100 kg.

INSTRUMENTS—DETERMINED CONSTANTS

INSTRUMENTS	COMPONENT	T ₀	V	h	DETERMINED
Wood-Anderson	N - S	0.85	1370	8 to 1	January 23, 1943.
Wood-Anderson	E - W	0.85	1370	10 to 1	January 22, 1943.
Bosch-Omori)	Not Operating.				
Bosch-Omori)					

Month November, 1943.

Page No. 20

No. and Date	Phase	Time G. M. T.			Period	AMPLI- TUDE mm	REMARKS
		h	m	s			
# 97 Nov. 3	e	14	43	57	15.0		Distant.
	eL	15	09	30			
	F	15	50				
# 98 Nov. 6	e	8	51	21			Distant.
	eL	9	14	07			
	F	11	00				
# 99 Nov. 13	e	7	58	16			Nearby.
	i	7	59	15			
	F	8	01				
# 100 Nov. 14	iP	4	22	34		3.0N 4.0E 20.0N 32.0E	Approximate distance 220 miles.
	iS	4	23	20			
	F	4	31				
# 101 Nov. 16	e	11	43	21			Distant.
	e	11	47	59			
	F	12	02				
# 102 Nov. 29	e	19	44	27			Distant.
	F	20	10				

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SEISMOLOGICAL RECORD AT BALBOA HEIGHTS, CANAL ZONE

Lat. 8° 57' 39" N.

Long. 79° 33' 29" W.

h = 36 meters.

Lithologic foundation: Basalt.

Time Correction: Within 1.0 sec.

INSTRUMENTS—FIXED CONSTANTS

INSTRUMENTS	SYMBOL	REGISTRATION	DAMPING	PAPER SPEED	MASS
Wood-Anderson	I	Photographic	Magnetic	60 mm. per min.	1.3 gr.
Bosch-Omori	II	Smoked Sheet	Air	15 mm. per min.	100 kg.

INSTRUMENTS—DETERMINED CONSTANTS

INSTRUMENTS	COMPONENT	T	V	h	DETERMINED
Wood-Anderson	N - S	0.85	1370	8 to 1	January 22, 1943
Wood-Anderson	E - W	0.85	1370	10 to 1	January 22, 1943
Bosch-Omori	Not - Operating				
Bosch-Omori					

December - 1943.

21

Month -----

Page No. -----

No. and Date	Phase	Time G. M. T.			Period	AMPLI- TUDE mm	REMARKS
		h	m	s			
#103 Dec. 1	e	10	41	01			Distant.
	i	10	46	02			
	F	11	15				
#104 Dec. 13	eP	00	46	29			Approximate distance 190 miles.
	eS	00	47	08			
	F	00	49				
#105 Dec. 21	eP	13	48	33			Approximate distance 620 miles. Press reports show shock in Venezuela near Lat. 11 N, Long. 69.5 W at 13:46 G.M.T.
	eS	13	50	14			
	F	14	07				
#106 Dec. 22	eP	6	55	58			Approximate distance 180 miles.
	eS	6	56	37			
	F	6	59				
#107 Dec. 22	e	7	04	44			Nearby.
	F	7	10				
#108 Dec. 22	eP	12	55	22			Approximate distance 600 miles. Record similar to #105.
	eS	12	57	00			
	F	13	20				
#109 Dec. 23	eP	15	48	20		3.5 N 4.0 E	Approximate distance 590 miles. Record similar to #105.
	eS	15	49	56			
	F	16	30				
#110 Dec. 24	eP	1	02	32			Approximate distance 560 miles. Record similar to #105.
	eS	1	00	04			
	F	1	20				

SEISMOLOGICAL RECORD AT BALBOA HEIGHTS, CANAL ZONE

Month December 1943Page No. 22

No. and Date	Phase	Time G. M. T.			Period s	AMPLI- TUDE mm	REMARKS
		h	m	s			
#111	e	11	27	39			Nearby.
REXX 30	e	11	28	03			
Dec. 30	F	11	29				
L. T. CHAPEL Acting Chief Hydrographer							