

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 0.5 sec.

INSTRUMENTS—FIXED CONSTANTS

INSTRUMENTS	SYMBOL	REGISTRATION	DAMPING	PAPER SPEED		MASS
				60 mm. per min.	15 mm. per min.	13 gr. 100 kg.
Wood-Anderson	I	Photographic	Magnetic	60 mm. per min.		
Bosch-Omori	II	Smoked Sheet	Air	15 mm. per min.		

INSTRUMENTS—DETERMINED CONSTANTS

INSTRUMENTS	COMPONENT	T.	V	h	DETERMINED
					July 18, 1934 July 18, 1934
Wood-Anderson	N-S	0.8	1370	critical	July 18, 1934
Wood-Anderson	E-W	0.8	1370	critical	July 18, 1934
Bosch-OmoriNot operating.				
Bosch-Omori					

Month **JANUARY 1936**Page No. **1**

No. and Date	Phase	Time G. M. T.			Period s	Amplitude		REMARKS
		h	m	s		E	N	
						mm	mm	
1 Jan. 4	ePNE	14	32	50	✓			weak
	eN	14	33	44				
	eE	14	38	42				
	FNE	14	41					
2 Jan. 7		03	33	47	✓			Very weak.
		03	35					
3 Jan. 8		22	21	36	✓			Weak.
		22	25					
Jan. 9		16	12	23	✓			Dredging Division blast 2,770 lbs. of dynamite in Miraflores Lake, approximately 5 miles NW from Balboa.
4 Jan. 10		04	09	40	✓			Very faint, barely discernible.
		04	14					
5 Jan. 10		04	46	00	✓			Very weak.
		04	48					
6 Jan. 10		06	21	36	✓			Very faint trace.
		06	24					
Jan. 10		16	59	04				Dynamite - Miraflores Lake. (See discussion for Jan. 9th)
Jan. 11		18	39	58				Dynamite - Miraflores Lake. (See discussion for Jan. 9th)
Jan. 13		17	52	19				Dynamite - Miraflores Lake (See discussion for Jan. 9th.)
7 Jan. 14	iPNE	14	19	14	✓			
	iN	14	24	44				
	iE	14	24	42				
	FNE	14	34					
Jan. 15		14	20	42				Dynamite - Miraflores Lake (See discussion Jan. 9th)
8 Jan. 17		14	17	to	✓			Very faint trace.
		14	19					
Jan. 17		15	20	45				Dynamite - Miraflores Lake. (See discussion for Jan. 9th.)
9 Jan. 18		03	25		✓			Very faint, barely discernible.
		03	31					

SEISMOLOGICAL RECORD AT BALBOA HEIGHTS, CANAL ZONE

JANUARY 1936

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Month -----

No. and Date	Phase	Time G. M. T.			Period s	Amplitude		REMARKS
						E mm	N mm	
10 Jan. 19	ePNE 1SNE MN ME FNE	22 ^h 22	36 ^m 36	07 21 24 22 40	✓	8.1	12.4	Distance about 70 miles.
11 Jan. 20	ePNE 1SNE FNE	02	46	00 15 48	✓			Distance about 70 miles. Weak.
Jan. 20		18	34	13				Dynamite - Miraflores Lake. (See report for Jan. 9th)
12 Jan. 20		17	16	to 17 22	✓			Faint trace
13 Jan. 22		06	33	to 06 37	✓			Very faint.
Jan. 22		15	04	11				Dynamite blast - Miraflores Lake (See report for Jan. 9th)
14 Jan. 22	ePNE eSNE FNE	17	53	52 34 57	✓			Distance about 240 miles. Weak.
Jan. 23		16	08	47				Dynamite blast - Miraflores Lake - (See report for Jan. 9th)
15 Jan. 23	ePNE eSNE FNE	16	40	45 03 43	✓			Distance about 100 miles. Weak.
Jan. 24		18	09	50				Dynamite - Miraflores Lake (See report for Jan. 9th)
Jan. 25		18	20	05				Dynamite - Miraflores Lake (See report for Jan. 9th)
16 Jan. 26		10	58	58 to 11 03	✓			Weak
17 Jan. 26		11	10	to 11 14	✓			Very faint.
Jan. 27		18	23	28				Dynamite - Miraflores Lake (See report Jan. 9th)
Jan. 29		16	07	47				Dynamite - Miraflores Lake (See report for Jan. 9th)
18 Jan. 30		07	41	50 to 07 43	✓			Very faint trace.
19 Jan. 30		08	18	51 to 08 21	✓			Very faint trace.
Jan. 31		15	25	19				Dynamite - Miraflores Lake (See report for Jan. 9th)
20 Jan. 31		22	43	to 22 45	✓			Very faint trace. Barely discernible.

International
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Chief of Surveys

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Lat. 8° 57' 39" N.

Long. 79° 33' 29" W.

h = 36 meters.

Lithologic foundation: Basalt.

Time Correction: Within 0.5 sec.

INSTRUMENTS—FIXED CONSTANTS

INSTRUMENTS	SYMBOL	REGISTRATION	DAMPING	PAPER SPEED		MASS
				60 mm. per min.	15 mm. per min.	13 gr. 100 kg.
Wood-Anderson	I	Photographic	Magnetic	60 mm. per min.		
Bosch-Omori	II	Smoked Sheet	Air	15 mm. per min.		

INSTRUMENTS—DETERMINED CONSTANTS

INSTRUMENTS	COMPONENT	T _c	V	h	DETERMINED
					July 18, 1934 July 18, 1934
Wood-Anderson	N-S	0.8	1370	critical	July 18, 1934
Wood-Anderson	E-W	0.8	1370	critical	July 18, 1934
Bosch-Omori	Not operating.				
Bosch-Omori					

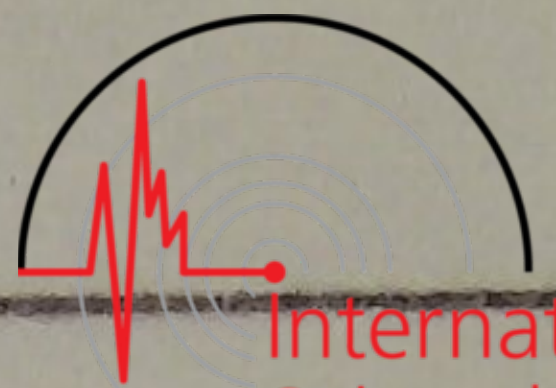
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No. and Date	Phase	Time G. M. T.			Period s	Amplitude		REMARKS
		h	m	s		E	N	
						mm	mm	
<i>*Time on grams is measured from beginning of minute marks.</i>								
No. 21 Feb. 2		04	50	58				Very faint trace. Local
			to					
		04	52					
No. 22 Feb. 3	1PN 1SN FN	02	31	37				Distance about 30 miles. E-W clock stopped
		02	31	42				
		02	33					
Feb. 3		15	56	13				Dynamite blast in Miraflores Lake, approximately 5 miles NW from Balboa.
No. 23 Feb. 3	1PNE 1SNE MN ME FNE	23	17	22				Distance about 30 miles.
		23	17	27				
		23	17	32		6.5	6.5	
		23	17	28		6.5		
		23	19					
Feb. 4		13	19	33				Dynamite, Miraflores Lake. See report for Feb. 3.
Feb. 6		13	17	03				Dynamite - Miraflores Lake. See report for February 3.
No. 24 Feb. 6		23	46	35				Very faint trace.
			to					
		23	49					
No. 25 Feb. 7		01	10	46				Weak
			to					
		01	14					
No. 26 Feb. 8	oPNE oSNE FNE	18	58	43				Distance about 120 miles. Very weak
		18	59	04				
		19	01					
Feb. 10		18	45	57				Dynamite, Miraflores Lake. See report for February 3.
Feb. 11		16	52	23				Dynamite blast, probably Balboa Harbor.
No. 27 Feb. 11	1PNE 1SNE MN ME FNE	17	56	45				Distance about 120 miles.
		17	57	08				
		17	57	11			18.5	
		17	57	12		9.1		
		18	00					
Feb. 12		13	26	44				Dynamite, Miraflores Lake. See report for February 3.
No. 28 Feb. 15		13	07					Faint trace of 3.0 second period waves.
			to					
		13	14					

SEISMOLOGICAL RECORD AT BALBOA HEIGHTS, CANAL ZONE

Month **FEBRUARY, 1936**Page No. **4**

No. and Date	Phase	Time G. M. T.			Period s	Amplitude		REMARKS
		h	m	s		E mm	N mm	
No. 29 Feb. 19		02	59	48				Weak
			to					
		03	04					
No. 30 Feb. 21	oPNE	05	40	26				Distance about 60 miles.
	oSNE	05	40	37				
	MN	05	40	38			9.0	
	ME	05	40	43		5.4		
	F		?					
No. 31 Feb. 21		05	42	34				Weak. Superposed.
			to					
		05	44					
No. 32 Feb. 21		13	53	20				Weak
			to					
		13	57					
No. 33 Feb. 21		19	21	30				Very faint.
			to					
		19	24					
No record from 16:00 February 22 to 13:30 February 23.								
No. 34 Feb. 24		16	00					Faint trace.
			to					
		16	03					
No. 35 Feb. 26	1PNE	09	18	30				Distance about 70 miles. Intensity II (McV. scale)
	1SNE	09	18	43				
	MN	09	18	45			14.4	
	ME	09	18	48		11.4		
	FNE	09	22					
No. 36 Feb. 27		02	10					Faint trace.
			to					
		02	13					
No. 37 Feb. 27	oPNE	07	55	39				Distance about 70 miles.
	1SNE	07	55	53				
	MNE	07	55	54		7.0	6.5	
	FNE	07	58					

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Time Correction: Within 0.5 sec.

INSTRUMENTS—FIXED CONSTANTS

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

INSTRUMENTS—DETERMINED CONSTANTS

INSTRUMENTS	COMPONENT	T _c	V	h	DETERMINED
					July 18, 1934 July 18, 1934
Wood-Anderson	E - W	0.8	1370	Critical	July 18, 1934
Wood-Anderson	N - S	0.8	1370	Critical	July 18, 1934
Bosch-Omori) ----- Not operating - - -				
Bosch-Omori					

Month March 1936Page No. 5

No. and Date	Phase	Time G. M. T.			Period s	Amplitude		REMARKS
		h	m	s		E	N	
						mm	mm	
Time on grams is measured from beginning of minute marks.								
58 March 1		11 : 44 : 14 to 11 : 46						Very faint. Local.
39 March 2		16 : 57 to 17 : 00						Very faint trace.
40 March 5	e PNE e SNE FNE	14 : 34 : 57 14 : 35 : 48 14 : 38						Very weak Distance about 290 miles.
41 March 5		19 : 16 to 19 : 17						Very faint trace.
42 March 6	i PNE i SNE FNE	01 : 57 : 08 01 : 57 : 17 01 : 59						Weak. Distance approximately 50 miles.
43 March 7		20 : 37 to 20 : 43						Very faint.
44 March 12		21 : 26 to 21 : 31						Very faint trace.
45 March 17 & 18		23 : 58 to 00 : 01						Very weak.
46 March 18		02 : 29 : 40 to 02 : 33						Very weak.
47 March 19	e PNE e SNE FNE	08 : 20 : 41 08 : 21 : 04 08 : 22						Weak Distance approximately 130 miles
48 March 20	e PNE i SNE M N M E FNE	15 : 59 : 25 15 : 59 : 52 15 : 59 : 57 15 : 59 : 58 16 : 05				6.0	8.5	Distance approximately 150 miles

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SEISMOLOGICAL RECORD AT BALBOA HEIGHTS, CANAL ZONE

Month MARCH 1936Page No. 6

No. and Date	Phase	Time G. M. T.			Period s	Amplitude		REMARKS
		h	m	s		E mm	N mm	
49 March 20	e PNE	18	47	43				Distance approximately 320 miles.
	i SNE	18	48	40				
	M N	18	48	43			6.5	
	M E	18	48	47		5.9		
	FNE	19	03					
50 March 22		11	32	01				Very faint trace.
			to					
		11	53					
51 March 25		18	07	11				Weak
			to					
		18	15					
52 March 25		21	23					Very faint, barely discernible.
			to					
		21	25					
53 March 27		15	32	32				Very weak.
			to					
		15	34					
54 March 28		18	35	15				Very faint trace.
			to					
		18	37					
55 March 29		08	25	56				Very faint trace.
		08	27					
56 March 29	e PNE	09	16	43				Distance about 140 miles.
	e SNE	09	17	08				
	MNE	09	17	11		4.4	6.5	
	FNE	09	19					
57 March 29		11	42	07				Very weak.
		11	43					
58 March 30	e PNE	12	17	19				Weak. Distance about 140 miles.
	e SNE	12	17	44				
	FNE	12	19					

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Wood-Anderson	I	Photographic	Magnetic	60 mm. per min.	1.3 gr. 100 kg.
Bosch-Omori	II	Smoked Sheet	Air	15 mm. per min.	

INSTRUMENTS—DETERMINED CONSTANTS

INSTRUMENTS	COMPONENT	T _c	V	h	DETERMINED
Wood-Anderson	N - S	0.8	1370	Critical	July 18, 1934
Wood-Anderson	E - W	0.8	1370	Critical	July 18, 1934
Bosch-Omori					
Bosch-Omori					

Month APRIL, 1936Page No. 7

No. and Date	Phase	Time G. M. T.			Period s	Amplitude		REMARKS
		h	m	s		E mm	N mm	
59 April 1		02:29:05						Weak
		to						
		02:46						
60 April 5	i PNE i SNE MN ME FNE	19:27:42					5.5	Distance about 30 miles.
		19:27:46						
		19:27:47			1.5			
		19:27:48						
		19:29						
61 April 6		03:48						Very faint trace.
		to						
		03:52						
62 April 6	ePNE iSNE MN ME FNE	17:09:36					4.6	Distance approx. 210 miles.
		17:10:13						
		17:10:19			4.1			
		17:10:20						
		17:13						
63 April 6		17:57						Aftershock very faint.
		to						
		18:00						
64 April 6		21:31						Very faint trace.
		to						
		21:36						
65 April 7		03:56						Very faint trace.
		to						
		03:39						
66 April 10		15:31						Weak.
		to						
		15:34						
67 April 14	ePNE eSNE FNE	05:56:07						Very weak. Distance approx. 70 miles.
		05:56:21						
		05:58						
68 April 15		18:13						Very faint.
		to						
		18:16						
69 April 15		21:17						Very faint trace, barely discernible.
		to						
		21:20						
70 April 16		20:15						Very faint.
		to						
		20:18						
71 April 17		19:14						Weak.
		to						
		19:17						

SEISMOLOGICAL RECORD AT BALBOA HEIGHTS, CANAL ZONE

April, 1936

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Month

No. and Date	Phase	Time G. M. T.			Period s	Amplitude		REMARKS
		h	m	s		E mm	N mm	
72 April 21	1PN 1SN MN FN	07:23:30 07:23:36 07:23:37 07:25					8.9	Distance about 35 miles. E - W time marker not working.
73 April 23	1PNE 1SNE MN ME FNE	00:49:50 00:49:59 00:50:01 00:50:02 00:52					9.4 8.9	Distance about 50 miles. Felt by a few people on the Atlantic Side.
74 April 25	EPN ePE 1PNE MN ME FNE	12:51:32 12:51:34 12:52:14 12:52:16 12:52:18 12:56					5.7 8.0	Distance about 230 miles.
75 April 25		12:57:32 to 13:02						Aftershock. Weak.
76 April 25		13:03 to 13:06						Aftershock. Very faint.
77 April 25		13:34 to 13:37						Very faint.
78 April 27	ePN ePE FN	06:33:37 06:33:36 06:48						Weak

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INSTRUMENTS—DETERMINED CONSTANTS

INSTRUMENTS	COMPONENT	T _c	V	h	DETERMINED
					July 18, 1934
Wood-Anderson	N-S	0.8	1370	Critical	July 18, 1934
Wood-Anderson	E-W	0.8	1370	"	"
Bosch-Omori	} -----	} -----	} -----	} -----	} -----
Bosch-Omori					

Month May, 1936Page No. 9

No. and Date	Phase	Time			Period	Amplitude		REMARKS	
		G. M. T.				s	E		N
		h	m	s			mm		mm
79 May 2		02:32						Very faint trace.	
		to							
		02:34							
80 May 5		18:48						Very faint trace.	
		to							
		18:48							
81 May 5		19:19						Very faint trace.	
		to							
		19:21							
82 May 6		03:42						Very faint.	
		to							
		03:48							
83 May 6	1PNE 1SNE M CN CE FNE	08:21:25 (Light beam moving too rapidly to be recorded)						Intensity IV-V on Mod. Mercalli Scale. (Exact distance uncertain, but probably less than 50 miles). This shock caused general alarm throughout the Isthmus and due to the loud noise and sudden beginning most people thought it was a heavy explosion. No damage, however, was reported except for a few cracks and some loosened tile.	
		08:22:10							
		08:22:06							
		08:25							
		No records from 13:05 to 20:16, May 15. No records from 13:11 May 17 to 20:14, May 18.							
84 May 19	1FE 1SE ME FE	12:20:28 12:20:41 12:20:42 12:25				5.4		Distance about 75 miles N-S component not working	
85 May 21	oPNE oSNE FNE	20:08:22 20:08:37 20:10						Very faint. Distance about 80 miles.	

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SEISMOLOGICAL RECORD AT BALBOA HEIGHTS, CANAL ZONE

Month May 1936

Page No. 10

No. and Date	Phase	Time G. M. T.			Period s	Amplitude		REMARKS
		h	m	s		E mm	N mm	
86 May 23	ePNE eSN eSE FNE	11:59:59 12:00:39 12:00:41 12:03						Weak. Distance about 250 miles.
87 May 25		03:39 to 03:42						Very faint trace. Barely discernable.
88 May 25		04:28 to 04:30						Very faint.
89 May 26		04:22 to 04:25						Very faint.
90 May 27	ePNE FNE	02:45:05 02:46						Very faint.
91 May 28		18:54 to 19:14						Weak. Distant disturbance.



G. B. MATTHEW,
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Wood-Anderson	N - S	0.8	1370	"	July 18, 1934
Bosch-Omori	- - -	NOT OPERATING			
Bosch-Omori					

Month JUNE 1936Page No. 11

No. and Date	Phase	Time G. M. T.			Period s	Amplitude		REMARKS
		h	m	s		E	N	
						mm	mm	
92 June 6.	o PNE	20	04	22			Very weak. Distance about 75 miles.	
	1 SNE	20	04	38				
	FNE	20	06					
93 June 8.	o PNE	19	11	24			Distance about 75 miles.	
	1 SNE	19	11	37				
	MNE	19	11	38	4.5	4.5		
	FNE	19	13					
94 June 10.		15	41	54			Very faint.	
			to					
		13	:	43				
95 June 11.		02	56	40			Very faint.	
			to					
		02	:	59				
96 June 11.		03	23	17			Very faint.	
			to					
		03	:	25				
97 June 11.	1 PNE	03	27	53			Distance about 250 miles.	
	1 SNE	03	28	17				
	M N	03	28	20		4.0		
	M E	03	28	26	2.6			
	FNE	03	35					
98 June 20.		22	23				Very faint trace.	
			to					
		22	:	30				
99 June 22.		12	11				Very faint trace.	
			to					
		12	:	15				
100 June 22.	o PNE	22	57	51			Weak Distance approximately 250 miles.	
	1 S N	22	58	34				
	o S E	22	58	38				
	FNE	23	01					
101 June 27.	o PNE	19	19	13			Very weak. Distance approximately 230 miles.	
	o S N	19	19	52				
	o S E	19	19	51				
	FNE	19	22					

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Wood-Anderson	N-S	0.8	"	"	"
Bosch-Omori	-----	Not operating			
Bosch-Omori	-----	Not operating			

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Month July 1936Page No. 12

No. and Date	Phase	Time G. M. T.			Period s	Amplitude		REMARKS
		h	m	s		E mm	N mm	
102 July 5		10:09:55						Weak
		to						
		10:15						
103 July 5		19:15:00						Very faint trace
		to						
		19:18						
104 July 9		00:59:50						Very faint
		to						
		01:05						
105 July 13	ePNE	11:19:09						Distance about
	eSN	11:24:33						2380 miles
	eSE	11:24:40						
	eN	11:27:17						Weak
	eE	11:27:15						U.S.C.G.S. Gives 24° S.
	LN	11:29:15						Lat., 70° ± W. Long.
	LE	11:29:06						
	FNE	12:00						
106 July 16		09:46:18						Very faint trace
		to						
		09:48						
107 July 17	ePN	15:05:09						Distance approximately
	eSN	15:05:14						30 miles.
	FN	15:06						Very faint.
								E-W clock stopped
108 July 18		17:51						Very faint trace.
		to						
		17:57						E-W clock stopped
109 July 20	ePNE	21:44:54						Weak.
	1SNE	21:45:18						Distance about
	FNE	21:48						130 miles
110 July 26	Faint seismic activity recorded from 02:54 to 02:57							
111 July 26		07:43						Very faint trace
		to						from distant dis-
		07:48						turbance

R. Z. KIRKPATRICK,
Chief of Surveys.

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.

Time Correction: Within 0.5 sec.

Lithologic foundation: Basalt.

INSTRUMENTS—FIXED CONSTANTS

INSTRUMENTS	SYMBOL	REGISTRATION	DAMPING	PAPER SPEED		MASS
				60 mm. per min.	15 mm. per min.	
Wood-Anderson	I	Photographic	Magnetic	60 mm. per min.		1.5 gr.
Bosch-Omori	II	Smoked Sheet	Air	15 mm. per min.		100 kg.

INSTRUMENTS—DETERMINED CONSTANTS

INSTRUMENTS	COMPONENT	T.	V	h	DETERMINED
					July 18, 1934
Wood-Anderson	E W	0.8	1370	Critical	July 18, 1934
Wood-Anderson	N S	"	"	"	"
Bosch-Omori)	Not operating	---	---	---	---
Bosch-Omori)					

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Month AUGUST 1936Page No. 13

No. and Date	Phase	Time			Period	Amplitude		REMARKS	
		G. M. T.				s	E		N
		h	m	s			mm		mm
112 Aug. 1		Very faint seismic activity from 14:04 to 14:06							
113 Aug. 5	e PNE i S N l S E F NE	11 : 22 : 08 11 : 23 : 00 11 : 23 : 01 11 : 25 :						Weak. Distance about 300 miles.	
114 Aug. 6		Faint seismic activity from 17 : 27 to 17: 30.							
115 Aug. 9	e PNE e SNE FNE	23 : 44 : 17 23 : 44 : 27 23 : 46						Very faint Distance about 55 miles.	
	NOTE:	There were no records, either N-S or E-W, from 13:42 August 9 to 13:51 August 10, 1936							
116 Aug. 10	e PNE e S N e S E FNE	19 : 22 : 53 19 : 23 : 34 19 : 23 : 33 19 : 26						Weak. Distance about 240 miles.	
117 Aug. 21		Faint seismic activity from 05 : 54 to 05 : 56							
118 Aug. 22		Faint seismic activity from 10 : 04 to 10 : 07							
119 Aug. 25	e P N e P E i SNE MNE FNE	19 : 20 : 35 19 : 20 : 34 19 : 20 : 45 19 : 20 : 46 19 : 23				6.7	9.7	Distance about 55 miles.	
120 Aug. 25		Faint seismic activity from 20 : 25 to 20:28							
121 Aug. 26		09 : 32 to 09 : 36						Weak	
122 Aug. 27		Seismic activity from 11 : 03 to 11:06							
123 Aug. 28	i PNE i SNE M N M E FNE	10 : 29 : 23 10 : 29 : 46 10 : 29 : 51 10 : 29 : 55 10 : 33				5.5	7.6	Distance about 125 miles.	
124 Aug. 29		Faint seismic activity from 07 : 27 to 07 : 34							
125 Aug. 29		09 : 27 to 09 : 34						Very faint--barely discernible. Evidently from distant <i>distance</i> <i>disturbance.</i>	

SEISMOLOGICAL RECORD AT BALBOA HEIGHTS, CANAL ZONE

Month AUGUST 1936

Page No. 14

No. and Date	Phase	Time G. M. T.			Period s	Amplitude		REMARKS
		h	m	s		E mm	N mm	
126 Aug. 30		10	10	43 to 14				Weak.
127 Aug. 31	0 PNE 1 SNE MNE FNE	22	15	24 35 36 :		3.0	3.5	Distance about 60 miles.



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SEISMOLOGICAL RECORD AT BALBOA HEIGHTS, CANAL ZONE

Lat. 8° 57' 39" N.

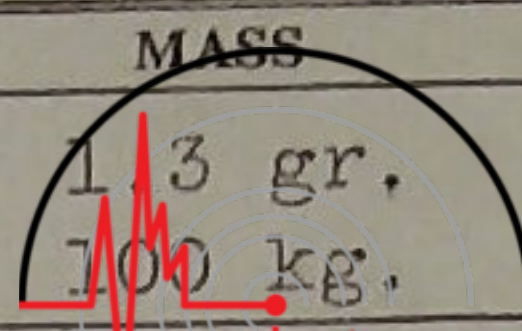
Long. 79° 33' 29" W.

h=36 meters.

Lithologic foundation: Basalt.

Time Correction: Within 0.5 sec.

INSTRUMENTS—FIXED CONSTANTS

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

INSTRUMENTS—DETERMINED CONSTANTS

INSTRUMENTS	COMPONENT	T.	V	h	DETERMINED
					July 18, 1934 " " "
Wood-Anderson	E - W	0.8	1370	Critical	
Wood-Anderson	N - S	0.8	1370	"	
Bosch-Omori	}	Not Operating			
Bosch-Omori					

Month September, 1936.Page No. 15

No. and Date	Phase	Time G. M. T.			Period s	Amplitude		REMARKS
		h	m	s		E	N	
						mm	mm	
128 Sept. 2	1PNE 1SNE MNE FNE	00:57:45 00:57:56 00:57:57 00:59				2.6	4.1	Distance about 60 miles.
129 Sept. 2	1PNE 1SNE MNE FNE	02:07:57 02:08:08 02:08:09 02:09				1.5	1.7	Distance about 60 miles.
130 Sept. 3		00:09 to 00:13						Weak.
131 Sept. 7	1PNE 1SNE FNE	03:57:02 03:57:15 03:59						Very faint Distance about 75 miles.
132 Sept. 9	1PNE 1SNE MNE FNE	00:48:51 00:49:04 00:49:06 00:51				11.8	10.3	Distance about 75 miles.
133 Sept. 17		08:51 to 08:54						Weak.

SEISMOLOGICAL RECORD AT BALBOA HEIGHTS, CANAL ZONE

Month September, 1936.Page No. 16

No. and Date	Phase	Time G. M. T.			Period s	Amplitude		REMARKS
		h	m	s		E mm	N mm	
No. 134 Sept. 19	ePN	14	12	23				Very weak.
	ePR	14	12	27				
	eNE	14	13	12				
	eN	14	13	24				
	eE	14	13	23				
	FNE	14	16					
135 Sept. 20	1PNE	09	02	40				Distance about 220 miles.
	1SN	09	03	22				
	1SE	09	03	19				
	MN	09	03	28			18.4	
	ME	09	03	26			20.0	
	FNE	09	09					
136 Sept. 22		17:30 to 17:32						Local. Very faint.
137 Sept. 22		Faint seismic activity from 17:44 to 17:46						
138 Sept. 22	ePNE	18	09	38				Distance about 70 miles.
	eSNE	18	09	50				
	FNE	18	11					Very faint.
								R. Z. KIRKPATRICK, Chief of Surveys.



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 0.5 sec.

INSTRUMENTS—FIXED CONSTANTS

INSTRUMENTS	SYMBOL	REGISTRATION	DAMPING	PAPER SPEED	MASS
Wood-Anderson	I	Photographic	Magnetic	60 mm. per min.	13 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	0.8	1370	Critical	July 18, 1934
Wood-Anderson	E-W	"	"	"	" " "
Bosch-Omori)		Not Operating			
Bosch-Omori)					

Month October, 1936Page No. 17

No. and Date	Phase	Time G. M. T.			Period s	Amplitude		REMARKS
		h	m	s		E mm	N mm	
139 Oct. 5		10:04						Very weak.
		to						
		10:08						
140 Oct. 6		Faint seismic activity from 15:20 to 15:23						
141 Oct. 9		Faint seismic activity from 17:06 to 17:08						
142 Oct. 11	1PNE 1SNE 1NE 1SE 1NE	20:54:09 20:54:26 20:54:28 20:54:27 20:58						Distance about 95 miles. Intensity III (Modified Mer. scale) Felt on both the Atlantic and Pacific entrances of the Canal.
143 Oct. 12	1PNE 1SNE 1NE 1NE	18:28:45 18:29:08 18:29:12 18:32			12.0	15.0		Distance about 125 miles. Intensity I.
144 Oct. 19	ePN ePE 1SNE 1NE	05:23:42 05:23:43 05:24:11 05:26						Weak. Distance about 170 miles.
145 Oct. 20		Very faint seismic activity from 20:32 to 20:34.						
146 Oct. 21	ePN ePE eSN eSE 1NE	08:13:43 08:13:42 08:14:26 08:14:27 08:19						Very weak. Distance about 250 miles.

SEISMOLOGICAL RECORD AT BALBOA HEIGHTS, CANAL ZONE

Month October - 1936Page No. 18

No. and Date	Phase	Time G. M. T.			Period s	Amplitude		REMARKS
		h	m	s		E mm	N mm	
147 Oct. 23	ePN ePE eSN eSE FNE	06:43:30 06:43:31 06:44:13 06:44:15 06:47						Very weak. Distance about 250 miles.
148 Oct. 23								Very faint seismic activity from 12:07 to 12:09
149 Oct. 27	ePNE 1SNE FNE	17:33:18 17:33:27 17:34:30						Very weak. Distance about 50 miles.
150 Oct. 29	ePNE eSNE FNE	05:13:56 05:14:07 05:15						Very faint. Distance about 60 miles.
151 Oct. 29	1PN 1PE 1SNE MN ME CE CN FNE	05:53:53 05:53:54 05:54:34 05:54:42 05:54:52 05:55:36 05:55:31 06:10		46		36.5 52.2		Distance about 230 miles. Intensity III at Balboa Heights. Reported felt in David and Santiago, Republic of Panama.
152 Oct. 29	ePNE eSNE FNE	08:03:39 08:04:21 08:07						Aftershock. Very weak.
153 Oct. 31								Very faint seismic activity from 17:04 to 17:06



R. Z. KIRKPATRICK,
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SEISMOLOGICAL RECORD AT BALBOA HEIGHTS, CANAL ZONE

Lat. 8° 57' 39" N.

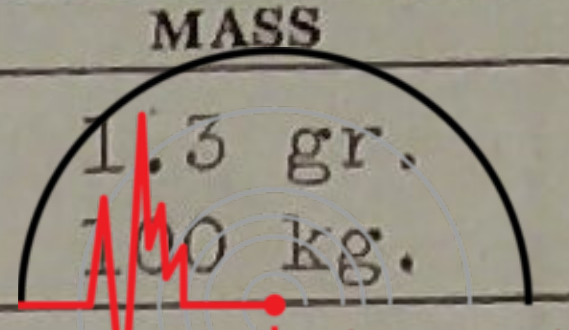
Long. 79° 33' 29" W.

h = 36 meters.

Lithologic foundation: Basalt.

Time Correction: Within 0.5 sec.

INSTRUMENTS—FIXED CONSTANTS

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

INSTRUMENTS—DETERMINED CONSTANTS

INSTRUMENTS	COMPONENT	T ₀	V	h	DETERMINED
					July 18, 1934
Wood-Anderson	N - S	0.8	1370	Critical	July 18, 1934
Wood-Anderson	E - W	"	"	"	" " "
Bosch-Omori) Not Operating				
Bosch-Omori					

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Month ~~November, 1936~~Page No. ~~19~~

No. and Date	Phase	Time G. M. T.			Period s	Amplitude		REMARKS
		h	m	s		E	N	
						mm	mm	
154 Nov. 1								Very faint seismic activity from 11:19 to 11:21.
155 Nov. 3								Very faint seismic activity from 11:13 to 11:15.
156 Nov. 5	ePNE eSNE FNE	00:26:02 00:26:13 00:27						Very faint. Distance about 60 miles.
157 Nov. 13								Seismic activity from 16:59 to 17:02
158 Nov. 14	ePN ePE iSN iSE NNE FNE	13:41:53 13:41:54 13:42:38 13:42:37 13:42:42 13:45				2.0	2.9	Weak. Distance about 250 miles.
159 Nov. 16	ePNE eSNE FNE	17:31:30 17:32:13 17:34						Very weak. Distance about 240 miles.
160 Nov. 16								Faint seismic activity from 18:46 to 18:49.
Note: There were no records from 23:46 November 16 to 13:49 Nov. 17. (E-W clock stopped. N-S light burned out.)								
161 Nov. 19	ePE eSE FE	21:13:21 21:15:48 21:29:00						N-S light burned out. Weak. Distance approximately 850 miles.
162 Nov. 21	ePE iSE ME FE	18:04:09 18:04:54 18:05:04 18:08				5.0		N-S not set properly. Distance about 250 miles.
163 Nov. 22								Faint seismic activity from 18:22 to 18:36.

SEISMOLOGICAL RECORD AT BALBOA HEIGHTS, CANAL ZONE

Page No. 30Month November, 1938

No. and Date	Phase	Time G. M. T.			Period s	Amplitude		REMARKS
		h	m	s		E mm	N mm	
164 Nov. 23								Very faint seismic activity from 00:15 to 00:17. Barely discernible.
165 Nov. 23	1PE 1SE ME CE FE	00:37:12 00:37:49 00:38:16 00:39:21 00:45					20.5	Intensity III. Distance about 210 miles. N-S clock stopped.
166 Nov. 23	ePE eSE FE	20:08:44 20:10:32 20:15						Weak. Distance about 620 miles. N-S stopped.
167 Nov. 24		17:04 to 17:05						Very weak. Local.
168 Nov. 26	1PN 1PE 1SN 1SE MN ME CN CE FNE	02:13:13 02:13:14 02:14:07 02:14:08 02:14:17 02:14:21 02:15:42 02:15:47 02:30					5.6 6.7	Distance about 310 miles.
169 Nov. 26								Slight seismic activity from 18:15 to 18:22.
170 Nov. 28	1PNE 1SNE MN ME FNE	11:59:20 11:59:38 11:59:39 11:59:40 12:02						Intensity III. Distance about 100 miles.

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SEISMOLOGICAL RECORD AT BALBOA HEIGHTS, CANAL ZONE

Lat. 8° 57' 39" N.

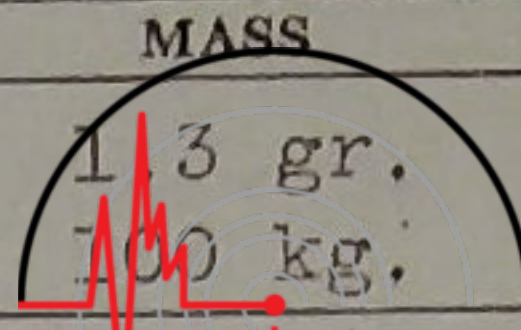
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Lithologic foundation: Basalt.

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INSTRUMENTS—FIXED CONSTANTS

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

INSTRUMENTS—DETERMINED CONSTANTS

INSTRUMENTS	COMPONENT	T.	V	h	DETERMINED
					July 18, 1934
Wood-Anderson	N-S	0.8	1370	Critical	" " "
Wood-Anderson	E-W	"	"	"	" " "
Bosch-Omori					
Bosch-Omori					

Month December - 1936Page No. 21

No. and Date	Phase	Time G. M. T.			Period	Amplitude		REMARKS
		h	m	s		E	N	
						mm	mm	
171 Dec. 2		16:33 to 16:35						Very faint. Local
172 Dec. 6		16:35 to 16:37						Very faint. Local.
173 Dec. 8		Faint seismic activity from 06:31 to 06:34.						
174 Dec. 10	1PNE 1SNE MN ME FNE	13:00:25 13:00:59 13:01:12 13:01:11 13:06				23.1	2x40	Distance about 190 miles. Intensity II
175 Dec. 10.		Seismic activity from 16:23 to 16:26.						
176 Dec. 20	1PN ePE eN FNE	02:45:50 02:45:51 02:48:12 03:01						Destructive in El Salvador.
177 Dec. 20		13:25 to 13:31						Very faint.
178 Dec. 20		14:24 to 14:29						Very faint.
179 Dec. 23		01:49 to 01:53						Very faint. Barely discernible.
180 Dec. 24		11:22 to 11:26						Very faint.

SEISMOLOGICAL RECORD AT BALBOA HEIGHTS, CANAL ZONE

Month December, 1936Page No. 22

No. and Date	Phase	Time G. M. T.			Period	Amplitude		REMARKS
		h	m	s		E mm	N mm	
181 Dec. 25	oPNE iSNE MNE FNE	21:42:16 21:42:40 21:42:47 21:45				9.2	13.6	Distance about 130 miles.
182 Dec. 28		09:15 to 09:19						Weak. N-S stopped.
183 Dec. 31		14:54 to 14:57						Weak.
184 Dec. 31								Very faint seismic activity from 16:22 to 16:24

R. Z. KIRKPATRICK,
Chief of Surveys.

