

PANAMA CANAL COMPANY
 Engineering and Construction Bureau
 Meteorological and Hydrographic Branch

Lat. 8° 57' 39" N
 Long. 79° 33' 29" W

Balboa Heights, Canal Zone

h: 36 meters

SEISMOLOGICAL BULLETIN - JANUARY 1963

----- Standard Seismograph System USC&GS: Sprengnether LP (Z.N.E); Benilff SP (z.n.e) -----

No.	Date	Phase	Time G.C.T.	Period	AMPLI-	Remarks
					TUDE mm	
1	1	iP _z iS _{ne}	04 07 03 08 20			USCGS: 6.9 N 73.1 W Colombia Δ = 375 miles
2	1	iP _z	12 53 15			USCGS: 7.4 N 74.1 W Colombia
3	1	iP _z	20 43 36			
4	1	iP _z	23 50 48			
5	2	iP _z	09 54 55			USCGS: 10.0 N 84.8 W West Coast of Costa Rica
6	2	iP _z iS _{ne}	11 42 10 42 20			Felt Cristobal, C. Z. Force II Δ = 50 miles
7	2	iP _z	15 15 43			USCGS: 4.2 S 135.2 E Near South Coast of W. New Guinea
8	3	iP _z iS _{ne}	15 51 04 51 42			Δ = 180 miles
9	3	iP _z iS _{ne}	16 16 35 18 10			Δ = 575 miles
10	4	iP _z iN iN	00 33 05 40 30 48 46			USCGS: 1.2 N 27.7 W 1500 km. South of Cape Verde Islands
11	4	iP _z iS _{ne}	17 46 02 46 39			Δ = 175 miles
12	4	iP _z	21 18 42			USCGS: 6.9 N 73.1 W Colombia
13	4	iP _z	21 49 02			

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No.	Date	Phase	Time G.C.T.	Period	AMPLI-	Remarks
					TUDE mm	
14	6	iP _Z	06 20 03			USCGS: 1.8 S 80.7 W Near Coast of Ecuador
15	6	iP _Z iS _{ne}	13 54 41 55 17			Felt El Volcan, R. P. Δ = 175 miles
16	7	iP _Z	12 08 06			USCGS: 0.6 N 126.7 E Halmahera Region
17	11	iP _Z iS _{ne}	06 43 32 44 09			USCGS: 7.5 N 82.5 W Near S Coast of Panama Δ = 225 miles
18	11	iP _Z	12 21 41			USCGS: 45.0 S 75.7 W Near Coast of Southern Chile
19	11	iP _Z	14 38 25			USCGS: 12.6 N 88.2 W Off Coast of El Salvador
20	11	iP _Z iS _{ne}	03 40 45 41 51			USCGS: 4.8 N 76.7 W North Colombia Δ = 315 miles
21	15	eP _Z	22 50 50			USCGS: 31.3 S 13.4 W South Atlantic Ocean
22	16	eP _Z	03 50 24			USCGS: 54.0 S 133.5 W South Pacific Ocean
23	17	eP _Z eS _{ne}	00 54 28 55 05			Felt El Volcan, R. de P. Δ = 175 miles
24	17	iP _Z iS _{ne}	14 08 38 09 15			Δ = 175 miles
25	17	iP _Z iS _{ne}	22 31 19 31 56			Δ = 175 miles



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No.	Date	Phase	Time		AMPLI-	Remarks
			G.C.T.	Period	TUDE mm	
26	21	iP _z iS _{ne}	07 39 38.5C 39 47		USCGS: 9.3 N 83.0 W Panama-Costa Rica Border = 50 miles	
27	26	iP _z iS _{ne}	16 06 52 C 07 15		Δ = 110 miles	
28	26	iP _z iS _{ne}	18 03 05 03 20		Felt El Volcan, R. de P. Δ = 75 miles	
29	26	iP _z	21 21 59 D		USCGS: 4.6 N 76.5 W Colombia	
30	27	iP _z iS _{ne}	15 24 37 D 24 48		Felt Santa Clara, R. de P. Δ = 55 miles	
31	28	eP _z	13 12 50 D			
32	29	eP _z	03 46 14 C			
33	29	iP _z iS _{ne}	04 32 21 C 33 00		Δ = 185 miles	
34	29	eP _z	06 46 28			
35	30	iP _z iS _{NE}	10 21 56 C 31 44		Δ = 5,400 miles	

W. H. Esslinger
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Chief Hydrographer

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No.	Date	Phase	Time		Period	AMPLI- TUDE mm	Remarks
			G.C.T.				
1	1	iP _Z iS _{ne}	04 07 03 08 20			USCGS: 6.9 N 73.1 W Colombia Δ = 375 miles	
2	1	iP _Z	12 53 15			USCGS: 7.4 N 74.1 W Colombia	
3	1	iP _Z	20 43 36				
4	1	iP _Z	23 50 48				
5	2	iP _Z	09 54 55			USCGS: 10.0 N 84.8 W West Coast of Costa Rica	
6	2	iP _Z iS _{ne}	11 42 10 42 20			Felt Cristobal, C. Z. Force II Δ = 50 miles	
7	2	iP _Z	15 15 43			USCGS: 4.2 S 135.2 E Near South Coast of W. New Guinea	
8	3	iP _Z iS _{ne}	15 51 04 51 42			Δ = 180 miles	
9	3	iP _Z iS _{ne}	16 16 35 18 10			Δ = 575 miles	
10	4	iP _Z iN iN	00 33 05 40 30 48 46			USCGS: 1.2 N 27.7 W 1500 km. South of Cape Verde Islands	
11	4	iP _Z iS _{ne}	17 46 02 46 39			Δ = 175 miles	
12	4	iP _Z	21 18 42			USCGS: 6.9 N 73.1 W Colombia	
13	4	iP _Z	21 49 02				

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No.	Date	Phase	Time		Period	AMPLI- TUDE mm	Remarks
			G.C.T.				
14	6	iP _Z	06 20 03			USCGS: 1.8 S 80.7 W Near Coast of Ecuador	
15	6	iP _Z iS _{ne}	13 54 41 55 17			Felt El Volcan, R. P. Δ = 175 miles	
16	7	iP _Z	12 08 06			USCGS: 0.6 N 126.7 E Halmahera Region	
17	11	iP _Z iS _{ne}	06 43 32 44 09			USCGS: 7.5 N 82.5 W Near S Coast of Panama Δ = 225 miles	
18	11	iP _Z	12 21 41			USCGS: 45.0 S 75.7 W Near Coast of Southern Chile	
19	11	iP _Z	14 38 25			USCGS: 12.6 N 88.2 W Off Coast of El Salvador	
20	11	iP _Z iS _{ne}	03 40 45 41 51			USCGS: 4.8 N 76.7 W North Colombia Δ = 315 miles	
21	15	eP _Z	22 50 50			USCGS: 31.3 S 13.4 W South Atlantic Ocean	
22	16	eP _Z	03 50 24			USCGS: 54.0 S 133.5 W South Pacific Ocean	
23	17	eP _Z eS _{ne}	00 54 28 55 05			Felt El Volcan, R. de P. Δ = 175 miles	
24	17	iP _Z iS _{ne}	14 08 38 09 15			Δ = 175 miles	
25	17	iP _Z iS _{ne}	22 31 19 31 56			Δ = 175 miles	



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No.	Date	Phase	Time		Period	AMPLI- TUDE mm	Remarks
			G.C.T.				
26	21	iP _z iS _{ne}	07 39	38.5C 39 47		USCGS: 9.3 N 83.0 W Panama-Costa Rica Border = 50 miles	
27	26	iP _z iS _{ne}	16 06	52 C 07 15		Δ = 110 miles	
28	26	iP _z iS _{ne}	18 03	05 03 20		Felt El Volcan, R. de P. Δ = 75 miles	
29	26	iP _z	21 21	59 D		USCGS: 4.6 N 76.5 W Colombia	
30	27	iP _z iS _{ne}	15 24	37 D 24 48		Felt Santa Clara, R. de P. Δ = 55 miles	
31	28	eP _z	13 12	50 D			
32	29	eP _z	03 46	14 C			
33	29	iP _z iS _{ne}	04 32	21 C 33 00		Δ = 185 miles	
34	29	eP _z	06 46	28			
35	30	iP _z iS _{NE}	10 21	56 C 31 44		Δ = 5,400 miles	

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SEISMOLOGICAL BULLETIN - FEBRUARY 1963

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No.	Date	Phase	Time G.C.T.	Period	AMPLI-	Remarks
					TUDE mm	
1	3	iP _Z iS _{ne}	02 02 02 C 02 23			= 100 miles
2	3	iP _Z iS _{ne}	12 54 02 C 55 26			USCGS: 7.6 N 72.1 W Venezuela-Colombia Border Δ = 600 miles
3	3	iP _Z iS _{ne}	17 35 31 C 35 52			= 100 miles
4	4	iP _Z iS _{ne}	12 29 50 D 30 47			USCGS: 5.1 N 82.4 W South of Panama Δ = 275 miles
5	5	iP _Z iS _{ne}	07 21 32 D 21 42			= 50 miles
6	5	iP _Z	20 47 55 C			USCGS: 38.4 " 73.2 W Near Coast of Central Chile
7	6	eP _Z	01 30 02 C			USCGS: 38.4 S 73.6 W Near Coast of Central Chile
8	6	iP _Z iS _{ne}	03 29 31 D 30 49	0.75	11.0	USCGS: 6.8 N 73.2 W Colombia-Venezuela Border Δ = 450 miles
9	6	iP _Z iS _{ne}	07 02 38 D 03 18	0.45	29.0	USCGS: 7.4 N 82.6 W Near South-Coast of Panama Δ = 190 miles
10	7	iP _Z iS _{ne}	05 17 57 C 18 42	0.3	3.5	Δ = 215 miles
11	9	iP _Z iS _{ne}	05 03 28 C 04 16	0.8	2.5	Δ = 230 miles
12	12	iP _Z iS _{ne}	05 39 14 C 39 29	0.4	8.1	Δ = 75 miles



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No.	Date	Phase	Time		Period	AMPLI-	Remarks	
			G.C.T.			TUDE		
						mm		
13	12	iP _z iS _{ne}	23 08 21 C 09 11		0.4	8.0		
14	13	iP _z	09 09 14 C		2.3	2.4	USCGS:	24.5 N 121.8 E Northern Formosa
15	13	eP _z	18 34 08 C					
16	14	iP _z	07 24 10 D		1.0	12.0		
17	14	iP _z	08 33 01 D		1.0	24.0	USCGS:	6.2 N 82.5 W South of Panama
18	19	iP _z	06 12 19 C		0.75	4.0		
19	21	iP _z	23 44 08 C		0.50	2.0	USCGS:	12.7 N 84.9 W Nicaragua
20	22	iP _z	21 16 55 D		0.5	3.4	USCGS:	18.1 N 71.3 W Near South Coast of Dominican Republic
21	23	iP _z iS _{ne}	16 08 47 D 09 13		0.4	1.75	Δ = 125 miles	
22	24	iP _z	05 43 43 C		0.6	5.5	USCGS:	15.1 S 72.5 W Near Coast of Southern Peru
23	24	iP _z iS _{ne}	13 37 13 D 40 37		0.8	6.0	USCGS:	14.6 N 91.4 W Central Guatemala Δ = 1,250 miles

Station out of service from 25 February until 1 March for modification

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No.	Date	Phase	Time		Period	AMPLI-	Remarks
			G.C.T.			TUDE	
						mm	
1	3	iP _Z iS _{ne}	02 02 02 C 02 23				= 100 miles
2	3	iP _Z iS _{ne}	12 54 02 C 55 26				USCGS: 7.6 N 72.1 W Venezuela-Colombia Border Δ = 600 miles
3	3	iP _Z iS _{ne}	17 35 31 C 35 52				= 100 miles
4	4	iP _Z iS _{ne}	12 29 50 D 30 47				USCGS: 5.1 N 82.4 W South of Panama Δ = 275 miles
5	5	iP _Z iS _{ne}	07 21 32 D 21 42				= 50 miles
6	5	iP _Z	20 47 55 C				USCGS: 38.4 " 73.2 W Near Coast of Central Chile
7	6	eP _Z	01 30 02 C				USCGS: 38.4 S 73.6 W Near Coast of Central Chile
8	6	iP _Z iS _{ne}	03 29 31 D 30 49	0.75	11.0		USCGS: 6.8 N 73.2 W Colombia-Venezuela Border Δ = 450 miles
9	6	iP _Z iS _{ne}	07 02 38 D 03 18	0.45	29.0		USCGS: 7.4 N 82.6 W Near South Coast of Panama Δ = 190 miles
10	7	iP _Z iS _{ne}	05 17 57 C 18 42	0.3	3.5		Δ = 215 miles
11	9	iP _Z iS _{ne}	05 03 28 C 04 16	0.8	2.5		Δ = 230 miles
12	12	iP _Z iS _{ne}	05 39 14 C 39 29	0.4	8.1		Δ = 75 miles



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No.	Date	Phase	Time		Period	AMPLI- TUDE mm	Remarks
			G.C.T.				
13	12	iP _Z iS _{ne}	23 08 21 C 09 11		0.4	8.0	
14	13	iP _Z	09 09 14 C		2.3	2.4	USCGS: 24.5 N 121.8 E Northern Formosa
15	13	eP _Z	18 34 08 C				
16	14	iP _Z	07 24 10 D		1.0	12.0	
17	14	iP _Z	08 33 01 D		1.0	24.0	USCGS: 6.2 N 82.5 W South of Panama
18	19	iP _Z	06 12 19 C		0.75	4.0	
19	21	iP _Z	23 44 08 C		0.50	2.0	USCGS: 12.7 N 84.9 W Nicaragua
20	22	iP _Z	21 16 55 D		0.5	3.4	USCGS: 18.1 N 71.3 W Near South Coast of Dominican Republic
21	23	iP _Z iS _{ne}	16 08 47 D 09 13		0.4	1.75	Δ = 125 miles
22	24	iP _Z	05 43 43 C		0.6	5.5	USCGS: 15.1 S 72.5 W Near Coast of Southern Peru
23	24	iP _Z iS _{ne}	13 37 13 D 40 37		0.8	6.0	USCGS: 14.6 N 91.4 W Central Guatemala Δ = 1,250 miles

Station out of service from 25 February until 1 March for modification

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SEISMOLOGICAL BULLETIN - MARCH 1963

----- Standard Seismograph System USC&GS: Sprengnether LP (Z.N.E); Benioff SP (z.n.e) -----

No.	Date	Phase	Time G.C.T.	Period	AMPLI- TUDE mm	Remarks
						Station returned to service March 1st. Sheets for March 5, 1963 retained by Modification Team for inclusion in report.
1	5	iP _Z	07 08 14 D	1.5	7.5	USCGS: 4.5 S 81.5 W Off Coast of Northern Peru
2	7	iP _Z iS _N	05 30 42 C 37 31	1.0	0.75	USCGS: 27.0 S 113.5 W Approximately 500 km West of Easter Island Δ = 3,250 miles
3	7	iP _Z	12 25 42 C	0.75	1.5	USCGS: 44.3 S 75.3 W Near Coast of Southern Chile
4	8	iP _Z iS _n	22 27 34 C 28 38	0.75	7.0	USCGS: 9.0 N 84.1 W Near West Coast of Costa Rica Δ = 305 miles
5	8	iP _Z	23 09 14 D	0.75	4.0	
6	11	iP _Z iS _{ne}	11 31 29 C 32 26	0.5	4.0	USCGS: 5.1 N 76.4 W Central Colombia Δ = 275 miles
7	15	eP _Z	00 35 37 C	1.0	8.0	
8	16	iP _Z	08 59 04 C			USCGS: 46.5 N 154.7E Kurile Islands Region
9	17	iP _{ZZ} iS _{ne}	06 19 41 D 20 24	0.6	23.0	USCGS: 7.1 N 82.2 W South of Panama Δ = 300 miles
10	22	iP _Z iS _n	15 12 14 D 12 38	0.5	8.0	Δ = 115 miles

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----- Standard Seismograph System USC&GS: Sprengnether LP (Z.N.E); Benioff SP (z.n.e) -----

No.	Date	Phase	Time		Period	AMPLI- TUDE mm	Remarks
			G.C.T.				
11	23	iP _Z iS _n	23 03 18 D 04 02		0.75	1.75	△ = 210 miles
12	24	iP _{ZZ}	02 27 12 C		1.2	2.0	USCGS: 51.6 N 173.3 W Andreanof Islands, Aleutian Islands
13	26	iP _Z	10 02 10 C				
14	27	iP _Z	13 17 10 C		0.6	1.75	USCGS: 6.3 N 73.1 W Colombia
15	28	iP _Z	00 27 00 C				USCGS: 66.3 N 19.6 W Iceland
16	30	iP _Z	00 55 24 D		0.25	30.0	
17	30	iP _Z	06 20 41 C		0.75	2.5	
18	31	iP _Z	04 49 40 C				USCGS: 6.5 S 81.1 W Near Coast of Southern Peru

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SEISMOLOGICAL BULLETIN - APRIL 1963

Standard Seismograph System USC&GS: Sprengnether LP (Z.N.E); Benioff SP (z.n.e)

No.	Date	Phase	Time G.C.T.	Period	AMPLI-	Remarks
					TUDE mm	
1	2	iP _Z	00 59 20 D	0.75	3.0	USCGS: 6.6 N 73.2 W Colombia
2	3	iP _Z	16 40 27 C	0.6	2.5	
3	7	iP _{ZZ}	22 56 07 C	1.5	4.0	USCGS: 4.9 S 103.2 E Near Southwest Coast of Sumatra
4	10	iP _Z iS _e	06 58 09 C 59 21	0.5	3.0	USCGS: 6.9 N 73.2 W Northern Colombia
						△ = 345 miles
5	11	iP _Z	08 46 54 D	1.0	2.0	
6	13	iP _{ZZ} iS _N	02 24 30 D 27 32	1.4	63.0	USCGS: 6.2 S 76.5 W Central Peru
						△ = 1,100 miles
7	13	iP _Z	14 50 55 C	0.75	8.0	USCGS: 3.4 S 135.4 E Near North Coast of New Guinea
8	16	iP _Z	01 49 12.5D	0.5	2.2	
9	16	iP _Z	01 56 52	1.0	2.0	
10	16	iP _Z	02 15 02.5	0.5	1.25	
11	19	ePS _Z	07 57 20			USCGS: 35.3 N 25.2 E Crete
12	24	eP _Z	02 36 47			USCGS: 0.8 S 91.6 W Galapagos Islands Region
13	26	iP _Z	04 46 58 C	0.3	2.0	



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No.	Date	Phase	Time		AMPLI- TUDE mm	Remarks
			G.C.T.	Period		
14	27	eP _Z	09 02 53	0.5	0.7	
15	29	eP _Z	20 39 16			USCGS: 17.4 N 92.7 W Chiapas, Mexico
16	29	iP _Z	21 57 14 C			
17	30	iP _{ZZ}	01 18 11' C	1.5	2.5	USCGS: 0.7 S 129.0 E Halamahera Region
18	30	iP _{ZZ}	18 47 10 C	1.0	1.0	USCGS: 8.2 S 79.9 W Near Coast of Peru

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SEISMOLOGICAL BULLETIN - MAY 1963

Standard Seismograph System USC&GS: Sprengnether LP (Z.N.E); Benioff SP (z.n.e)

No.	Date	Phase	Time		Period	AMPLI-	Remarks
			G.C.T.			TUDE	
						mm	
1	1	iP _Z	10 17 50	C			USCGS: 19.0 S 169.0 E New Hebrides Islands
2	10	iP _{ZZ} iS _E	22 25 24 27 26	C	1.25	4.0	USCGS: 2.2 S 77.6 W Ecuador $\Delta = 750$ miles
3	12	iP _Z iS _{ne}	13 18 27 18 55	D	0.25	4.0	$\Delta = 135$ miles
4	12	iP _Z	20 20 10	D	1.0	2.5	
5	13	eP _Z	01 34 08				USCGS: 6.7 N 73.1 W Northern Colombia
6	13	iP _Z	12 47 21	C	0.5	1.5	USCGS: 14.5 N 92.9 W Mexico - Guatemala Border
7	16	iP _Z	13 10 09	D	0.5	2.0	
8	18	eP _{ZZ}	05 40 59	C			USCGS: 29.6 S 68.5 W La Rioja Province, Argentina
9	19	iP _{ZZ} iS _{NE}	01 12 35 20 22	C			USCGS: 46.5 S 75.1 W Coast of Southern Chile $\Delta = 3,850$ miles
10	19	iP _{ZZ}	21 42 44	C	0.75	0.75	USCGS: 23.8 N 45.9 W North Atlantic Ocean
11	20	iP _{ZZ}	01 36 24	C	0.75	1.5	USCGS: 8.3 N 83.0 W Panama - Costa Rica Border
12	20	iP _{ZZ}	02 44 08	C	0.75	0.75	USCGS: 8.3 N 83.0 W Panama - Costa Rica Border
13	20	eP _{ZZ}	05 33 46		0.5	0.5	

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----- Standard Seismograph System USC&GS: Sprengnether LP (Z.N.E); Benioff SP (z.n.e) -----

No.	Date	Phase	Time	Period	AMPLI-	Remarks
			G.C.T.		TUDE	
					mm	
14	20	iP _Z	11 51 54			USCGS: 30.7 S 178.3 W Kermadec Islands Region
15	21	eP _Z	18 21 34 C			
16	22	iP _Z	16 02 34 D	1.0	6.0	
17	23	iP _Z	07 48 02 C			USCGS: 19.2 N 64.6 W Leeward Islands Region
18	23	iP _Z	15 31 50 D	1.5	4.5	
19	24	iP _Z iS _n	07 34 09 D 34 50	1.0	18.0	USCGS: 6.7 N 82.1 W Near South Coast of Panama △ = 195 miles
20	25	eP _Z	16 20 05			USCGS: 20.7 N 120.9 E South of Formosa
21	28	iP _Z iS _n	08 24 23 C 25 35	0.6	3.6	USCGS: 5.8 N 71.9 W Central Colombia △ = 345 miles
22	28	iP _Z iS _n	08 51 45 C 52 25	0.5	2.0	△ = 190 miles

W. H. Esslinger
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 Chief Hydrographer



PANAMA CANAL COMPANY
Engineering and Construction Bureau
Meteorological and Hydrographic Branch

Lat. 8° 57' 39" N
Long. 79° 33' 29" W

Balboa Heights, Canal Zone

h: 36 meters

SEISMOLOGICAL BULLETIN - JUNE 1963

----- Standard Seismograph System USC&GS: Sprengnether LP (Z.N.E); Benioff SP (z.n.e) -----

No.	Date	Phase	Time		Ampli- tude mm	Remarks	
			G.C.T.	Period			
1	2	iP _z	21 16 53	D			
2	2	iP _z	22 24 50	C	1.0	3.6	
3	2	iP _z iS _n	22 27 32 28 21	D	0.8	7.5	USCGS: 8.2 N 74.8 W Colombia $\Delta = 235$ miles
4	3	iP _z iS _e	11 33 39 34 37	C	1.5	2.2	USCGS: 5.3 N 72.9 W Colombia $\Delta = 280$ miles
5	4	eP _z	21 24 32				USCGS: 1.2 S 127.3 E Halmahera Region
6	7	eP _z	16 09 37	C	0.30	1.0	USCGS: 19.0 N 121.8 E Off North Coast of Luzon, P.I.
7	7	eP _z	16 42 54				
8	7	eP _z	19 35 44				USCGS: 8.5 N 103.1 W Clipperton Island Region
9	8	iP _z iS _n	12 47 41 48 57	C	0.75	4.0	$\Delta = 360$ miles
10	8	iP _z	20 19 40	C	0.60	0.5	

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SEISMOLOGICAL BULLETIN - JUNE 1963

Standard Seismograph System USC'GS: Sprengnether LP (Z.N.E): Benioff SP (z.n.e)

No.	Date	Phase	Time G.C.T.	Period	Ampli- tude mm	Remarks
11	10	eP _Z	04 37 09			USCGS: 55.4 S 146.4 E West of Macquarie Islands
12	11	iP _{ZZ} iS _n	18 35 37 C 36 31	0.8	2.25	USCGS: 4.9 N 77.5 W Near West Coast of Colombia Δ = 260 miles
13	12	iP _Z iS _n	10 18 34 D 18 50	0.25	1.5	Δ = 75 miles
14	15	eP _{ZZ}	15 39 20 C	1.0	0.75	USCGS: 36.3 S 98.9 W Off Coast of Central Chile
15	15	eP _Z	22 52 55 C	0.25	0.5	FELT: El Volcan, terrific roaring sound
16	16	eP _Z	10 22 13 D			
17	19	iP _Z	09 28 47 D	1.0	0.5	
18	20	iP _Z iS _n	01 02 59 C 03 25	0.5	2.0	Δ = 125 miles
19	20	iP _Z iS _n	15 18 47 C 19 28	0.3	1.0	Δ = 195 miles
20	21	iP _Z	03 34 15 C	0.75	1.0	USCGS: 10.6 N 85.9 W Near West Coast of Costa Rica



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JUNE
SEISMOLOGICAL BULLETIN - AUGUST 1963

----- Standard Seismograph System USC&GS: Sprengnether LP (Z.N.E): Benioff SP (z.n.e) -----

No.	Date	Phase	Time		Period	Ampli- tude mm	Remarks
			G.C.T.				
21	21	eP _z	12 24 35			USCGS: 23.7 S 66.6 W Jujuy Province, Argentina	
22	23	iP _z iS _n	22 45 55 C 46 10	0.5	7.0	△ = 75 miles	
23	24	eP _z	04 38 08 D			USCGS: 59.5 N 151.7 W Cook Inlet	
24	25	iP _z	00 10 14 C	0.8	3.5		
25	25	iP _z	08 09 04 C	0.5	1.2		
26	25	e _z	10 54 11 C	0.5	1.0	USCGS: 15.9 S 75.3 W Near Coast of Peru	
27	25	iP _{zZ} iS _n	11 44 31 C 45 13	0.5	2.5	USCGS: 8.7 N 82.9 W Panama-Costa Rica Border Felt: Boquete, Chiriqui Province R. de P. △ = 220 miles	
28	26	iP _{zZ} iS _n	00 59 59 D 01 00 39	0.5	10.0	USCGS: 7.1 N 82.2 W South of Panama Felt: Boquete, Chiriqui Province R. de P. △ = 220 miles	
29	26	iP _z	05 24 28	0.25	0.5	Felt: Bambito, El Volcan, Chiriqui Province, R. de P.	

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Balboa Heights, Canal Zone

h: 36 meters

SEISMOLOGICAL BULLETIN - JUNE 1963

Standard Seismograph System USC&GS: Sprengnether LP (z.n.e); Benioff SP (z.n.e)

No.	Date	Phase	Time G.C.T.	Period	Ampli- tude mm	Remarks
30	26	iP _z iS _n	14 24 45 C 25 58	0.75	5.5	FELT: Boquete, Chiriqui Province R. de P. Western Panama Δ = 220 miles
31	26	iP _{zZ} iS _n	17 43 33 D 44 20	0.1	7.0	USCGS: 7.1 N 82.3 W Near South Coast of Panama FELT: Boquete, Chiriqui Province R. de P. Δ = 220 miles
32	28	eP _z	21 54 14			
33	30	iP _z	15 35 32 C	0.5	1.0	USCGS: 7.4 N 72.9 W Northern Colombia

W. H. Esslinger
 W. H. Esslinger
 Chief Hydrographer

Quakes Felt at Bambito, R. de P.
June - 1963

Times are EST - add 5 hours for GMT

Intensity ratings on Modified Mercalli Scale not used this month

Dates

1st	2045, 2105	Shocks all coming from the East
6th	0300	Shock from South-East
8th	1210	Shock from East like an explosion
15th	1800	Shock from East, terrific roaring
16th	0310	Shock from East. light shake
23d	1910	Cross shake, direction uncertain
26th	1240	Shock from East, a quick kick

The above data are excerpted from the monthly report of a cooperative weather observer, Mr. Leonard M. Butz, who resides in an isolated community near El Volcan, Chiriqui Province, Republic of Panama.

Beginning with August report, earthquakes are classified by the observer on MercaIIIi Scale.

PANAMA CANAL COMPANY
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Meteorological and Hydrographic Branch

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Balboa Heights, Canal Zone

h: 36 meters

SEISMOLOGICAL BULLETIN - JULY 1963

~~Standard Seismograph System USC&GS: Sprengnether LP (Z, N, E); Benioff SP (z, n, e)~~

No.	Date	Phase	Time		Period	Ampli-	Remarks
			G.C.T.			tude	
						mm	
1	1	iP _z iS _n	00 25 43 C 25 56		0.4	11.0	△ = 65 miles
2	2	eP _{zZ}	02 55 36 D				USCGS: 2.4 S 77.8 W Ecuador
3	2	iP _n iS _n	18 06 25 07 16				USCGS: 9.0 N 83.0 W Panama-Costa Rica Border △ = 240 miles
4	3	iP _n iS _n	05 34 12 34 54				△ = 220 miles
5	5	iP _z iS _n	13 53 29 D 54 10		0.5	11.0	△ = 220 miles
6	8	iP _z iS _n	07 15 56 D 16 36		0.6	1.25	△ = 220 miles
7	9	iP _{zZ} iS _{neNE}	09 25 25 C 26 20		0.8	2.0	USCGS: 8.5 N 83.0 W Costa Rica-Panama Border Felt: Bambito, El Volcan, Chiriqui Province, R. de P. △ = 265 miles
8	10	iP _z	03 38 44		0.25	0.5	Felt: Bambito, El Volcan, Chiriqui Province, R. de P.
9	10	iP _z	09 11 34				



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Balboa Heights, Canal Zone

h: 36 meters

SEISMOLOGICAL BULLETIN - JULY 1963

Standard Seismograph System USC&GS: Sprengnether LP (Z.N.E): Benioff SP (z.n.e)

No.	Date	Phase	Time G.C.T.	Period	Ampli- tude mm	Remarks
10	10	iP _z	17 36 31 D	0.5	1.0	
11	10	iP _{zZ} iS _n	18 23 38 D 24 28	0.8	2.0	USCGS: 8.8 N 82.9 W Panama △ = 240 miles
12	10	iP _z	20 18 28 C	0.8	1.5	
13	10	iP _z iS _n	22 50 31 D 51 10	0.75	1.25	USCGS: 8.5 N 83.0 W Panama-Costa Rica Border △ = 185 miles
14	12	eP _z	20 16 23	0.6	1.2	
15	13	iP _z iS _e	13 11 28 C 12 21	0.5	1.6	 △ = 255 miles
16	14	iP _{zZ} iS _N	05 45 36 D 48 58	0.6	2.0	USCGS: 10.4 N 62.6 W Off Coast of Northern Venezuela △ = 1200 miles
17	15	iP _z iS _n	00 33 06 D 34 06	0.4	1.0	USCGS: 4.4 N 77.5 W Near Coast of Colombia △ = 290 miles
18	17	iP _z iS _n	07 00 24 C 01 09	0.5	0.5	 △ = 215 miles
19	17	iP _z iS _n	21 44 13 C 44 58	0.8	1.2	 △ = 215 miles



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Balboa Heights, Canal Zone

h: 36 meters

SEISMOLOGICAL BULLETIN - JULY 1963

----- Standard Seismograph System USC&GS: Sprengnether LP (Z.N.E): Benioff SP (z.n.e) -----

No.	Date	Phase	Time G.C.T.	Period	Ampli- tude mm	Remarks
20	18	iP _{zZ}	05 10 31 C			USCGS: 61.0 S 22.3 W Sandwich Islands Region
21	18	iP _{zZ} iS _e	08 18 55 C 19 37	0.25	1.25	△ = 215 miles
22	18	iP _z iS _n	17 45 34 D 45 58	0.25	2.0	△ = 165 miles
23	18	iP _z iS _n	22 18 18 C 18 58	0.75	3.2	△ = 190 miles
24	19	iP _z iS _n	00 31 34 D 32 13	0.5	4.75	△ = 185 miles
25	19	iP _z iS _n	19 15 11 C 15 51	0.75	1.0	△ = 190 miles
26	19	iP _z	23 30 29 D	0.75	1.0	
27	20	e _z	06 56 20			USCGS: 57.6 S 148.5 E Macquarie Island Region
28	24	iP _z iS _n	22 08 48 D 09 32	0.6	1.5	△ = 210 miles
29	25	iP _z	07 05 58 D	0.75	27.0	USCGS: 6.8 N 73.0 W Northern Colombia

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h: 36 meters

SEISMOLOGICAL BULLETIN - JULY 1963

----- Standard Seismograph System USC&GS: Sprengnether LP (Z.N.E); Benioff SP (z.n.e) -----

No.	Date	Phase	Time G.C.T.	Period	Ampli- tude mm	Remarks
30	28	iP _z iS _{ne}	11 44 13 D 44 59	0.5	5.0	USCGS: 6.7 N 82.5 W South of Panama Felt: Bambito, El Volcan, Chiriqui Province, R. de P. △ = 220 miles
31	29	iP _z iS _n	17 17 32 18 14	0.4	0.5	Felt: Bambito, El Volcan Chiriqui Province, R. de P. △ = 200 miles
32	30	iP _z iS _n	01 00 57 01 27	0.25	0.8	△ = 145 miles
33	30	iP _z iS _n	05 17 39 18 14	0.5	0.8	△ = 170 miles
34	30	iP _z iS _n	11 19 30 20 10	0.5	1.0	△ = 190 miles
35	30	iP _z iS _n	12 17 15 17 49	0.3	0.5	Felt: Strong at Bambito, El Volcan, Chiriqui Province, R. de P. △ = 165 miles
36	30	eP _z	14 03 51 D	1.25	5.0	USCGS: 55.9 S 27.5 W Sandwich Islands
37	30	eP _z	14 23 53 D			
38	30	eP _z	17 43 48 D			



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h: 36 meters

SEISMOLOGICAL BULLETIN - JULY 1963

----- Standard Seismograph System USC&GS: Sprengnether LP (Z.N.E.); Benioff SP (z.n.e) -----

No.	Date	Phase	Time G.C.T.	Period	Ampli- tude mm	Remarks
39	31	iP _z iS _n	01 54 51 D 55 22	0.25	0.75	△ = 150 miles
40	31	iP _z iS _n	06 17 04 D 17 38	0.5	1.0	△ = 165 miles
41	31	iP _z iS _n	09 34 37 D 35 00	0.5	1.5	△ = 110 miles
42	31	iP _z iS _n	12 00 46 C 01 31	0.3	1.0	△ = 215 miles
43	31	iP _z iS _e	17 11 21 D 12 03	0.25	1.0	△ = 200 miles
44	31	iP _z iS _e	18 34 12 C 34 55	1.0	3.0	USCGS: 9.2 N 82.4 W South of Panama △ = 205 miles

W. H. Esslinger
W. H. Esslinger
Chief Hydrographer

Quakes Felt at Bambito, R. de P.
July - 1963

Times are EST - add 5 hours for GMT

Intensity ratings on Modified Mercalli Scale not used this month

Dates

5th	1600	Light shock from the East
8th	0440	Long broken shocks from the East
10th	Sometime before 0300	Direction uncertain
28th	2220, 2250	Direction uncertain
29th	0645, 0735, 0755, 0802, 0915, 1215, 1505, 1840, 2000, 2020, 2045, 2120, 2212, 2215, 2300	All light shocks
30th	0017, 0535, 0605 0715 0825 0915, 1002, 1015, 1045, 1207, 1212, 1215, 1240, 1330, 1340, 1430, 1447, 1700, 1710, 1750, 1805, 1825, 1950, 2015, 2050, 2200, 2210, 2300	Light shocks Heavy shock, intensity undetermined Small shock All light shocks
31st	0610, 0650, 0712, 0737, 1020, 1100, 1210 1332 1336, 1400, 1415, 1735, 1930, 1935, 1942	Light shocks Heavy shock, intensity undetermined All light shocks

Observers remarks: "Not a very pleasant sensation, this shaking gives one food for thought. People around are much concerned, scared and worried."

PANAMA CANAL COMPANY
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Balboa Heights, Canal Zone

h: 36 meters

SEISMOLOGICAL BULLETIN - AUGUST 1963

-----Standard Seismograph System USC&GS: Sprengnether LP (Z, N, E); Benioff SP (z, n, e)-----

No.	Date	Phase	Time G.C.T.	Period	Ampli- tude mm	Remarks
1	1	iP _z iS _n	20 04 59 D 05 33	0.4	1.0	Felt: Bambito, R. de P. △ = 165 miles
2	2	iP _z iS _n	16 21 52 C 22 35	0.5	1.0	△ = 205 miles
3	2	iP _z iS _n	20 40 44 C 41 23	0.75	3.0	Felt: Force III, Bambito, R. de P. △ = 185 miles
4	3	iP _z iS _n	06 43 29 D 44 09	0.6	1.0	Felt: Bambito, R. de P. △ = 190 miles
5	3	iP _z iS _n	10 22 29 D 23 13	0.75	1.0	Felt: Bambito, R. de P. △ = 210 miles
6	3	iP _{zZ} iS _N	10 29 36 D 36 07	1.0	32.5	△ = 150 miles
7	3	iP _z iS _n	19 45 19 C 46 02	0.8	4.6	△ = 205 miles
8	3	iP _z iS _n	23 13 46 C 14 21	0.8	3.0	Felt: Force III Bambito, R. de P. △ = 170 miles
9	4	i _N	12 10 31			USCGS: 4.1 S 80.9 W Near North Coast of Peru



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Balboa Heights, Canal Zone

h: 36 meters

SEISMOLOGICAL BULLETIN - AUGUST 1963

Standard Seismograph System USCG&S: Sprengnether LP (Z.N.E.); Benioff SP (z.n.e)

No.	Date	Phase	Time		Period	Amplitude mm	Remarks
			G.C.T.				
10	4	iP _Z iS _n	15 16 27 C 17 08		0.6	3.0	Felt: Bambito, R. de P. △ = 195 miles
11	4	iP _Z iS _n	18 09 54 C 10 28		0.6	1.0	Felt: Bambito, R. de P. △ = 70 miles
12	6	iP _Z iS _e	03 13 26 C 14 07		0.5	2.6	Felt: Force IV Bambito, R. de P. △ = 195 miles
13	6	iP _Z iS _e	06 56 35 D 57 18		0.8	2.0	Felt: Force III Bambito, R. de P. △ = 205 miles
14	6	iP _Z iS _e	15 04 21 C 05 02		0.6	3.5	Felt: Bambito, R. de P. △ = 195 miles
15	6	iP _Z iS _e	23 42 47 C 43 22		0.5	9.0	Felt: Bambito, R. de P. △ = 170 miles
16	7	iP _Z iS _e	21 43 06 C 43 43		0.6	2.9	△ = 175 miles
17	8	iP _Z iS _e	23 43 03.5D 43 45		0.9	1.7	△ = 200 miles
18	10	iP _{ZZ} iS _e	18 38 34 C 39 28		0.75	1.25	USCGS: 8.8 N 82.9 W Panama-Costa Rica Border Felt: Bambito, R. de P. △ = 260 miles



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h: 36 meters

SEISMOLOGICAL BULLETIN - AUGUST 1963

Standard Seismograph System USC&GS: Sprengnether LP (Z.N.E): Benioff SP (z.n.e)

No.	Date	Phase	Time		Period	Ampli- tude mm	Remarks
			G.C.T.				
19	10	iP _z	19 20 20	C	0.5	1.5	△ = 80 miles
		iS _e	21 03.5				
20	13	iP _z	23 23 59	D	0.5	1.0	△ = 180 miles
		iS _n	24 37				
21	14	iP _z	19 03 30	C	0.5	19.0	USCGS: 3.4 S 135.4 E West Irian
22	15	iP _{zZ}	17 29 47	C	1.0	2.25	USCGS: 13.8 S 69.3 W Peru-Bolivia Border
23	17	eP _z	11 34 05				
24	19	iP _z	12 26 53	D	0.5	1.25	Felt: Bambito, R. de P. △ = 165 miles
		iS _e	27 27				
25	20	iP _z	13 21 14	D	0.5	1.25	USCGS: 4.1 N 76.5 W Colombia △ = 310 miles
		iS _n	22 19				
26	21	iP _z	02 11 29	C	0.6	1.0	△ = 210 miles
		iS _n	12 13				
27	21	iP _z	03 41 25	D	0.7	1.0	USCGS: 14.3 N 72.5 W Caribbean Sea Felt: Caracas, Venezuela △ = 550 miles
		iS _n	42 54				



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SEISMOLOGICAL BULLETIN - AUGUST 1963

----- Standard Seismograph System USC&GS: Sprengnether LP (Z.N.E.); Benioff SP (z.n.e) -----

No.	Date	Phase	Time G.C.T.	Period	Ampli- tude mm	Remarks
28	22	eP _Z	18 16 08			Felt: Bambito, R. de P.
29	22	eP _Z	20 12 45			
30	22	iP _Z iS _e	23 21 41 D 22 45	0.3	17.0	USCGS: 4.3 N 76.4 W Colombia △ = 305 miles
31	24	iP _Z iS _n	14 48 19 49 06	0.75	1.0	△ = 225 miles
32	27	eP _Z	03 33 05			USCGS: 45.9 S 75.3 W Near Coast of Southern Chile
33	27	iP _Z iS _n	11 44 25 C 44 37	0.3	7.0	△ = 55 miles
34	28	e _Z e _Z	17 06 19 20 37			USCGS: 39.1 S 91.8 W West of Chile
35	29	iP _Z iS _n	02 50 24 D 50 58	0.4	1.0	△ = 165 miles
36	29	iP _Z	09 12 48 C	0.8	2.0	
37	29	iP _Z iS _N	15 34 19 C 37 29	0.5	0.75	USCGS: 7.1 S 81.6 W Off Coast of Peru △ = 1100 miles

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Balboa Heights, Canal Zone

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SEISMOLOGICAL BULLETIN - AUGUST 1963

Standard Seismograph System USC&GS: Sprengnether LP (Z.N.E); Benioff SP (z.n.e)

No.	Date	Phase	Time G.C.T.	Period	Ampli- tude mm	Remarks
38	31	iP _z	11 03 42 C	0.3	1.2	Felt: Force III Bambito, R. de P. △ = 205 miles
		iS _n	04 25			
39	31	iP _z	13 10 41 C	0.6	1.0	USCGS: 11.9 N 87.0 W Off West Coast of Nicaragua

W. H. Esslinger
 W. H. Esslinger
 Chief Hydrographer



Quakes Felt at Bambito, R. de P. August - 1963

Times are EST - add 5 hours for GMT

All shocks rated intensity I to II on Modified Mercalli Scale except as noted

Dates

1st	0515, 0520, 0600, 0645, 0655, 0720, 0937, 1200, 1255, 1317, 1330, 1415, 1500, 1502, 1510, 1620, 1750, 1850, 1945, 2345, 2350	All light shocks
2d	0650, 0700, 0900, 1100, 1515 1540 1835, 1850	Small shocks Felt Force III Mercalli Continuing throughout the evening with many small tremors
3d	0000, 0145, 0500, 0520, 0635, 0650, 0710, 0745, 0750, 0900, 1300, 1610, 1615, 1730 1815 1817, 1818, 1910, 2100, 2210, 2220,	All small shocks Felt Force III Mercalli All small shocks
4th	0200, 0300, 0500, 0520, 0715, 0730, 1017, 1026, 1300, 1308, 1645, 1825, 2017, 2210, 2330, 2340	
5th	0055, 0120, 0200, 0315, 0400, 0445, 0610, 0625, 1010, 1033, 1135, 1200, 1353, 1400, 1425, 1435, 1500, 1501, 1502, 1512, 1520, 1545, 1600, 1610, 1655, 1715, 1722, 1726, 1817, 1820, 1825, 1832, 1855 1935 1936, 1938, 1940, 2020, 2035, 2042, 2110, 2200, 2215 2230 2231, 2232, 2233	All small shocks Felt Force III Mercalli All small shocks Felt Force IV Mercalli

Quakes Felt at Bambito, R. de P.
August - 1963

<u>Dates</u>		
6th	0150, 0152	Small shocks
	0154, 0155	Felt Force III Mercalli
	0156, 0200 (Observer fell asleep) 0545,	
	0800	Two shocks
	1010, 1145, 1255, 1310,	
	1405, 1500, 1525, 1545,	
	1600, 1750, 1800, 1810,	
	1840, 1850, 1910	
		Observer comments: "Calmed down, seem to have abated"
7th	0610, 0745, 1400	Small shocks
	1405	Felt Force IV Mercalli
8th	0637	Small shock
	0640	Felt Force III Mercalli. Several light tremors, a trembling sensation
9th	1055, 1145	Trembling sensation continues
10th	1335, 1340, 2035, 2230	Slowing down
11th	0150, 0530	Felt Force III Mercalli
	0532, 0747	Light shocks
12th	0002, 0300, 0500, 0635,	All small shocks
	0745, 0748, 1200, 1201	
	1210	Felt Force III Mercalli
	1320, 1505, 1807, 1820	All small shocks
13th	0402, 0501, 1115	All small shocks
14th	1015	Felt Force III Mercalli
	1320	Small shock
15th	0125, 0145, 0315, 0622,	All small shocks
	0905, 2001, 2101	
16th	0900, 1315, 2110	All small shocks
17th	0210, 1215	Felt Force III Mercalli
	1505, 2210	All small shocks
18th	0115, 0300, 1800, 1805	All small shocks
19th	0015, 0728, 0800	With several light shocks after

Quakes Felt at Bambito, R. de P.
August - 1963Dates

20th	1015, 1325, 1807	All light shocks
21st	0145, 0410, 0415, 1905 2002	All light shocks
22d	1112, 1315, 1706	All small shocks
23d	0409, 0610, 0900	All small shocks
24th	0410, 0955, 1310, 1500, 1512, 2355	All small shocks
25th	0200	Felt Force III Mercalli
	0411	Small shock
26th	0725, 1330, 2235	All small shocks
27th	1005, 1410, 1615, 1910	All small shocks
28th	0300, 0715, 1000	All small shocks
	1201 to 1305	Trembling
29th	1055, 1630, 1945	All small shocks
	2145	Felt Force III Mercalli
30th	0310, 0504, 0810, 1230	All small shocks
	1410	Felt Force III Mercalli
31st	0210, 0312	Small shocks
	0605	Felt Force III Mercalli
	1415	Small shock

PANAMA CANAL COMPANY
 Engineering and Construction Bureau
 Meteorological and Hydrographic Branch

Lat. 8° 57' 39" N
 Long. 79° 33' 29" W

Balboa Heights, Canal Zone

h: 36 meters

SEISMOLOGICAL BULLETIN - SEPTEMBER 1963

----- Standard Seismograph System USC&GS: Sprengnether LP (Z.N.E); Benioff SP (z.n.e) -----

No.	Date	Phase	Time		Period	Amplitude mm	Remarks
			G.C.T.				
1	1	iP _{zZ} iS _n	11 12 21 C 13 20		0.25	1.25	USCGS: 5.4 N 82.4 W South of Panama Felt: Bambito, R. de P. △ = 285 miles
2	1	iP _z iS _n	13 12 20.5 C 13 10		0.5	1.25	Felt: Bambito, R. de P. △ = 240 miles
3	1	EP _{zZ}	23 58 40				
4	2	iP _z iS _n	23 09 58 C 10 42		0.4	0.75	△ = 210 miles
5	3	iP _z iS _n	18 39 19 D 40 32		0.6	5.3	USCGS: 6.9 N 73.1 W Colombia △ = 350 miles
6	4	iP _z iS _n	10 36 25 C 37 04		0.5	1.0	USCGS: 7.9 N 82.7 W Near South Coast of Panama Felt: Force III, Bambito, R.deP. △ = 180 miles
7	4	iP _{zZ}	13 42 33 D		0.5	1.4	USCGS: 71.4 N 73.3 W Near East Coast of Baffin Island
8	4	iP _z iS _n	15 35 11.5 D 35 26		0.4	4.0	△ = 65 miles
9	6	iP _z iS _e	02 30 41.5 D 30 50		0.45	29.0	Felt Force I △ = 53 miles



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Engineering and Construction Bureau
Meteorological and Hydrographic Branch

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Balboa Heights, Canal Zone

h: 36 meters

SEISMOLOGICAL BULLETIN - SEPTEMBER 1963

Standard Seismograph System USC&GS: Sprengnether LP (Z,N,E); Benioff SP (z,n,e)

No.	Date	Phase	Time G.C.T.	Period	Ampli- tude mm	Remarks
10	6	iP _Z	13 59 35.5 D	0.6	1.5	USCGS: 2.2 N 83.2 W South of Panama
11	8	eP _Z	01 14 14			
12	8	eP _Z	09 15 02			USCGS: 36.2 S 100.5 W Southeast of Easter Island
13	9	eP _Z	03 04 42			
14	13	iP _n iS _n	01 12 43 13 20			Felt: Force III Bambito, R. de P. △ = 175 miles
15	14	eP _N	04 17 00			
16	15	eP _Z	01 01 30			USCGS: 10.3 S 165.6 E Santa Cruz Islands
17	16	iP _Z iS _Z	17 24 43 25 28			△ = 215 miles
18	17	iP _{ZZ}	05 59 00 C	1.0	3.5	USCGS: 10.6 S 78.2 W Central Peru
19	17	iP _{ZZ}	07 37 06 C	1.0	3.5	USCGS: 1.5 S 77.9 W Ecuador
20	17	eP _Z	19 35 05			USCGS: 10.1 S 165.3 E Santa Cruz Islands

PANAMA CANAL COMPANY
 Engineering and Construction Bureau
 Meteorological and Hydrographic Branch

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Balboa Heights, Canal Zone

h: 36 meters

SEISMOLOGICAL BULLETIN - SEPTEMBER 1963

Standard Seismograph System USC&GS: Sprengnether LP (Z,N,E); Benioff SP (z,n,e)

No.	Date	Phase	Time G.C.T.	Period	Ampli- tude mm	Remarks
21	24	iP _z iS _e	16 34 39.5 35 10	2.0	16.1	USCGS: 10.6 S 78.0 W Near Coast of Peru Δ = 145 miles
22	29	i _z	22 47 07 C			USCGS: 36.1 N 18.0 E Ionian Sea
23	30	iP _z iS _n	01 48 40 C 49 09	0.5	2.0	Δ = 140 miles
24	30	iP _z iS _e	03 47 38 D 48 30	0.4	6.0	USCGS: 7.3 N 76.9 W Colombia Δ = 250 miles

W. H. Esslinger
 W. H. Esslinger
 Chief Hydrographer

Quakes Felt at Bambito, R. de P.
September - 1963

Times are EST - add 5 hours for GMT

All shocks rated intensity I to II on Modified Mercalli Scale except as noted

Dates

1st	0420, 0620, 0815	
2d	0115, 0412, 1201	
3d	1330, 1435, 1445, 1945, 2310	
4th	0530 1810	Felt Force III Mercalli
5th	0530, 1912	
6th	0310, 2100	
7th	0520, 2140, 2312	
8th	0245, 0500 1345	Felt Force III Mercalli
9th	1210	
10th	0220, 0405, 0820, 1320, 1905	
11th	0130, 1203, 1710, 1913	
12th	0140, 1355, 1515, 1903, 2010	Felt Force III Mercalli
13th	1112, 1325	
14th	0130, 1800	
15th	0210, 2100	
17th	1215	
19th	2045	
20th	1325	
21st	0945	
22d	0320	
23d	1600	
24th	0545	
25th	0625	
26th	0830	
27th	0520, 1500	
28th	0530, 1500	
29th	0535	
30th	0125, 2345	

PANAMA CANAL COMPANY
 ENGINEERING AND CONSTRUCTION BUREAU
 Meteorological and Hydrographic Branch

Lat. 8° 57' 39" N
 Long. 79° 33' 29" W

Balboa Heights, Canal Zone

h: 36 meters

SEISMOLOGICAL BULLETIN - OCTOBER 1963

Standard Seismograph System USC&GS: Sprengnether LP (Z.N.E); Benioff SP (z.n.e)

No.	Date	Phase	Time G.C.T.	Period	Ampli- tude mm	Remarks
1	1	iP _z iS _e	02 45 05 D 46 18.5	0.7	2.9	USCGS: 6.8 N 73.1 W Colombia △ = 350 miles
2	1	iP _z iS _n	10 31 45 D 32 25	0.8	1.9	USCGS: 10.2 N 84.5 W Costa Rica △ = 190 miles
3	3	iP _z iS _n	17 05 12 D 05 46	0.2	1.9	△ = 165 miles
4	12	iN	11 56 00			USCGS: 46.0 N 148.8 E Kurile Islands
5	13	iP _z iS _n	05 11 19 D 12 12	0.9	4.6	USCGS: 9.8 N 84.1 W Costa Rica Felt: Bambito, R. de P. △ = 255 miles
6	13	iP _z	05 32 30 C			USCGS: 44.8 N 149.5 E Kurile Islands
7	14	iZ	05 45 22			USCGS: 2.3 S 77.6 W Peru-Ecuador Border
8	19	iP _z iS _n	03 22 46 23 23			Felt: Bambito, R. de P. △ = 180 miles
9	19	iP _z iS _n	06 49 37.5 D 50 28	0.4	1.9	Felt: Bambito, R. de P. △ = 240 miles



PANAMA CANAL COMPANY
ENGINEERING AND CONSTRUCTION BUREAU
Meteorological and Hydrographic Branch

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Balboa Heights, Canal Zone

h: 36 meters

SEISMOLOGICAL BULLETIN - OCTOBER 1963

Standard Seismograph System USC&GS: Sprengnether LP (Z,N,E); Benioff SP (z,n,e)

No.	Date	Phase	Time		Amplitude mm	Remarks
			G.C.T.	Period		
10	20	i _Z	00 31 21 D			USCGS: 37.7 S 73.2 W Near Coast of Chile
11	20	iP _Z iS _n	01 21 29 D 02 11	0.2	9.6	△ = 200 miles
12	21	iP _Z iS _n	01 52 57 D 53 22	0.3	2.1	△ = 120 miles
13	21	iP _Z iS _n	02 27 17 D 27 41	0.9	3.1	△ = 115 miles
14	22	iP _Z iS _n	05 45 59 D 46 14.5	0.4	3.1	△ = 75 miles
15	23	iP _Z iS _e	17 47 30.5 D 47 54	0.5	3.9	△ = 95 miles
16	24	iP _Z iS _n	06 45 26.5 D 46 16.5			USCGS: 4.3 N 78.4 W Near West Coast of Colombia Felt: Bambito, R. de P. △ = 240 miles
17	24	iP _Z iS _n	07 25 12 C 26 04.5			Felt Force IV, Bambito, R. de P. △ = 250 miles



PANAMA CANAL COMPANY
ENGINEERING AND CONSTRUCTION BUREAU
Meteorological and Hydrographic Branch

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Balboa Heights, Canal Zone

h: 36 meters

SEISMOLOGICAL BULLETIN - OCTOBER 1963

Standard Seismograph System USC&GS: Sprengnether LP (Z.N.E); Benioff SP (z.n.e)

No.	Date	Phase	Time G.C.T.	Period	Ampli- tude mm	Remarks
18	27	iP _z iS _e	12 03 48 D 04 26	0.8	5.0	USCGS: 5.6 N 79.4 W Off West Coast of Colombia Δ = 180 miles
19	31	iP _z iS _n	03 34 27 D 35 12			Δ = 215 miles

W. H. Esslinger
W. H. Esslinger
Chief Hydrographer



Quakes Felt at Bambito, R. de P.
October - 1963

Times are EST - add 5 hours for GMT

All shocks rated intensity I to II on Modified Mercalli Scale, except as noted

Dates

- 4th 0230, Shock enough to awaken one
- 6th 0210, Felt Force IV
- 7th 0115
- 8th 0510 and 0725
- 9th 2210 and one later, time not determined
- 11th 2210
- 12th 0125, 0225 and 0705
- 13th 0210
- 15th 2055
- 17th 0320
- 18th 1820
- 19th 2215
- 20th 0214, 0720, 1142 Small shocks
1510 Felt Force IV
- 21st 1020, 1315 and 1520
- 22d 0310 and 0420
- 24th 0155 Small shock
0256 Felt Force IV
- 26th 1415
- 27th 0910
- 29th 0155 and 0405
- 30th 0650, 2215 and 2312
- 31st 0515

On the 7th and 8th of October, Mr. Butz, the Observer, wrote the following comments:
"These days (7th and 8th) of pronounced smoke were very interesting, apparently coming from Costa Rica, as it was too wet for fires up here". (IRAZU Volcano is approximately 130 miles NW of Bambito)

PANAMA CANAL COMPANY
 Engineering and Construction Bureau
 Meteorological and Hydrographic Branch

Lat. 8° 57' 39" N
 Long. 79° 33' 29" W

Balboa Heights, Canal Zone

h: 36 meters

SEISMOLOGICAL BULLETIN - NOVEMBER 196³~~4~~

----- Standard Seismograph System USC&GS: Sprengnether LP (Z.N.E); Benioff SP (z.n.e) -----

No.	Date	Phase	Time		Amplitude mm	Remarks
			G.C.T.	Period		
1	1	iP _n	02 27 10			USCGS: 5.5 N 82.6 W South of Panama
2	2	iP _z iS _e	05 04 04 C 04 34	0.6	9.0	△ = 145 miles
3	2	iP _z iS _e	08 15 37.5 D 15 47.5	0.3	21.3	△ = 50 miles
4	3	iP _{zZ} iS _n	03 13 12 C 15 36	0.5	18.0	USCGS: 3.5 S 77.8 W Peru-Ecuador Border △ = 900 miles
5	4	iP _z ⁱ iS _n	01 36 49 C 41 36	1.9	30.0	△ = 4,200 miles
6	6	e _z	02 32 42			USCGS: 2.6 S 138.4E Western New Guinea
7	9	iP _{zZ} i _n	21 19 23 D 21 49	1.0	11.0	USCGS: 9.0 S 71.5 W Western Brazil
8	10	iP _{zZ} iS _n	01 04 32 D 07 41	0.75	4.5	USCGS: 9.2 S 71.5 W Western Brazil △ = 1,200 miles
9	11	iP _{zZ} iS _n	20 20 05 D 21 09	0.75	60.0	USCGS: 4.0 N 82.6 W Off West Coast of Colombia △ = 305 miles



PANAMA CANAL COMPANY
Engineering and Construction Bureau
Meteorological and Hydrographic Branch

Lat. 8° 57' 39" N
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Balboa Heights, Canal Zone 3 h: 36 meters
SEISMOLOGICAL BULLETIN - NOVEMBER 1964

Standard Seismograph System USC&GS: Sprengnether LP (Z,N,E); Benioff SP (z,n,e)

No.	Date	Phase	Time G.C.T.	Period	Ampli- tude mm	Remarks
10	15	eP _Z	21 25 47			
11	16	eP _Z	06 55 16			USCGS: 41.3 S 87.5 W Off Coast of Chile
12	17	iP _Z iS _N	00 55 51 C 01 02 06	1.25	8.0	△ = 2,870 miles
13	17	iP _Z iS _e	20 29 56 D 30 03.5	0.5	6.3	△ = 37 miles
14	18	iP _Z iS _N	14 46 45 D 52 48			USCGS: 29.9 N 113.6 W Gulf of Mexico △ = 2,800 miles
15	20	iP _Z	01 39 13 D	0.4	2.5	
16	23	eP _Z ePP _E ePP _N eS _N	07 58 25 08 04 04 06 59 13 28			△ = 8,700 miles
17	24	iP _Z	00 22 13 C	0.4	1.0	
18	24	iP _Z iS _n	16 50 56 C 51 48	0.5	1.0	△ = 250 miles



PANAMA CANAL COMPANY
Engineering and Construction Bureau
Meteorological and Hydrographic Branch

Lat. 8° 57' 39" N
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Balboa Heights, Canal Zone

h: 36 meters

SEISMOLOGICAL BULLETIN - NOVEMBER 1964³

----- Standard Seismograph System USC&GS; Sprengnether LP (Z.N.E); Benioff SP (z.n.e) -----

No.	Date	Phase	Time		Period	Ampli- tude mm	Remarks
			G.C.T.				
19	25	iP _z	06 51 43	C	0.6	1.5	USCGS: 6.9 N 73.3 W Colombia
		iS _n	52 55				△ = 345 miles

W. H. Esslinger
W. H. Esslinger
Chief Hydrographer

Quakes Felt at Bambito, R. de P.
November - 1963

Times are EST - add 5 hours for GMT

All shocks rated intensity I to II on Modified Mercalli Scale

Dates

1st	0115, 0510 and 0516
5th	0510
6th	1535
8th	2220 and 2250
9th	1930
14th	0310
16th	2110
17th	0525
21st	2110
26th	0510
27th	0905 and 2212
29th	0310 and 1612

PANAMA CANAL COMPANY
 Engineering and Construction Bureau
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Lat. 8° 57' 39" N
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Balboa Heights, Canal Zone

h: 36 Meters

SEISMOLOGICAL BULLETIN - DECEMBER 1964³

----- Standard Seismograph System USC&GS: Sprengnether LP (Z.N.E): Benioff SP (z.n.e) -----

No.	Date	Phase	Time G.C.T.	Period	Ampli- tude mm	Remarks
1	4	eP _{zZ}	15 53 33			USCGS: 46.0 N 153.2 E Kurile Islands Region
2	5	iP _{zZ} iS _e	11 30 31 D 31 09	0.5	22.0	USCGS: 7.0 N 77.6 W Colombia Felt: Force I Balboa Heights △ = 184 miles
3	7	iP _z iS _e	22 56 38 C 57 08	0.3	8.5	△ = 145 miles
4	10	iP _z iS _e	02 33 14 34 04.5	0.4	1.5	USCGS: 5.4 N 22.5 W South of Panama △ = 240 miles
5	12	iP _z iS _n	20 56 19 C 57 32	0.7	7.0	△ = 350 miles
6	13	iP _z iS _n	05 28 56 C 29 37	0.4	1.4	USCGS: 6.9 N 77.1 W Northern Colombia △ = 195 miles
7	14	iP _{zZ} iS _n	10 28 01 C 29 02	0.3	2.0	USCGS: 5.0 N 82.6 W South of Panama △ = 295 miles
8	14	iP _z iS _n	18 17 10 C 17 48	0.4	3.6	△ = 180 miles



PANAMA CANAL COMPANY
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Balboa Heights, Canal Zone

h: 36 meters

SEISMOLOGICAL BULLETIN - DECEMBER 1964³

----- Standard Seismograph System USC'GS: Sprengnether LP (Z,N,E); Benioff SP (z,n,e) -----

No.	Date	Phase	Time G.C.T.	Period	Ampli- tude mm	Remarks
9	15	iP _Z Z iS _E	19 53 42 D 20 04 43	1.0	12.0	USCGS: 4.8 S 108.0 E Java Sea △ = 6,500 miles
10	16	eP _Z	02 11 34			
11	16	iP _Z iS _n	14 36 47 D 37 32	0.5	1.2	△ = 215 miles
12	18	iP _Z iPP _E	00 43 46 D 47 56			USCGS: 24.8 S 176.6 W Tonga Islands
13	18	iP _Z iS _e	18 18 22 D 19 04	0.4	3.0	△ = 200 miles
14	19	iP _Z Z	17 08 25 C	0.9	2.8	USCGS: 9.7 S 79.1 W Near Coast of Central Peru
15	21	iP _Z iS _e	18 59 23 C 19 00 02	0.5	1.5	△ = 185 miles
16	22	iP _Z iS _e	23 15 31 D 16 42	0.7	16.0	△ = 340 miles
17	23	iP _e iS _n	22 36 07 37 17			△ = 335 miles



PANAMA CANAL COMPANY
Engineering and Construction Bureau
Meteorological and Hydrographic Branch

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Balboa Heights, Canal Zone

h: 36 meters

SEISMOLOGICAL BULLETIN - DECEMBER 1964³

----- Standard Seismograph System USC&GS: Sprengnether LP (Z.N.E); Benioff SP (z.n.e) -----

No.	Date	Phase	Time G.C.T.	Period	Ampli- tude mm	Remarks
18	25	iP _z iS _e	00 55 44 C 56 29	0.5	1.0	△ = 215 miles
19	25	iP _z iS _e	04 02 38.5 02 56	0.3	4.0	△ = 85 miles
20	25	iP _z iS _e	17 54 29 C 55 08	0.5	2.5	△ = 185 miles
21	27	iP _z iS _e	23 48 02 D 48.48	0.3	2.0	USCGS: 6.7 N 83.9 W South of Costa Rica △ = 220 miles
22	28	iP _z iS _e	02 35 03 C 35 41	0.7	2.0	△ = 180 miles
23	29	iP _z	17 21 32 C	0.75	2.5	
24	31	iP _{zZ}	17 49 33	1.8	7.0	

W. H. Esslinger
W. H. Esslinger
Chief Hydrographer



Quakes Felt at Bambito, R. de P.
December - 1963

Times are EST - add 5 hours for GMT

All shocks are rated intensity I to II on Modified Mercalli Scale unless noted otherwise

DATES

10th	2315	Light shock
15th	2230	From East
16th	0120	Direction uncertain
21st	1355	Two shocks
22d	1020	Light shock
	1225	Trembling for seven seconds
24th	0300	Heavy shock

Notes by observer on ash clouds (from IRAZU Volcano in Costa Rica):

"On the 13th at 3:25 p.m. a cloud covered the sun giving this part of the country an eery aspect until 6:30 p.m. This occurred again on the 15th at 4 p.m. Blue sky was showing in North and Northwest. On the 17th and 18th from 4 to 5:30 p.m., observed clouds of peculiar color and a nauseating odor, even the dog sneezed and gasped for air. These banks of clouds are too dark to be classed as fog. They came in from WSW in banks, sometimes steady and sometimes rolling. Very interesting, especially the smell."