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PROPAGATION AND ATTENUATION OF Lg WAVES IN SOUTH AMERICA

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Observatorio San Calixto
Cas. 5939
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19. ABSTRACT (Continue on reverse if necessary and identify by block number)

Characteristics of Lg waves in La Paz station LPB are analyzed, in part I. After realizing that earthquakes with oceanic path and those deep do not produce Lg, they were discarded. Remaining 486 earthquakes, occurred from 1974 to 1986, are considered, looking for Lg characteristics, according to origin region.

Lg are guided waves SH type, originated in surficial and in subducrion intermediate depth earthquakes. Apparent velocity is 3.57 km/s independent of distance, but with some dispersion (beginning often is not clear). Predominant period is 1.1 to 1.3 s. Amplitude in most cases equals P amplitude; it is normalized by dividing Lg/P, with results similar to Bath's normalized wave energy. They are transmitted efficiently through shields, poorly along cordilleran structures; from Peru Lg recording is uneven, meriting a more detailed study; from southern region (Argentina and Chile) waves are weak, but not so much as suggested by a first glance (wave period longer finds lesser recording gain).

~~In part II~~ recording in several South American stations is considered. Some earthquakes of- (cont.)

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18 (cont'd)
recording type, oceanic path, cordilleran path, transmission efficiency.

~~19~~ (cont'd)
part ~~I~~ were revised. They confirm previous conclusions of part I and help to identify efficiency of different paths and type of Lg recording, since origin regions and recording stations are at the ends of wave path ~~(figs. 12-14)~~. Type of recording may unveil hidden cordilleran structure in Andes-plains transition.

Grant AFOSR-87-0311A
PROPAGATION AND ATTENUATION OF Lg WAVES IN SOUTH AMERICA

SCIENTIFIC REPORT

INTRODUCTION

The seismic phase Lg had not been remarked by seismologists before Press and Ewing (1952) studies, in spite of its relevance in many short period records; possibly it was a part of a relative abandon of surface waves (which had been considered the main part of seismograms, but later they were of much less use than shorter smaller body waves).

Pomeroy et al. (1982) review the investigations achieved concerning Lg (together with other regional phases) considered potential discriminators between earthquakes and explosions; they list a generous bibliography, that we shall spare now.

A fact we have to emphasize: Lg has been studied mostly for ancient crustal paths, so that results generally are characterized by two qualities: relevance and uniformity, making them a good candidate for the measurements of seismic magnitude, especially for small events.

In South America a few Lg studies have been performed; we mention only Cabré (1971) and Chinn et al. (1980). The theses of Alcócer (1989) and Ayala (1989) and a paper of Minaya et al. (1989) are a fruit of this Grant and are synthesized in that report.

PART I. Lg AS RECORDED IN LPB STATION

Data used

486 earthquakes ocurred in or near South America and have been examined in La Paz, Bolivia, LPB station records, after rejecting those with oceanic path enough long to eliminate Lg and those deeper than 200 km. We consider earthquakes between 1974 and 1986, of magnitude mb between 4.4 and 5.8 . (Epicenter determinations by the International Seismological Centre were used). Let us remark the uneven distribution of epicenters in the region, especially we have to emphasize the small number of earthquakes from the Brazil. See hypocentral data in Table I, together with azimuth to LPB and epicentral distance in degrees, hypocentral distance in km, velocity, normalized amplitude Lg/P (introduced later), time of Lg travel and character.

Table I

No.	DATE			H		LAT	LONG W	H	mb	D	Az	V	Lg/P	D	T	CHAR
y	m	d	h	m	s	(o)	(o)	(km)		(o)	(o)	(km/s)		(km)	(s)	

COLOMBIA

No.	m	d	h	m	s	LAT	LONG W	H	mb	D	Az	V	Lg/P	D	T	CHAR
1-75	V	12	08	00	39.0	6.88N	73.09	59	4.6	23.78	168	3.65	2.7	2646.9	726.0	B
2-75	VI	23	05	22	48.3	6.83N	73.11	162	4.9	23.73	168	3.65	5.6	2641.6	723.7	B
3-76	II	01	03	03	36.3	0.40N	77.21	42	4.6	19.00	152	3.57	7.7	2119.3	593.7	A
4-76	III	13	21	44	41.8	6.83N	72.98	166	5.3	23.71	168	3.69	1.8	2639.6	714.2	A
5-76	V	12	16	42	15.1	7.43N	74.95	61	5.1	24.75	164	3.59	6.6	2750.6	810.9	A
6-76	VI	14	01	37	00.1	6.75N	73.0	161	4.8	23.64	168	3.55	1.9	2631.6	741.9	B
7-76	VIII	03	02	19	22.7	5.23N	75.97	123	4.7	22.80	160	3.67	5.1	2533.1	689.0	B
8-77	V	15	21	52	43.8	6.20N	77.44	6	4.7	24.41	160	3.54	1.1	2712.2	766.2	B
9-78	I	10	20	08	36.1	3.51N	73.64	42	4.8	20.65	165	3.56	1.6	2294.8	644.9	C
10-78	IV	28	04	28	29.0	12.00N	72.54	13	5.2	28.68	170	3.57	1.8	3185.4	891.0	A
11-78	V	27	16	16	42.6	6.76N	72.98	125	4.7	23.64	168	3.56	1.2	2631.8	739.4	B
12-78	VI	18	02	20	25.3	6.83N	72.9	169	4.1	23.70	168	3.62	2.3	2639.6	727.0	C
13-78	VIII	08	02	58	36.2	7.02N	72.11	39	5.0	23.73	170	3.56	8.3	2636.9	738.8	A
14-78	X	05	23	22	21.0	7.36N	76.94	35	4.7	25.30	160	3.56	0.9	2811.3	789.7	C
15-79	V	29	12	59	02.5	5.28N	75.73	122	4.9	22.95	161	3.64	1.8	2552.9	700.5	B
16-79	IX	02	02	00	12.4	4.28N	76.39	101	4.7	28.86	159	3.68	0.6	3474.2	944.0	C
17-80	II	12	08	18	49.4	3.65N	74.02	39	4.4	20.89	164	3.53	2.0	2329.4	657.6	B
18-80	III	06	13	42	03.0	5.97N	74.25	60	4.5	23.16	165	3.54	1.8	2574.0	728.0	B
19-80	V	25	15	43	30.4	5.45N	74.50	33	5.0	22.47	164	3.56	3.1	2456.8	701.3	B
20-80	XI	18	16	34	38.5	6.82N	72.92	171	4.9	23.68	168	3.53	1.0	2636.6	746.5	B
21-80	XI	26	17	35	41.2	7.87N	72.40	46	4.9	24.62	170	3.55	9.1	2735.7	768.8	A
22-80	XI	27	06	50	50.0	10.90N	68.00	33	---	27.29	180	3.59	5.5	3032.4	842.2	A
23-81	IV	27	18	50	38.7	7.01N	75.52	33	4.9	24.87	160	3.58	1.4	2763.5	771.3	B
24-81	V	13	04	38	25.0	4.10N	77.11	47	4.6	22.35	157	3.54	2.7	2483.7	701.6	C
25-81	V	20	03	01	49.0	7.74N	76.31	136	4.5	22.64	159	3.59	1.0	2519.2	701.7	C
26-81	VI	13	16	39	23.9	6.76N	73.05	171	5.0	23.67	168	3.68	1.4	2635.5	715.1	B
27-81	VIII	05	12	58	28.0	3.98N	76.39	52	5.1	21.92	158	3.56	1.9	2435.3	685.0	A
28-81	VIII	25	16	54	35.0	6.95N	76.60	8	5.3	24.80	160	3.55	6.1	2755.5	775.0	C
29-81	VIII	30	20	50	9.4	6.91N	76.53	35	4.9	24.74	160	3.51	0.5	2749.1	783.6	C
30-81	X	24	04	36	50.9	6.82N	73.00	167	4.9	23.71	168	3.51	1.3	2639.7	752.1	C
31-81	X	26	09	05	29.8	6.79N	73.05	165	4.9	23.69	168	3.69	2.8	2637.4	714.2	C
32-81	XII	17	12	54	03.4	6.73N	73.05	165	5.0	23.60	168	3.67	0.8	2636.2	718.3	B
33-82	II	23	20	07	30.9	6.73N	73.01	175	4.7	23.62	168	3.56	2.6	2630.2	719.2	A
34-82	III	09	12	21	52.2	6.76N	72.96	170	4.7	23.63	168	3.50	1.8	2631.3	752.8	B
35-82	V	14	01	18	50.8	2.36N	75.50	63	4.6	20.13	159	3.52	2.6	2236.6	632.2	B
36-82	VII	12	13	35	42.0	4.34N	73.53	16	4.6	21.42	166	3.55	2.2	2380.0	670.0	C
37-82	VIII	15	07	26	28.3	6.74N	73.01	172	4.9	23.50	160	3.54	3.3	2616.7	739.7	C

38-82	XII	23	22	47	2.4	6.87N	72.82	160	4.8	23.72	169	3.64	1.3	2640.1	723.6	C
39-83	I	10	17	02	27.5	6.76N	72.98	171	4.9	23.65	168	3.57	2.0	2645.8	737.5	A
40-83	III	07	23	14	11.4	6.86N	73.04	163	4.8	23.76	168	3.52	1.6	2644.8	751.6	C
41-83	III	31	13	12	51.0	2.50N	76.70	12	5.4	20.68	156	3.57	5.6	2297.8	634.0	A
42-83	VII	23	21	29	44.6	6.88N	73.06	160	4.5	23.78	168	3.54	2.3	2647.0	746.4	C
43-83	VII	24	15	39	45.6	6.82N	73.05	165	4.8	23.71	168	3.54	2.7	2639.6	746.4	C
44-83	VIII	29	08	24	24.7	6.80N	73.0	169	5.0	23.70	168	3.65	4.4	2638.5	721.3	A
45-83	XII	31	12	18	5.5	6.82N	73.02	170	4.7	23.70	168	3.54	0.8	2636.8	744.5	C
46-84	I	06	11	37	49.8	6.75N	73.06	166	5.0	23.66	168	3.59	4.7	2630.8	733.2	C
47-84	I	25	18	46	25.0	3.50N	76.66	49	4.6	21.62	157	3.53	3.4	2402.7	680.0	C
48-84	I	28	17	04	39.2	6.66N	74.52	81	5.0	23.91	165	3.50	1.7	2657.9	758.5	B
49-84	VIII	11	13	14	20.9	6.76N	72.99	173	4.7	23.65	168	3.65	1.3	2633.4	721.1	B
50-84	X	27	11	56	13.2	9.32N	74.73	61	5.0	26.99	166	3.68	0.5	2999.5	815.1	C

VENEZUELA

1-74	I	25	21	51	48.0	11.00N	61.00	27	4.4	27.93	194	3.52		3103.4	882.0	A
2-74	VI	12	16	25	45.2	10.60N	63.47	11	5.7	27.35	190	3.66	1.0	3038.9	829.8	A
3-74	VI	13	12	32	31.0	10.61N	63.35	0	---	27.37	190	3.57	8.4	3040.8	852.0	B
4-74	IX	20	14	47	57.9	9.35N	70.57	41	4.7	25.83	175	3.54	3.6	2870.3	812.1	B
5-74	X	29	03	10	16.9	10.58N	63.45	33	5.0	27.33	191	3.62	1.1	3036.8	839.1	A
6-75	III	05	13	47	58.3	9.13N	69.87	25	5.5	25.56	176	3.65	5.6	2840.1	779.7	C
7-75	III	05	15	18	14.8	9.17N	69.91	43	4.5	25.60	176	3.51	4.3	2844.7	810.2	B
8-75	IV	05	09	34	37.6	10.10N	69.95	36	5.5	26.43	177	3.66	2.7	2936.8	802.4	B
9-75	IV	15	09	47	44.8	9.42N	61.47	52	5.3	26.61	194	3.63	3.4	2957.1	814.6	B
10-75	VII	18	05	17	33.0	10.94N	64.46	3	4.8	27.53	188	3.66	6.1	3058.8	836.0	B
11-75	VIII	24	01	05	15.1	10.75N	62.65	111	5.1	27.64	191	3.59	2.0	3073.1	854.9	A
12-75	XII	05	09	31	50.8	10.83N	62.67	144	4.9	27.71	191	3.63	4.6	3062.2	849.2	A
13-76	X	13	17	35	50.7	10.81N	61.53	63	4.9	27.93	194	3.65	1.6	3103.9	815.3	A
14-76	XII	02	05	33	59.3	10.78N	63.71	38	4.8	27.19	177	3.63	2.9	3021.3	832.7	B
15-76	XII	21	04	32	31.0	8.80N	61.70	40	4.7	25.92	194	3.68	1.9	2880.0	783.0	A
16-77	I	26	05	43	22.8	7.50N	71.95	75	4.6	24.18	171	3.51	1.2	2687.7	766.2	B
17-77	II	21	03	07	43.5	10.52N	62.51	45	4.7	27.45	192	3.58	1.5	3050.3	850.5	B
18-77	II	21	17	48	1.0	9.55N	70.81	4	5.0	26.00	174	3.53	4.6	2888.8	819.0	B
19-77	VII	24	05	44	44.3	10.82N	68.79	14	4.6	27.19	179	3.53	9.0	3021.1	855.7	A
20-77	VIII	14	04	22	49.7	10.94N	62.36	110	4.2	27.87	192	3.65	5.9	3098.6	831.3	B
21-77	IX	03	15	25	16.1	10.42N	62.28	35	4.7	27.39	192	3.54	7.6	3043.5	857.9	B
22-77	IX	14	20	51	8.8	10.85N	62.38	94	4.7	27.79	192	3.51	1.3	3098.2	882.7	B
23-77	IX	18	17	31	16.2	10.51N	63.33	42	4.6	27.28	190	3.55	7.2	3031.4	853.8	B
24-77	X	04	13	44	54.7	10.38N	62.32	42	5.1	27.34	142	3.55	1.3	3038.0	855.8	C
25-77	XII	11	16	22	6.2	9.56N	69.52	2	5.5	25.70	177	3.56	6.4	2855.5	801.3	B
26-77	XII	17	23	25	10.0	10.90N	65.50	14	4.6	27.38	186	3.54	9.5	3042.2	859.4	A
27-78	I	18	01	17	54.5	10.26N	62.19	46	4.8	27.26	192	3.59	2.2	3029.2	842.5	B
28-78	III	15	15	26	37.8	10.33N	62.25	11	4.5	27.31	192	3.62	2.5	3034.4	839.0	C
29-78	V	18	03	25	4.9	10.76N	62.45	116	4.7	27.68	192	3.65	1.2	3077.7	[illegible].1	B
30-78	XI	07	02	40	23.0	8.57N	62.90	17	4.6	25.46	192	3.55	1.9	2828.9	797.0	A
31-79	III	30	12	10	07.0	12.89N	70.79	33	4.6	29.36	175	3.53	1.2	3262.3	923.0	B
32-79	V	05	20	04	56.0	8.43N	70.91	08	5.4	24.96	174	3.53	8.6	2773.3	784.4	B
33-79	V	05	20	08	40.3	8.48N	70.99	34	5.2	25.01	173	3.65	5.0	2777.9	760.7	A

34-79	VII	17	08	49	28.8	10.25N	62.24	40	4.6	27.00	193	3.54	6.6	3000.2	847.2	A
35-79	VIII	03	11	43	57.3	8.73N	70.76	15	4.8	25.24	174	3.68	1.4	2837.8	720.7	C
36-80	II	12	02	29	14.0	9.85N	68.62	24	4.6	26.21	179	3.54	1.9	2912.3	822.0	A
37-80	VI	23	22	57	39.0	10.53N	63.40	11	5.0	27.29	190	3.58	1.5	3032.2	846.0	B
38-80	XI	17	16	50	21.5	10.88N	69.49	39	4.6	27.27	177	3.55	6.9	3030.2	854.5	B
39-80	XI	27	06	50	50.0	10.90N	68.00	33	---	27.29	180	3.59	5.5	3032.4	844.7	B
40-80	XII	20	17	00	24.3	9.69N	72.43	66	4.6	26.41	171	3.55	2.4	2935.1	826.8	C
41-81	X	18	04	31	1.2	8.20N	72.00	37	5.5	24.29	170	3.67	4.6	2699.1	735.8	A
42-81	XII	08	22	53	13.3	9.03N	71.06	43	4.5	25.57	173	3.50	1.6	2841.4	811.8	B
43-81	XII	25	12	35	48.3	10.84N	62.40	96	5.1	27.88	192	3.68	4.0	3099.2	833.7	B
44-82	I	15	03	59	18.0	9.40N	69.91	12	5.1	25.83	176	3.56	1.7	2870.0	806.2	C
45-82	III	18	02	11	50.0	10.50N	62.40	58	4.5	27.44	192	3.57	1.6	3049.4	855.0	B
46-82	V	10	01	25	57.3	10.70N	62.50	100	5.2	27.62	192	3.62	1.6	3070.5	847.7	B
47-82	V	27	11	26	6.6	8.75N	70.89	14	4.7	25.27	174	3.54	3.1	2807.8	792.4	B
48-82	VIII	10	08	24	00.0	10.68N	62.57	104	4.8	27.59	192	3.63	3.7	3067.3	845.5	B
49-82	XI	23	17	27	1.0	10.57N	63.20	23	4.8	27.36	190	3.54	1.0	3044.5	859.0	B
50-82	XII	11	10	18	37.3	8.65N	71.72	14	5.1	25.27	172	3.55	3.5	2807.8	790.7	B
51-83	III	19	03	00	26.3	10.60N	63.17	28	4.6	27.40	190	3.57	1.1	3044.5	853.2	B
52-83	IV	11	08	30	7.2	10.47N	62.74	43	4.7	27.35	191	3.56	6.4	3039.2	852.8	A
53-83	IV	11	08	18	10.2	10.43N	62.71	45	4.5	27.21	192	3.56	10.6	3033.5	852.8	A
54-83	V	02	21	55	52.4	10.31N	62.63	45	4.5	27.21	192	3.56	9.1	3008.3	842.8	B
55-84	I	23	21	36	50.8	10.72N	62.69	120	5.0	27.60	191	3.67	3.0	3069.0	835.2	B
56-84	V	25	00	59	23.6	10.37N	62.42	41	4.7	27.32	192	3.55	13.8	3035.8	854.4	A
57-84	VI	12	23	08	55.5	7.91N	71.31	38	4.7	24.49	173	3.51	1.7	2721.4	774.5	B
58-84	VI	14	10	04	30.7	9.92N	69.77	38	5.2	26.34	176	3.59	10.7	2926.9	814.0	A
59-86	II	26	11	41	15.0	9.72N	61.37	62	4.5	26.92	194	3.56	2.8	2991.7	840.4	B
60-86	II	28	01	12	56.8	9.64N	61.39	45	4.5	26.83	194	3.60	2.8	2981.4	828.2	B
61-86	III	25	07	10	33.6	10.35N	62.53	10	4.7	27.27	192	3.52	2.8	3030.0	860.8	B
62-86	VI	11	13	48	4.0	10.60N	62.93	33	4.9	27.44	191	3.58	10.3	3049.1	864.3	A

<u>ARGENTINA</u>

1-74	I	07	16	35	5.6	26.87S	65.70	20	5.7	10.54	347	3.61	1.9	1171.3	324.5	C
2-74	I	11	05	18	0.9	31.36S	68.85	108	5.2	15.09	10	3.62	0.1	1680.1	464.1	C
3-74	I	23	21	43	49.4	32.23S	69.82	103	5.2	15.70	5	3.59	1.2	1747.5	485.6	C
4-74	II	14	06	19	56.6	26.13S	66.36	40	4.9	9.69	350	3.63	0.5	1077.4	296.5	B
5-74	II	20	03	02	52.3	30.70S	68.64	104	5.4	13.49	27	3.58	1.6	1502.5	419.5	B
6-74	IV	02	19	36	43.6	30.83S	65.27	179	5.4	14.46	349	3.61	0.1	1616.6	447.9	C
7-74	VIII	14	17	56	48.3	32.20S	69.11	141	5.3	16.24	3	3.61	9.5	1809.9	501.3	C
8-74	[illegible]II	16	07	47	51.5	33.34S	68.33	35	4.8	16.47	1	3.54	0.6	1860.3	525.5	B
9-74	VIII	17	[illegible]	12	45.[illegible]	[illegible].88S	64.41	47	4.7	7.21	331	3.63	3.0	802.5	221.1	B
10-74	VIII	24	18	58	20.0	31.36S	67.40	12	5.3	14.77	357	3.52	2.5	1641.1	466.2	B
11-74	VIII	27	15	20	50.4	27.87S	66.70	149	5.5	11.36	353	3.53	9.5	1271.0	359.6	B
12-74	IX	03	20	22	20.5	25.89S	67.64	45	4.8	9.30	357	3.48	6.8	1034.3	297.5	C
13-74	X	06	07	47	51.5	30.93S	65.09	40	4.7	14.60	348	----------		1622.7	-----	
14-75	V	06	18	10	02.0	32.93S	69.02	14	5.0	16.35	3	3.59	2.0	1816.7	505.0	B
15-75	V	18	02	40	22.0	23.90S	66.00	0	---	7.60	344	3.55	1.1	844.4	238.0	C
16-75	VI	05	14	32	11.8	23.01S	66.52	173	4.7	11.52	352	3.57	3.9	1291.6	361.9	B
17-75	IX	05	19	10	9.2	24.00S	66.71	192	4.9	7.62	350	3.60	6.3	866.1	240.8	B

18-75	IX	20	21	07	02.0	32.59S	68.70	24	4.9	16.00	2	3.50	1.0	1777.9	508.0	B
19-75	XI	17	06	45	46.0	31.63S	69.40	112	5.2	15.07	5	3.55	1.4	1678.2	473.0	B
20-75	XII	06	05	35	37.0	30.89S	68.85	122	5.0	14.31	3	3.61	3.8	1594.6	441.7	C
21-76	I	04	04	42	4.0	27.90S	66.00	128	4.8	11.47	350	3.52	0.8	1280.8	364.0	C
22-76	II	14	09	01	52.0	33.65S	68.92	20	4.8	17.06	3	3.53	0.9	1895.6	537.0	C
23-76	III	20	02	55	47.8	27.36S	67.36	118	4.8	11.02	356	3.57	0.8	1230.1	344.2	C
24-76	III	27	21	05	7.1	31.83S	67.66	122	5.1	15.24	358	3.55	0.1	1687.7	478.9	C
25-76	V	04	02	07	11.3	27.30S	65.80	58	4.7	10.96	348	3.39	3.2	1219.1	359.6	C
26-76	VIII	03	23	43	54.6	31.53S	68.49	119	5.0	14.94	2	3.70	2.3	1660.0	449.4	B
27-76	IX	12	03	51	24.5	24.14S	66.78	178	4.8	7.67	351	3.60	0.4	870.6	241.5	B
28-76	X	24	00	13	51.0	32.80S	69.20	25	4.9	16.23	4	3.53	1.6	1803.5	511.0	C
29-76	[illegible]	26	07	13	38.0	27.98S	64.73	25	5.0	11.81	344	3.51	1.8	1312.4	374.0	C
30-76	[illegible]	[illegible]5	14	49	58.8	29.66S	68.90	140	5.0	13.09	4	3.61	2.1	1461.2	404.3	C
31-77	I	25	00	50	49.0	33.59S	68.27	20	5.4	16.98	1	3.54	5.9	1886.7	533.0	B
32-77	VI	07	13	31	23.7	29.74S	67.80	102	5.1	13.51	359	3.57	5.2	1464.6	410.2	C
33-77	VI	27	22	53	57.0	30.39S	67.10	52	4.8	13.83	356	3.52	9.0	1537.5	436.8	C
34-77	VIII	03	14	27	32.5	31.67S	69.29	51	5.0	15.11	4	3.49	0.2	1679.6	481.3	C
35-77	VIII	29	16	36	1.9	31.90S	69.22	114	5.3	15.33	4	3.62	3.8	1707.1	471.6	C
36-77	XI	23	09	26	23.4	31.04S	67.76	4	6.4	14.45	359	3.62	4.9	1605.5	443.6	B
37-77	XI	23	11	08	43.0	31.32S	67.82	32	5.3	14.72	359	3.67	0.8	1635.8	446.0	B
38-77	XI	23	11	44	23.0	31.60S	67.85	60	4.7	15.00	359	3.61	0.5	1667.7	462.0	B
39-77	XI	23	11	46	55.4	31.03S	67.58	8	5.2	14.44	358	3.62	1.9	1604.4	443.6	C
40-77	XI	23	11	58	10.0	31.00S	67.86	22	5.5	14.40	359	3.60	3.2	1600.1	444.5	C
41-77	XI	23	13	38	51.0	31.48S	68.20	49	4.8	14.88	0	3.52	0.4	1654.0	470.0	C
42-77	XI	23	13	50	38.0	31.36S	68.00	78	4.9	14.76	359	3.64	1.0	1641.8	451.0	C
43-77	XI	23	15	37	56.0	31.80S	67.74	65	4.6	15.20	359	3.53	0.3	1688.8	478.4	C
44-77	XI	23	16	17	51.0	31.21S	67.52	20	4.5	14.62	358	3.59	1.2	1624.0	452.4	C
45-77	XI	23	16	28	23.0	31.26S	67.66	10	5.1	14.76	358	3.70	2.7	1630.0	440.0	B
46-77	XI	23	16	36	3.0	31.30S	67.73	21	5.6	14.70	359	3.54	5.3	1633.4	461.4	C
47-77	XI	23	16	40	53.1	30.80S	67.10	33	5.1	14.23	356	3.56	3.0	1581.4	443.0	C
48-77	XI	23	21	52	2.5	31.43S	67.71	36	4.9	14.[illegible]	359	3.53	1.2	1648.2	467.5	C
49-77	XI	23	21	57	28.3	31.68S	67.74	62	4.8	15.08	359	3.43	0.6	1676.7	488.7	C
50-77	XI	23	23	04	13.4	31.82S	67.98	84	5.0	15.22	359	3.43	0.6	1693.2	493.6	C
51-77	XI	23	23	27	36.0	31.31S	67.69	20	5.1	15.02	358	3.45	2.1	1668.9	484.0	C
52-77	XI	23	23	32	20.0	30.37S	67.37	23	---	13.79	357	3.56	1.1	1532.4	430.0	B
53-77	XI	24	00	08	29.1	31.80S	67.53	33	---	15.21	358	3.59	2.1	1690.3	469.9	C
54-77	XI	24	03	20	05.6	31.71S	67.80	62	4.4	15.12	359	3.54	1.7	1181.1	475.0	C
55-77	XI	24	03	57	50.0	31.79S	67.80	48	4.3	15.19	359	3.60	0.8	1688.4	469.0	C
56-77	XI	24	04	59	27.0	31.92S	67.60	62	---	15.31	358	3.38	0.4	1702.2	503.0	C
57-77	XI	24	05	06	24.9	31.75S	67.60	45	4.3	15.16	358	3.55	2.5	1685.0	475.1	C
58-77	XI	24	06	13	35.0	31.64S	67.61	19	4.2	15.05	358	3.43	0.8	1672.2	487.5	C
59-77	XI	24	11	08	39.0	31.70S	67.90	83	4.0	15.10	359	3.44	0.5	1677.8	488.0	C
60-77	XI	24	18	20	16.5	31.31S	67.69	33	5.6	14.72	358	3.40	1.2	1635.5	481.0	C
61-77	XI	24	18	42	40.0	31.37S	69.79	26	5.8	14.77	359	3.62	2.8	1641.3	453.4	C
62-77	XI	24	22	19	58.3	31.48S	67.70	51	4.4	14.88	359	3.61	0.3	1654.1	457.7	C
63-77	XI	24	23	00	54.5	31.24S	67.76	47	4.9	14.65	359	3.50	1.9	1628.4	465.5	C
64-77	XI	25	00	04	31.6	31.06S	67.73	43	5.4	14.47	359	3.48	0.6	1608.3	462.4	C
65-77	XI	25	03	24	37.3	31.67S	67.25	33	4.5	15.08	359	3.63	4.2	1675.8	461.7	C
66-77	XI	25	03	47	16.6	31.79S	67.75	41	5.0	15.19	358	3.62	3.4	1688.2	466.4	C
67-77	XI	25	04	06	53.1	31.18S	67.70	22	4.8	14.59	358	3.63	2.0	1621.2	446.9	C
68-77	XI	25	18	02	40.3	31.24S	67.82	53	4.9	14.69	359	---------		1632.5	-----	
69-77	XI	25	18	56	32.1	31.36S	67.48	33	4.9	14.78	358	---------		1642.0	-----	

70-77	XI	25	20	42	15.6	31.30S	67.63	47	4.1	14.70	358	3.34	1.2	1633.0	210.2	C
71-77	XI	26	00	44	9.0	31.61S	67.65	24	4.7	15.02	358	3.45	0.8	1669.0	484.0	C
72-77	XI	26	13	52	21.5	31.34S	67.49	33	5.0	14.75	358	3.65	0.7	1639.2	448.5	C
73-77	XI	26	20	26	51.0	31.35S	67.70	33	3.7	14.76	358	3.54	1.0	1640.3	463.0	C
74-77	XI	27	06	26	4.0	31.13S	67.70	33	3.6	14.54	358	3.59	0.2	1615.9	450.0	C
75-77	XI	27	20	15	5.3	31.65S	67.80	47	4.8	15.05	357	3.59	1.1	1672.9	464.7	C
76-77	XI	28	00	17	24.3	31.09S	67.68	28	5.3	14.41	358	3.59	1.5	1601.3	445.7	B
77-77	XI	28	04	19	31.0	31.68S	67.65	2	5.6	15.08	358	3.54	11.1	1675.5	473.0	B
78-77	XI	28	05	39	24.0	30.97S	68.05	23	5.3	14.37	360	3.55	7.4	1596.8	450.0	B
79-77	XI	28	06	31	29.1	31.44S	67.44	17	5.9	14.85	358	3.58	14.3	1650.1	460.9	B
80-77	XI	28	18	40	18.8	31.90S	69.01	97	5.2	15.32	3	3.66	1.1	1705.0	466.2	C
81-77	XI	28	23	07	57.0	31.69S	67.30	1	4.9	15.10	357	3.52	[illegible]	1677.8	477.0	C
82-77	XI	29	00	33	38.0	31.62S	67.80	33	4.8	15.03	359	3.53	0.5	1670.3	473.0	B
83-77	XII	05	15	43	26.0	31.10S	67.96	11	5.4	14.56	359	3.55	3.0	1611.1	453.8	C
84-77	XII	06	08	41	35.0	31.02S	67.74	5	5.4	14.43	359	3.53	5.2	1603.3	454.2	B
85-77	XII	06	17	05	6.9	31.24S	67.90	21	5.9	14.64	359	3.56	7.8	1626.8	457.1	B
86-77	XII	06	18	27	38.0	31.30S	67.63	4	5.1	14.71	358	3.46	0.6	1634.4	472.4	C
87-77	XII	07	00	32	36.2	28.63S	67.38	128	5.3	12.06	347	3.61	1.5	1646.1	372.8	B
88-77	XII	07	03	22	44.0	31.19S	67.88	27	5.1	14.59	359	3.56	6.5	1621.3	456.0	C
89-77	XII	09	21	44	50.0	31.58S	67.85	14	4.9	14.98	359	3.59	1.5	1664.5	463.0	C
90-77	XII	10	07	11	55.6	31.27S	67.70	39	5.1	14.67	358	3.45	9.5	1630.4	472.6	C
91-77	XII	10	08	37	1.0	31.27S	67.75	37	4.8	14.65	357	3.56	3.7	1628.0	457.3	B
92-77	XII	10	14	19	57.9	31.21S	67.75	27	5.2	14.62	359	3.44	1.4	1624.6	372.1	C
93-77	XII	12	16	02	33.0	31.38S	67.50	40	4.9	14.79	358	3.40	0.9	1643.8	483.0	C
94-77	XII	21	03	47	32.2	31.58S	67.70	33	5.7	14.98	359	3.65	5.8	1664.7	455.8	C
95-78	I	01	10	50	56.0	31.14S	69.88	17	5.1	14.54	359	3.52	2.9	1615.6	459.0	C
96-78	I	03	01	10	4.4	31.54S	67.90	35	5.3	14.94	359	3.67	1.3	1660.4	452.6	C
97-78	I	03	06	31	5.1	31.26S	67.83	38	5.0	14.67	359	3.69	1.2	1630.4	441.9	C
98-78	I	17	11	33	14.5	31.25S	68.00	20	5.8	14.65	360	3.65	15.2	1627.9	445.5	B
99-78	I	22	12	08	25.8	31.45S	67.97	35	4.6	14.85	359	3.39	0.7	1650.3	459.2	C
100-78	I	24	12	18	15.7	31.74S	68.91	18	5.6	15.15	3	3.64	2.2	1683.4	462.3	C
101-78	III	18	00	38	40.0	31.41S	67.80	16	5.1	14.81	359	---------		1645.6	-----	
102-78	IV	04	13	33	53.3	31.20S	67.74	17	5.4	14.60	359	3.61	2.8	1622.3	449.4	C
103-78	V	10	23	06	02.0	29.97S	67.91	[illegible]	5.1	13.40	3	3.66	2.2	1489.3	407.0	C
104-78	VI	07	15	16	45.0	32.08S	67.56	[illegible]	5.1	15.49	358	3.41	0.5	1721.6	505.0	C
105-78	VI	26	18	49	11.8	31.60S	67.71	0	5.1	15.01	359	3.52	0.5	1667.3	473.2	C
106-78	VII	26	01	47	16.1	31.34S	67.76	46	5.0	14.94	359	3.53	0.9	1660.6	469.9	C
107-78	VIII	21	00	28	25.1	31.28S	67.86	25	5.5	14.68	359	3.61	2.4	1636.3	453.7	C
108-78	X	[illegible]	01	36	41.7	31.54S	67.68	43	5.3	14.95	358	3.61	1.1	1661.6	460.3	C
109-79	I	29	03	22	45.5	31.26S	68.40	10	5.0	14.66	1	3.62	0.7	1628.9	450.0	C
110-79	II	23	23	08	3.1	31.15S	68.34	51	4.8	14.56	1	3.69	0.9	1618.5	438.6	C
111-79	VIII	30	18	59	46.9	31.47S	67.69	47	5.4	14.88	358	3.72	9.8	1654.0	443.1	C
112-79	X	08	01	52	40.0	31.46S	68.04	39	4.8	14.86	360	3.64	4.0	1651.6	453.7	B
113-80	I	17	11	00	10.0	31.47S	67.70	29	4.8	14.88	359	3.52	0.1	1653.6	470.0	C
114-80	I	24	18	34	4.1	31.79S	68.50	43	4.7	15.19	1	3.51	0.9	1699.3	489.9	C
115-80	IV	09	08	17	57.4	31.65S	67.48	23	5.4	15.06	358	3.54	8.1	1673.5	472.6	C
116-80	V	25	21	46	11.8	31.33S	68.00	43	5.0	14.73	360	3.53	1.5	1637.2	463.2	C
117-80	XI	10	16	24	39.0	31.62S	67.47	13	5.6	15.03	358	3.61	2.6	1670.0	463.0	C
118-80	XII	06	03	43	11.5	31.26S	67.52	46	4.8	14.67	350	3.58	[illegible]	[illegible]	455.5	C
119-81	VII	02	11	03	35.0	32.99S	69.88	58	4.5	16.41	3	3.50	0.7	1824.2	509.0	C
120-82	VIII	04	05	12	20.2	30.53S	68.11	53	4.8	13.94	0	3.43	5.8	1549.8	451.8	C
121-82	XII	04	03	26	42.6	31.27S	67.75	36	4.9	14.67	359	3.59	1.2	1630.4	453.4	B

122-83	XI	26	17	00	2.1	31.48S	68.88	108	5.1	14.89	3	3.63	0.8	1657.9	448.0	C
123-83	XII	04	02	00	35.4	31.77S	69.42	113	5.2	15.21	5	3.51	3.7	1693.7	482.5	B
124-83	XII	04	02	09	20.8	24.05S	66.79	191	5.2	7.57	350	3.63	2.7	862.5	237.6	B
125-86	III	12	22	04	19.1	24.08S	66.80	198	5.2	7.69	351	3.47	0.6	877.1	252.9	B

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1-72	V	15	09	12	56.6	29.70S	71.30	49	4.9	13.40	13	3.52	5.9	1483.7	423.4	C
2-72	V	15	10	09	38.0	29.60S	69.40	17	5.4	13.09	6	3.66	14.1	1454.5	397.0	B
3-72	V	28	07	28	13.5	27.70S	71.30	53	4.8	11.47	15	3.65	25.1	1275.5	348.5	B
4-72	V	28	09	46	14.5	27.70S	71.40	4	4.9	11.48	16	3.66	19.3	1275.5	348.5	B
5-74	I	06	06	28	15.2	29.80S	71.26	67	5.0	13.52	13	3.61	5.8	1537.0	416.8	C
6-74	I	06	15	01	34.5	23.77S	68.79	87	5.3	7.23	5	3.58	13.6	808.0	225.5	B
7-74	VIII	04	21	08	52.8	24.45S	69.94	66	5.0	8.07	13	3.52	5.6	899.1	255.0	B
8-74	VIII	09	17	17	1.6	37.23S	73.62	11	5.0	21.19	15	3.59	0.7	2354.4	355.4	C
9-74	VIII	15	18	27	30.6	18.00S	71.03	98	5.4	18.75	9	3.61	1.1	2085.6	577.4	C
10-74	VIII	17	14	38	38.6	19.29S	69.74	98	4.2	3.15	30	3.45	0.3	363.3	105.4	B
11-74	VIII	18	10	44	11.8	38.34S	73.27	19	5.9	22.20	13	3.60	10.7	2466.7	684.0	C
12-74	VIII	24	04	16	26.2	22.60S	68.70	101	5.3	6.06	6	3.62	2.6	680.8	187.8	B
13-74	VIII	27	06	24	6.5	38.29S	73.53	15	5.4	22.20	14	3.56	1.1	2466.7	692.5	C
14-74	IX	04	03	40	37.0	18.00S	71.30	46	4.0	3.41	65	3.44	2.2	381.7	111.0	B
15-74	IX	20	04	48	35.7	19.80S	69.35	116	4.6	3.46	20	3.51	2.1	401.6	114.3	C
16-75	I	01	22	31	5.0	38.33S	73.24	24	5.3	22.18	13	3.58	0.1	2464.5	688.0	C
17-75	I	02	21	35	18.1	32.33S	70.07	112	5.1	16.65	7	3.60	1.7	1853.4	514.8	C
18-75	I	04	15	02	41.5	32.46S	71.42	77	4.3	16.14	12	3.73	2.5	1794.9	480.5	C
19-75	III	05	20	29	41.1	20.52S	68.77	100	4.7	4.01	9	3.59	6.0	458.4	127.6	B
20-75	VI	10	23	00	46.0	22.53S	68.70	151	4.8	6.00	6	3.52	0.6	683.3	194.0	B
21-75	VI	14	10	40	20.3	32.52S	70.68	92	5.6	16.00	9	3.57	38.4	1780.1	497.7	B
22-75	VI	15	10	45	9.2	22.59S	68.40	100	---	6.03	3	3.67	2.7	678.6	184.8	C
23-75	VI	22	22	53	5.3	22.39S	68.30	137	5.1	5.83	2	3.68	8.4	662.1	179.9	B
24-75	VII	24	06	42	35.0	33.05S	70.15	102	4.6	16.55	7	3.41	0.3	1841.7	540.1	C
25-76	II	01	09	45	24.0	19.31S	70.49	33	---	3.58	40	3.50	8.2	399.1	114.0	C
26-76	VI	14	07	53	8.4	22.34S	70.10	33	---	6.07	18	3.50	5.4	675.2	192.6	C
27-76	VIII	04	04	17	27.0	25.24S	63.23	91	4.7	8.73	7	3.57	3.2	974.2	273.0	B
28-76	XII	02	00	09	11.4	20.64S	69.80	176	---	4.38	21	3.60	2.9	517.5	143.6	C
29-76	XII	02	07	31	16.4	38.51S	71.28	43	5.0	12.28	14	3.44	2.1	1365.1	396.6	C
30-77	I	25	06	11	2.9	25.59S	70.26	40	4.8	7.31	17	3.64	2.8	813.2	223.1	B
31-77	IX	03	20	12	30.5	22.59S	68.59	126	4.8	6.04	4	3.56	4.0	682.8	191.8	C
32-77	IX	17	22	39	51.0	20.30S	68.91	33	---	3.83	12	3.65	5.5	426.8	105.0	C
33-77	XI	24	17	57	29.0	21.01S	67.62	188	4.8	4.48	354	3.67	2.7	532.1	145.1	C
34-77	XI	27	05	51	22.9	20.03S	70.30	75	---	4.05	31	3.53	8.0	456.2	129.0	C
35-77	XI	28	09	13	39.0	20.28S	69.05	117	4.3	3.92	18	3.50	0.5	450.9	129.5	B
36-77	XI	27	22	50	42.4	21.65S	68.52	119	4.9	5.11	5	3.59	4.9	580.1	161.6	C
37-78	III	15	01	09	23.5	21.43S	69.20	172	---	4.49	12	3.60	5.0	527.7	146.5	B
38-78	VII	25	21	57	57.1	20.64S	69.00	148	---	4.18	12	3.32	1.1	487.4	146.9	C
39-79	IV	19	02	59	45.3	24.21S	67.28	190	---	7.67	354	3.51	0.8	842.2	248.7	C
40-79	IV	19	07	16	45.6	40.28S	71.90	33	4.5	23.89	9	---------		2654.6	-----	
41-79	VIII	30	09	15	50.2	21.21S	68.60	118	5.4	4.68	5	3.56	2.6	533.2	149.8	C

42-79	IX	02	14	29	38.5	20.66S	68.74	110	5.0	4.15	9	3.58	35.7	474.0	132.5	B
43-80	XI	08	21	35	42.3	24.42S	67.67	98	5.3	7.86	357	3.59	6.6	878.8	244.7	B
44-80	XI	25	06	04	2.9	34.83S	70.88	94	5.0	18.37	8	3.63	1.0	2043.2	563.1	C
45-81	XII	08	22	05	45.0	22.32S	68.92	118	5.0	5.18	8	3.37	4.7	587.5	174.0	C
46-81	XII	09	04	34	48.5	20.74S	69.37	114	4.5	4.35	16	3.46	4.0	496.[illegible]	143.5	C
47-82	X	23	15	37	7.5	19.77S	69.40	143	---	3.46	22	3.64	4.4	410.2	112.7	B
48-82	X	23	16	02	29.9	20.28S	70.50	34	4.8	[illegible].36	31	3.67	3.2	485.6	132.3	C
49-82	X	26	03	24	30.1	29.70S	71.40	63	5.6	13.44	14	3.65	2.6	1494.6	409.3	B
50-83	III	05	22	10	29.4	29.32S	71.70	35	5.2	13.15	15	3.37	3.1	1401.5	4[illegible].5	C
51-83	III	31	17	32	58.0	21.45S	68.81	167	5.1	4.94	8	3.52	5.3	[illegible]3.7	162.9	B
52-83	V	03	05	55	21.6	22.80S	68.12	144	4.6	6.32	0	3.47	7.1	716.8	206.4	[illegible]
53-83	VII	05	16	48	6.6	24.03S	67.05	183	4.8	7.53	352	3.54	1.1	856.4	241.6	C
54-83	VII	06	05	54	55.8	24.17S	67.09	189	4.4	7.65	353	3.64	0.5	849.1	233.2	C
55-83	VII	07	04	50	37.8	20.69S	68.96	112	4.9	4.21	11	3.53	2.5	480.9	136.2	C
56-83	VII	08	02	03	16.0	20.70S	69.50	82	5.2	3.76	21	3.68	0.8	425.7	115.7	C
57-83	VII	15	23	41	9.5	23.10S	68.20	172	---	6.56	1	3.59	2.1	748.9	208.5	C
58-83	VII	19	04	33	24.5	22.06S	68.49	126	4.7	5.51	4	3.62	4.8	625.0	172.5	C
59-83	VII	19	20	21	20.8	24.23S	67.07	192	4.3	7.72	352	3.57	0.4	6[illegible]8.9	246.5	C
60-83	VII	19	22	10	39.3	20.65S	69.50	158	---	4.30	18	3.60	1.4	503.2	139.7	C
61-83	VII	20	05	40	52.5	22.80S	68.85	128	4.7	6.28	7	3.63	[illegible].5	70[illegible].4	195.5	C
62-83	VII	20	22	11	54.0	25.37S	70.20	69	---	9.01	13	3.60	1.6	1003.5	278.6	C
63-83	V[illegible]	[illegible]	[illegible]	[illegible]	[illegible].3	22.34S	68.54	119	5.5	5.79	4	3.60	4.7	654.2	181.7	C
64-83	XII	01	16	29	44.0	26.33S	71.00	49	4.5	10.11	16	3.58	0.8	1124.4	31[illegible]	C
65-83	XII	03	21	45	1.3	24.21S	67.10	198	---	7.70	353	3.55	0.5	878.1	247.0	C
66-83	XII	14	07	38	58.0	25.88S	71.20	35	4.3	9.73	18	3.51	2.1	1081.7	308.2	C
67-83	XII	15	04	22	33.9	33.09S	70.15	103	5.9	16.59	7	3.56	2.6	1846.2	530.1	B
68-83	XII	16	02	40	5.9	21.63S	68.42	123	4.9	5.08	3	3.58	7.7	577.5	161.0	B
69-83	XII	23	06	45	31.5	19.42S	69.29	124	4.4	3.09	22	3.58	1.3	136.5	101.8	B
70-83	XII	23	18	21	48.0	37.70S	73.50	7	5.4	21.69	14	3.57	2.0	2409.9	574.2	C
71-83	XII	23	22	56	7.1	27.48S	71.41	33	5.0	11.31	16	3.53	2.[illegible]	1257.1	356.1	C
72-83	XII	31	00	44	43.4	26.07S	70.18	65	5.2	9.69	12	3.59	2.9	1073.6	300.4	[illegible]
73-86	I	26	07	48	22.0	27.00S	70.90	10	5.7	10.76	14	3.62	23.1	1195.7	330.0	B
74-86	II	13	00	44	41.0	33.50S	72.10	51	4.8	17.27	13	3.47	1.0	1919.5	553.0	C
75-86	II	13	00	56	56.9	21.21S	68.54	136	4.4	4.67	5	3.50	3.4	536.4	153.1	[illegible]
76-86	III	21	13	55	41.0	30.70S	71.44	50	5.0	14.42	13	3.35	0.8	1602.9	317.2	C
77-86	IV	09	01	26	52.2	19.77S	69.56	[illegible]	5.0	3.51	23	3.59	2.2	405.5	112.9	B
78-86	V	14	00	24	30.9	19.15S	69.40	121	---	2.89	26	3.68	[illegible].3	343.1	93.1	B
79-86	V	14	15	54	25.0	32.60S	71.90	46	5.0	16.35	13	3.60	1.9	1817.2	504.8	C
80-86	V	19	12	36	29.4	28.36S	69.10	102	5.1	11.81	5	3.65	1.6	131[illegible].2	350.6	C
81-86	VI	05	03	42	53.4	23.10S	68.97	111	4.7	6.66	7	3.65	5.3	[illegible]8.3	204.6	C
82-86	VI	05	15	35	13.2	34.40S	70.90	91	5.1	18.00	9	3.51	0.2	[illegible].0	570.8	C
83-86	VI	24	12	25	28.4	30.70S	71.70	51	5.4	14.50	14	3.69	1.3	1611.9	436.6	C
84-86	VII	28	03	29	56.0	33.30S	72.00	41	4.7	17.05	13	3.68	6.3	1834.7	522.0	C
85-86	VII	28	20	29	2.7	33.30S	71.90	41	5.1	17.00	13	3.66	8.5	1839.3	516.2	C
86-86	VII	28	21	11	19.0	33.36S	72.10	41	5.0	17.07	13	3.74	1.7	1237.1	507.0	C
87-86	VII	29	03	20	25.0	23.70S	71.00	10	---	7.62	21	3.71	2.0	846.7	228.0	C
88-86	VII	29	09	24	56.1	20.46S	68.62	152	4.4	3.94	7	3.69	6.9	463.4	125.4	B
89-86	XI	29	20	11	20.4	23.25S	69.38	88	5.2	6.79	10	3.46	3.9	759.4	219.6	B
90-86	XI	30	08	06	53.2	20.24S	70.82	33	---	4.51	35	3.49	5.1	502.8	143.7	B

BRASIL

1-64	II	13	11	21	44.3	18.05S	56.75	16	5.5	10.95	276	3.66	11.8	1216.8	331.9	A
2-64	VI	19	03	56	22.4	2.05N	59.30	65	4.5	20.84	204	3.63	2.6	2316.4	368.1	A
3-75	I	23	11	40	24.0	10.70N	62.10	33	4.1	7.76	222	3.44	2.6	862.8	251.0	A
4-75	V	18	05	42	18.0	2.50S	58.10	33	4.4	20.80	204	3.63	1.3	2311.3	637.0	C
5-76	II	22	03	24	46.0	0.03N	59.08	10	4.8	18.96	200	3.55	3.1	2106.7	593.4	A
6-77	VIII	02	17	45	52.5	0.03S	50.06	33	4.6	24.19	226	3.60	4.8	2687.9	746.5	A
7-80	XI	12	21	23	4.6	8.07S	58.24	33	4.8	19.43	24[illegible]	[illegible]	4.7	2159.1	605.4	A
8-80	XI	20	03	29	41.8	4.50S	38.30	00	5.2	31.63	245	3.57	6.4	3514.4	983.2	A
9-83	VIII	05	06	21	42.9	3.58S	62.14	23	5.5	14.14	204	3.58	12.0	1571.3	439.1	A
10-86	XI	30	05	19	48.3	5.50S	35.70	5	4.9	33.52	248	3.58	2.2	3724.4	1040.3	A

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1-74	III	21	19	28	23.3	4.60S	73.50	47	4.8	13.00	156	3.52	10.9	1445.2	410.0	B
2-74	VI	12	18	20	32.0	3.97S	76.70	149	4.5	15.07	147	3.59	3.6	1681.0	468.0	C
3-74	VIII	09	04	53	30.1	8.48S	74.37	149	5.6	10.08	143	3.58	1.8	1129.9	315.9	A
4-74	VIII	15	23	46	47.5	15.70S	74.72	82	4.7	6.42	98	3.62	9.6	718.0	198.5	C
5-74	VIII	17	21	22	4.0	13.50S	74.30	98	4.3	6.67	117	3.30	9.6	747.5	227.0	B
6-75	I	02	11	31	21.1	15.06S	73.05	33	---	4.99	108	3.58	2.5	555.4	154.9	C
7-75	I	23	10	44	37.3	15.00S	70.89	196	4.1	2.90	113	3.50	0.6	377.1	107.7	C
8-75	V	18	05	10	55.8	16.90S	78.98	71	5.1	12.80	125	3.45	6.5	1424.0	412.2	C
9-75	VI	01	02	44	54.3	14.16S	75.61	38	4.8	7.62	109	3.62	4.0	847.5	233.7	B
10-75	VI	05	03	32	45.6	13.70S	76.11	61	5.5	8.24	111	3.54	4.6	917.6	258.9	B
11-75	VI	15	17	59	16.9	8.45S	74.17	180	4.6	9.98	144	3.59	2.3	1123.4	313.1	B
12-75	VII	23	16	57	34.0	15.50S	75.30	60	---	6.97	99	3.51	0.4	776.7	221.0	C
13-75	VIII	23	17	54	23.5	14.24S	75.66	68	---	7.64	108	3.54	7.8	851.6	240.5	B
14-75	VIII	24	15	30	7.0	5.48N	77.26	21	5.1	14.19	141	3.53	1.8	1576.8	446.7	B
15-75	IX	02	06	09	50.8	17.87S	69.36	166	---	1.79	42	3.54	1.6	259.1	73.2	C
16-76	II	01	15	58	22.0	7.58S	80.45	59	5.2	15.00	128	3.56	6.2	1667.7	468.0	C
17-76	V	07	05	10	50.0	8.65S	74.71	141	5.3	10.15	141	3.64	4.3	1136.5	312.5	A
18-76	VII	13	09	21	45.9	7.44S	73.93	33	4.9	10.68	148	3.51	0.5	1187.1	338.0	B
19-76	VIII	24	00	14	28.3	8.28S	74.44	90	4.7	10.27	144	3.56	3.1	1144.6	321.7	B
20-76	XII	02	13	34	19.0	13.50S	68.10	33	---	2.99	179	3.59	0.8	333.6	93.0	C
21-77	II	01	14	37	57.2	8.88S	74.57	161	4.7	9.86	141	3.57	3.4	1107.3	309.8	B
22-77	II	24	07	11	51.3	8.50S	74.55	139	4.7	10.17	142	3.63	1.2	1138.5	313.6	B
23-77	III	13	21	14	32.3	8.05S	74.41	161	5.2	10.45	144	3.62	6.1	1172.1	323.7	A
24-77	VIII	20	18	53	58.6	8.68S	74.32	187	5.0	9.89	143	3.61	1.8	1114.7	308.6	B
25-78	I	18	05	33	58.2	8.74S	74.35	169	4.9	9.86	142	3.53	5.0	1108.5	313.8	A
26-78	V	28	06	07	3.8	6.70S	75.00	75	4.8	11.60	148	3.47	5.1	1291.1	372.1	B
27-78	VI	09	04	08	39.6	7.75S	73.77	33	4.5	10.34	148	3.65	1.5	1149.3	314.0	C
28-78	VI	09	07	35	0.0	7.81S	74.59	164	4.9	10.75	144	3.63	6.9	1205.6	332.1	A
29-79	I	21	12	33	49.2	8.74S	74.94	149	4.8	10.22	140	3.72	10.5	1145.3	9	B
30-79	IV	18	19	36	31.0	7.72S	74.54	164	4.6	10.79	145	3.68	3.0	1210.[illegible]		A
31-79	XI	18	13	50	45.3	6.30S	74.30	33	4.9	11.88	150	3.40	0.8	132[illegible]		
32-79	XII	[illegible]	[illegible]	30	18.0	7.90S	72.20	98	4.8	9.47	155	3.53	1.3	105[illegible]		

33-80	I	31	00	24	35.6	7.69S	74.54	175	4.7	10.81	145	3.62	2.3	1213.8	335.4	B
34-80	III	06	09	46	17.7	6.17S	71.16	67	4.8	10.47	164	3.66	8.4	1165.2	318.4	A
35-80	III	08	20	50	4.8	8.44S	74.16	167	4.8	9.98	144	3.52	5.3	1121.4	318.6	A
36-80	IV	04	06	25	26.9	7.97S	74.46	169	4.9	10.54	144	3.61	1.5	1183.2	327.7	A
37-80	IV	09	10	00	19.0	9.86S	75.40	111	4.8	9.71	134	3.51	14.2	1084.6	309.0	A
38-80	V	16	04	52	54.8	8.02S	73.74	198	5.2	10.10	177	3.36	7.0	1139.5	339.1	A
39-80	VI	16	21	47	32.8	8.77S	77.75	152	4.8	10.08	141	3.62	1.3	1130.3	312.2	C
40-80	X	10	19	10	3.1	8.45S	74.52	152	[illegible].8	10.19	143	3.59	3.3	1142.4	318.2	B
41-81	IV	13	21	32	52.5	8.87S	72.95	55	5.0	8.79	149	3.56	13.5	978.2	274.8	A
42-81	IV	25	10	42	42.1	8.81S	74.52	15P	4.8	9.91	141	3.61	1.9	1112.4	308.1	C
43-81	IV	27	09	23	20.5	9.91S	75.65	41	4.5	9.84	133	3.57	5.4	1094.1	306.5	B
44-81	VI	24	07	54	22.0	15.00S	81.10	33	4.4	17.17	133	3.41	1.5	1908.0	560.0	C
45-81	VI	24	17	01	35.5	15.67S	74.74	41	4.6	6.26	99	3.58	3.3	696.7	194.6	C
46-81	VI	28	12	56	20.0	7.80S	74.33	131	4.7	10.60	145	3.62	5.7	1185.0	327.0	C
47-81	VII	13	19	47	37.0	6.81S	76.61	63	4.9	12.76	140	3.42	6.5	1419.2	415.0	C
48-81	VIII	16	21	46	54.2	8.83S	74.67	153	4.9	10.14	141	3.62	5.3	1137.0	314.1	A
49-81	VIII	16	23	11	21.9	8.63S	74.52	151	4.8	10.05	142	3.59	5.7	1126.8	313.9	B
50-81	IX	20	02	54	4.7	8.31S	74.38	169	4.6	10.21	144	3.55	3.7	1146.9	323.3	B
51-81	XI	11	07	52	43.5	8.88S	72.90	48	4.8	8.97	148	3.57	12.5	997.8	279.5	A
52-81	XI	25	17	43	35.1	8.48S	74.24	165	4.7	10.00	144	3.50	2.4	1123.3	320.9	C
53-81	XII	08	16	15	22.0	8.80S	73.10	62	5.1	9.14	148	3.54	6.1	1017.4	287.4	A
54-82	II	05	05	14	36.7	8.13S	74.37	169	4.8	10.35	144	3.42	8.8	1162.3	339.3	C
55-82	VIII	12	08	27	28.0	6.70S	75.80	33	4.7	12.30	143	3.47	6.4	1367.1	394.0	B
56-82	VIII	15	06	11	16.8	10.12S	76.47	117	5.5	10.34	129	3.52	4.6	1154.8	328.2	A
57-83	I	27	04	50	21.0	9.60S	74.42	33	---	9.24	139	3.55	2.1	1027.2	289.5	C
58-83	I	31	12	27	20.0	8.34S	74.17	115	4.8	10.07	145	3.37	3.3	1124.7	233.0	B
59-83	II	10	14	29	33.0	9.40S	74.50	88	5.0	9.41	139	3.56	1.2	1049.2	295.0	C
60-83	II	21	07	32	5.5	6.45S	73.30	33	---	11.24	154	3.62	1.6	1249.3	344.5	C
61-83	II	27	05	05	19.0	13.50S	76.80	33	5.4	8.90	111	3.56	2.3	989.4	279.0	B
62-83	III	13	19	12	15.7	8.35S	74.40	164	4.7	10.20	143	3.59	11.1	1145.1	318.3	A
63-83	III	20	01	56	38.6	10.48S	74.88	18	5.4	8.90	133	3.55	12.8	969.0	278.4	A
64-83	III	21	01	02	51.0	3.74S	78.30	46	4.5	16.16	143	3.46	1.7	1796.1	519.0	C
65-83	IV	15	10	08	20.0	5.99S	75.65	113	5.6	12.60	145	3.59	12.4	1404.5	391.2	A
66-83	IV	24	22	14	53.5	7.27S	74.20	119	4.5	10.97	148	3.67	1.6	1224.7	333.5	C
67-83	V	21	02	54	33.0	9.20S	76.07	187	4.5	10.63	134	3.61	1.5	1135.8	331.2	C
6[illegible]	[illegible]	[illegible]	[illegible]	27	56.0	10.57S	74.78	10	5.2	8.79	133	3.63	8.2	976.7	268.6	B
69-83	V	21	20	05	13.0	10.59S	74.79	10	5.2	8.79	133	3.62	6.4	976.6	269.8	A
70-83	VI	21	09	23	55.2	8.56S	74.38	152	5.1	10.02	143	3.58	6.1	1123.6	313.8	A
71-83	VII	15	20	16	54.1	17.63S	71.57	70	4.8	3.50	72	3.50	3.7	395.1	112.9	C
72-83	VII	21	02	33	29.0	8.58S	74.71	159	4.6	10.20	141	3.57	9.8	1144.4	320.6	B
73-83	IX	24	00	43	40.9	8.40S	74.22	176	4.7	10.05	144	3.60	2.0	1130.9	314.1	A
74-83	XI	25	22	56	25.0	3.77S	76.30	106	4.8	15.02	148	3.44	4.8	1670.0	485.0	A
75-83	XII	03	18	39	51.0	17.61S	69.51	178	---	1.72	52	3.61	1.5	261.2	72.3	C
76-83	XII	05	07	00	31.0	16.80S	72.50	92	---	4.23	86	3.60	2.8	478.9	133.0	C
77-83	XII	13	19	12	16.7	8.35S	74.40	164	4.7	10.20	143	3.57	1.4	1145.1	320.7	C
78-83	XII	16	09	11	52.7	10.15S	75.01	48	4.9	9.24	134	3.52	12.4	1027.8	291.3	A
79-83	XII	17	17	44	19.0	8.15S	74.55	149	4.6	10.22	143	3.51	2.4	1145.3	326.3	B
80-83	XII	19	06	26	3.5	15.42S	74.58	71	5.2	6.33	101	3.59	3.6	706.9	196.5	A
81-83	XII	25	05	32	40.9	5.09S	73.42	37	5.2	12.51	156	3.58	4.2	1390.5	388.8	A
82-84	I	09	18	35	20.0	6.05S	74.25	23	5.1	12.03	150	3.46	1.6	1336.8	386.3	A
83-84	VI	26	16	47	36.5	8.69S	74 45	163	5.0	9.96	142	3.57	4.5	1116.5	313.5	B
84-84	IX	30	21	31	15.7	8.68S	74.20	156	5.2	9.87	143	3.56	3.3	1107.7	311.3	A

85-86	I	10	11	18	5.0	15.90S	74.70	73	4.6	6.34	97	3.49	2.1	708.2	203;0	C
86-86	I	11	19	42	23.2	9.51S	77.50	51	5.4	11.51	128	3.49	3.8	1280.0	366.8	B
87-86	I	17	04	15	0.0	10.69S	78.44	46	5.5	11.61	121	3.62	4.3	1290.8	356.0	B
88-86	III	09	16	47	52.2	8.10S	80.11	33	4.8	14.45	127	3.61	1.7	1605.9	444.8	C
89-86	III	18	10	02	30.8	16.00S	72.30	126	4.7	4.08	98	3.56	0.7	470.5	132.2	C
90-86	IV	02	06	49	30.4	4.10S	80.80	33	4.7	17.55	135	3.58	4.7	1950.2	544.7	C
91-86	IV	08	18	02	44.6	7.90S	73.90	173	5.8	10.22	147	3.64	2.7	1148.6	315.4	A
92-86	IV	23	20	27	12.7	3.91S	81.02	48	5.4	17.85	136	3.69	1.0	1983.8	534.3	B
93-86	IV	28	13	43	12.0	15.00S	75.50	57	4.8	7.28	103	3.55	5.7	810.9	228.2	B
94-86	V	21	03	56	56.9	3.44S	76.70	126	4.9	15.51	148	3.43	5.3	1727.9	504.1	P
95-86	VI	27	21	48	55.7	16.19S	73.56	85	5.0	5.25	94	3.54	4.7	589.5	166.5	B
96-86	VII	14	06	34	44.5	9.60S	72.40	33	4.9	8.03	149	3.56	1.1	892.8	249.5	C
97-86	VII	17	18	11	22.9	9.20S	79.90	33	4.9	13.67	124	3.65	1.7	1519.2	416.1	C
98-86	VII	21	00	40	46.8	14.10S	76.20	43	4.5	8.18	108	3.51	1.0	909.9	259.2	C

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1-74	VIII	01	23	36	52.0	0.84N	79.40	79	4.7	20.57	148	3.57	0.8	2286.9	641.0	C
2-74	VIII	17	08	19	45.0	1.64S	81.21	19	4.7	19.64	140	3.50	1.6	2182.3	623.0	C
3-80	XI	09	13	02	57.2	1.62S	80.53	33	4.0	21.82	146	3.58	1.8	2424.6	677.8	C
4-80	XI	29	06	33	53.2	1.42N	84.58	33	4.5	24.15	138	----	---	2683.5		
5-81	IV	17	06	13	12.8	1.35N	81.01	33	4.2	21.87	145	3.62	1.5	2430.2	671.2	C
6-81	IV	22	09	47	21.0	2.82S	78.70	33	4.4	17.18	143	3.54	0.9	1909.2	539.0	C
7-81	V	06	21	34	49.4	2.07S	80.99	36	5.4	19.17	139	3.59	5.3	2130.3	592.6	B
8-81	V	06	21	36	7.2	1.95S	80.99	36	5.8	19.26	140	3.62	1.5	2140.3	590.8	C
9-81	V	13	03	58	12.0	1.29S	78.60	33	4.6	18.34	146	3.37	4.9	2038.0	604.0	B
10-81	V	26	04	55	30.6	3.03S	79.19	102	5.1	17.29	14?	3.52	2.4	1923.8	546.4	C
11-81	VI	24	13	25	37.0	2.50S	79.09	107	4.5	17.65	143	3.60	1.3	1964.0	546.0	C
12-83	VII	21	06	46	4.9	1.33S	80.99	54	5.0	19.74	141	3.55	1.3	2194.0	617.6	C
13-83	XII	21	18	36	56.2	0.38N	79.90	47	5.2	20.45	146	3.61	1.2	2272.7	628.8	B
14-86	I	19	08	03	29.0	0.61N	79.70	50	4.9	20.65	146	3.61	0.5	2295.0	634.5	C
15-86	I	28	06	51	46.6	1.84S	77.46	175	5.2	17,27	148	3.67	0.9	1926.8	524.0	B
16-86	II	07	02	47	52.0	1.31N	85.21	49	4.6	24.48	137	---------		2720.4	-----	
17-86	III	28	21	19	23.4	1.52S	78.06	167	4.8	17.86	147	3.68	0.3	1991.4	540.8	B
18-86	IV	18	02	03	54.0	2.64S	78.50	119	4.2	17.15	144	3.62	1.1	1910.3	527.7	C
19-86	V	24	17	01	17.7	1.41S	77.75	182	4.6	17.78	148	3.57	0.7	1983.9	556.3	C
20-86	VI	27	21	07	57.0	0.05N	77.40	38	4.3	18.85	151	3.60	1.1	2094.8	581.9	C

Characteristics of Lg

Short period waves of apparent velocity around 3.5 km/s, transversely polarized are considered here (exclusive of faster Li and slower Rg, though other authors consider those together with Lg).

In South America Lg originates in most of earthquakes not deeper than 200 km and are transmitted by continental crust, mostly by ancient stable zones.

The velocity for the beginning of the waves in most cases may not be measured precisely, because of its emerging character. We considered the apparent group velocity, that is to say, the ratio of hypocentral distance to the time between origin and initial Lg recording (without any distinction of time for waves before being confined within a guide layer and the time travel along that layer). That apparent velocity was found to change between 3.44 and 3.69 km/s (coincident with the S-wave velocity within the crust).

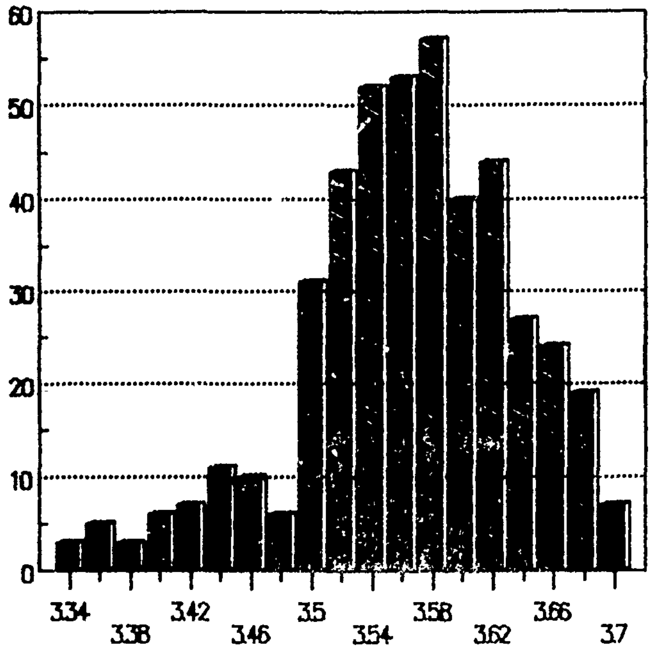

Fig. 1 .- Lg apparent velocity (km/s).

The amplitude is a function of magnitude, epicentral distance and local conditions both of generation and transmission. To normalize a measure avoiding any effects of distance and magnitude, we calculate Lg amplitude/P amplitude; this ratio changes between 0 and 17, with an exceptional case of 38.

Bath (1954), with the same goal of normalization, suggests a relative measure of wave energy that we shall name here by the symbol e. He acknowledges some inconsistencies of results, as we acknowledge for Lg/P; so we shall use both ways of normalization.

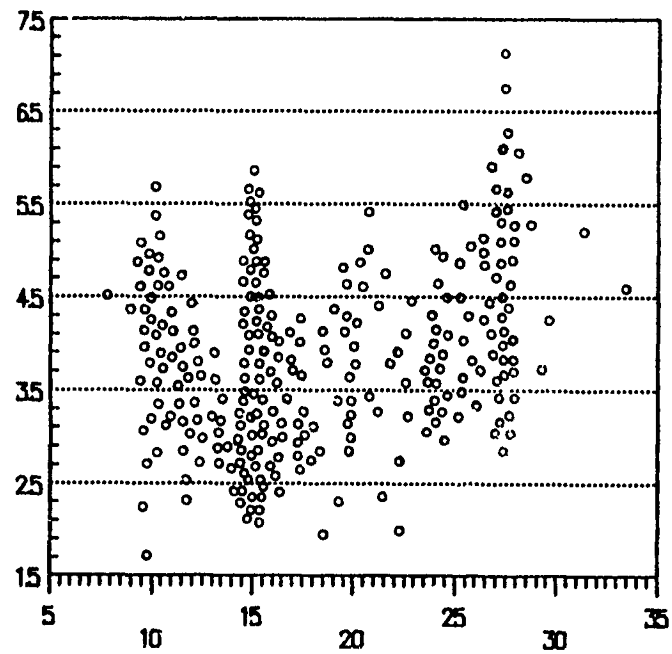

Fig. 2 .- Normalized energy vs. epicentral distance.

According to the transmission efficiency and the aspect of Lg (fig. 3), we distinguish:

Type A: Clear waves, well developed, beginning almost always impulsive.

Type B: Clear waves interfered by low frequency waves, emergent beginning (exceptionally impulsive), starting with medium amplitude to decrease then gradually.

Type C: Waves not clear, disturbed by noise, emergent or really doubtful beginning, small but rather constant amplitude.

Often Lg splits into several phases, that means several arrivals at different velocity and amplitude but coincident for the other aspects (until the moment it is not possible to decide if they have traveled along different layers, or the whole crust

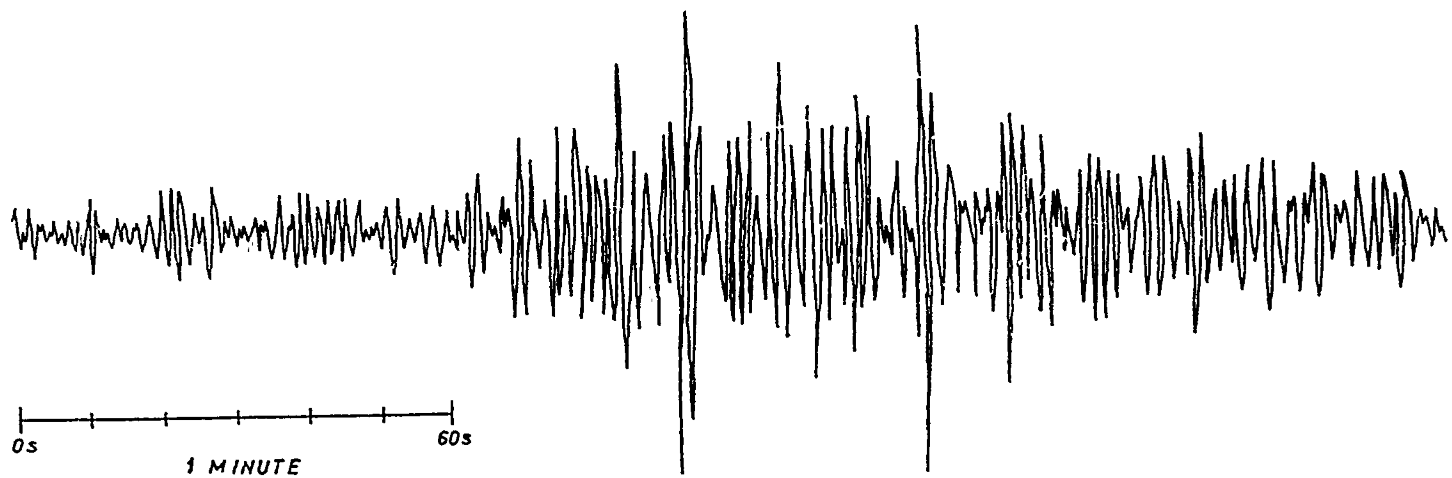

Fig. 3a .- Type A. June 14, 1984; Venezuela, E-W component.

Fig. 3b .- Type B. November 26, 1984; Colombia, E-W component.

Fig. 3c .- Type C. November 10, 1980; Argentina, E-W component.

is the guide for Lg1 and the most superficial layer guides Lg2).

The lack of uniformity in wave relevance is the main characteristic of South America, recommending by itself to forget any possibility of considering it instrumental for magnitude measurements.

Let us consider different measures for the different seismogenic regions:

Venezuela, Trinidad and Southern Caribbean

Types A and B are predominant. Lg lasts about two minutes, generally disappearing below Love and Rayleigh waves. The mean velocity amounts 3.58±.003 km/s. Several arrivals, even four, are common.

Mean amplitude Lg/P is 4.5±.395, being differences of regional character; e is 4.45±.120.

In the eastern part of that region focal depth may reach 144 km, that means the Caribbean plate subduction. Western earthquakes around Lake Maracaibo all are shallower than 75 km.

Colombia

The three types, A, B, C, are found in Colombia. Mean apparent velocity is 3.57±.006km/s. Amplitude changes so much that the mean 2.77±.294 is of little interest. For earthquakes deeper than normal Lg lasts two and a half minutes.

We need to distinguish three zones: The Lg from the West Coast and Western Cordillera is much attenuated at LPB and type C is predominant. For the Central Cordillera type B predominates. In the most eastern stripe (subandean to flat lands) type A prevails and several phases are apparent.

The seismic nest of Bucaramanga is a point of special interest: earthquakes occur at 125 to 175 km depth (only one exception of depth 59 km was found), meanwhile in the rest of Colombia only four other earthquakes occurred deeper than 81 km.

Other phases: S only was visible in 36 cases among 52; Rg only in several surface earthquakes which had Lg type A; in general other phases are much attenuated.

Ecuador

Type C is predominant. Small amplitude 1.52±.245 as an average, but larger e = 3.89±.138. Several distinct phases of Lg, specially for intermediate depth foci, the faster one with a mean velocity 3.58±.005km/s.

Earthquakes originate partly near the coast at a depth less than 55 km; the others at the subduction zone are deeper, reaching 182 km.

Rg hardly is visible; several phases in between P and Lg are more relevant than for Venezuela and Colombia earthquakes.

Brazil

Deep earthquakes from Western Brazil were not taken into account after realizing that they do not generate any Lg. The other Brazilian earthquakes occur all at the crust (unless one calculation at 63 km be correct).

The path of Lg is mostly through Brazil and Guyana Shields, with an apparent velocity 3.58±.007 km/s; so Lg is well developed, type A, with a mean amplitude Lg/P 5.2±.245 and e 4.53±.188.

P and other seismic phases are clear.

Peru and Peru-Brazil Border

Type A predominates, independently of distance. Focal depth between 0 and 198 km. Superposition of Love and Rayleigh waves disturbes the final Lg. Mean apparent velocity is 3.56±.003 km/s; mean e = 4.0±.109 . Approximate duration of Lg one minute.

In most cases two or more phases are clear within the Lg.

Chile

North Chile earthquakes occur at less than 10 degrees of distance to LPB, making difficult or also uncertain Lg analysis.

Type C predominates for any depth (ranging from 4 to 198 km). Apparent velocity may change from 3.35 to 3.69 km/s. As a general rule wave period is longer than for other azimuths, what is important to be remarked, since for this range of wave period instrumental gain is low, so that at a first glance Lg amplitude is minimun and, when measuring it, we find Lg/P 4.75±.255; e 3.21 ±.124 but P attenuation is strong, what allows a calculation larger for Lg/P. Lg always is a simple phase, meanwhile a double P appears for intermediate depth earthquakes (not for surface earthquakes).

Argentina

Most of the earthquakes are superficial, but several at the Nazca plate subduction are deeper, reaching 198 km, all being of type C. Lg apparent velocity is low, averaging 3.56±.005 km/s. Lg/P is 2.4±.225; e is 3.1±.07. Three to five seconds after first P arrival, another phase is relevant; on the contrary Lg is always simple. Length of period is rather large (the same as remarked for Chilean earthquakes).

Lg both for Argentina and Chile has a short duration or it does not appear at all; often it emerges on the S coda. It is not clear why some earthquakes produce Lg and other with identical apparent circumstances do not.

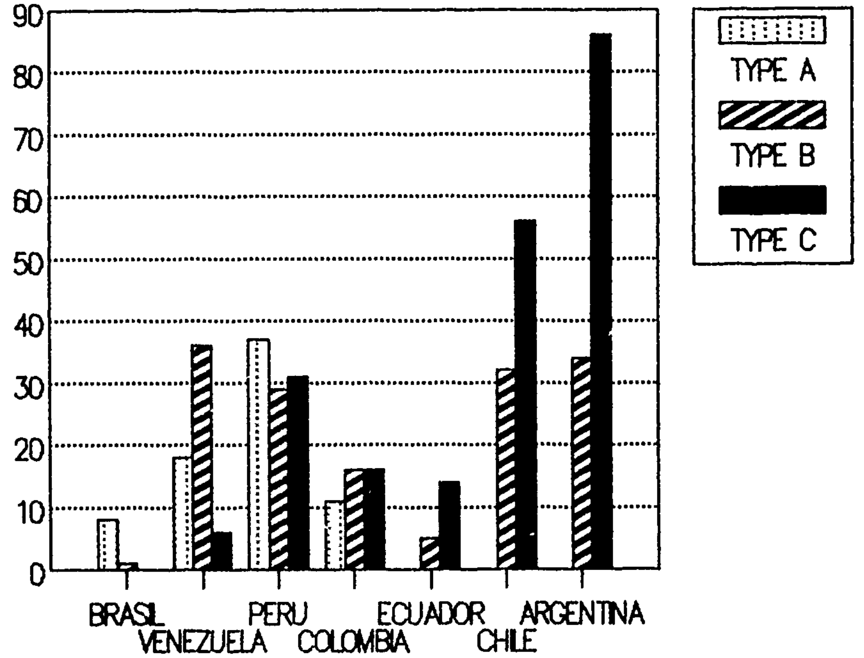

Fig. 4 .- Comparison of Lg types of recording in LPB, acording to origin regions.

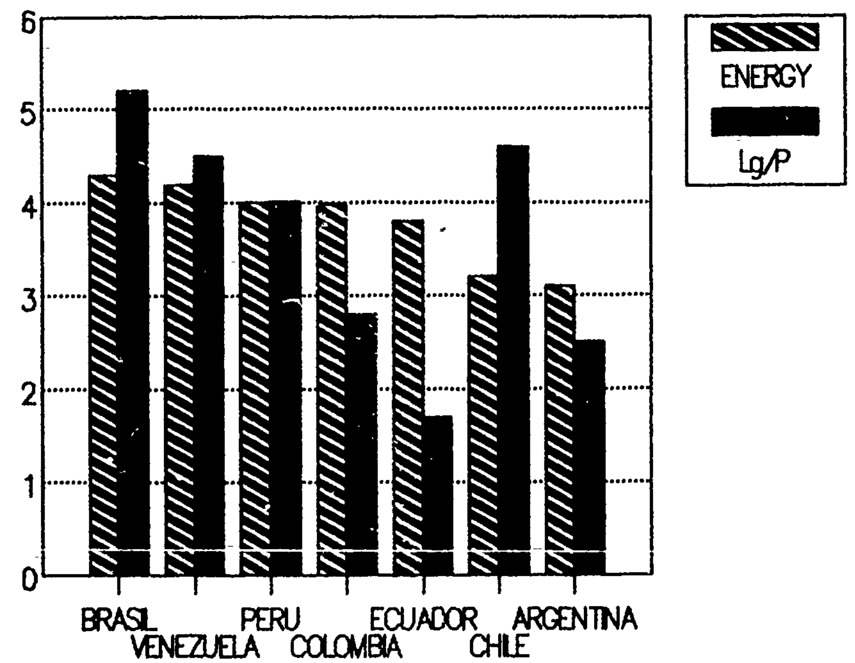

Fig. 5 .- Normalized wave energy and Lg/P amplitude.

Lg according to path characteristics

Amplitude and type of Lg depends more on the wave path than on the origin conditions.

Propagation of Lg along ancient stable structures is really efficient; at the other end, 200 km of oceanic path extinguishes completely Lg. The complex cordilleran structures have been considered inefficient paths; nonetheless the analysis of LPB records only gives a partial confirmation. Let us see this matter with more detail.

The earthquakes originated in Brazil and Venezuela have most of their path across Brazilian and Guyana Shields and they show large Lg at LPB.

Records of Chilean and Argentinian earthquakes have smaller or no Lg, being their path along cordileran structures (but our measures give stronger Lg, mainly for longer periods, because also P is small).

Western Colombia earthquakes need to undercross the Cauca Graben. This, according to some authors, means a line of contact of an ancient subduction; others interpret it as a contact of obduction; any way it is considered a plate discontinuity which may difficult Lg crossing. Moreover magmatic chambers may constitute obstacles to Lg. Earthquakes from the eastern side of Cauca Graben produce a clearer Lg in La Paz. Again foci in the most eastern seismogenic Colombia have a relevant Lg in LPB records.

The path from Peru and Peru-Brazil Border proves to be of medium efficiency: Lg waves are rather large, with several arrivals, but last only a short time. Such complex path merits a deeper analysis.

Many intermediate depth earthquakes produce remarkable Lg in South America, against the hypothesis that Lg originates always at surficial layers; probably the efficiency in Lg generation depends on the strike of subduction.

Geological crustal profiles for different paths across South America may be seen in Alcócer (1989), Ayala (1989), Couch et al. (1981), Meissner et al. (1976).

PART II. Lg RECORDED IN SEVERAL SOUTH AMERICAN STATIONS

After considering with detail Lg propagated through South America, recorded at LPB station, now it is much easier to revise Lg in other stations belonging to the World-Wide Seismograph System Network, and to show numerical results of our analysis. We have tried to make that analysis the most objective possible, studying the same earthquakes, by using stations similar to LPB and applying the same criteria as in part I. See table II (similar to table I).

TABLE II

St	DATE y	m	J	H h	m	s	LAT (o)	LONG (o)	W P (km)	mb	D (o)	Az (o)	V (km/s)	Lg/P	D (km)	t (s)	Amp (mU)	T (s)	e	CH
										COLOMBIA										
LPB	73	VIII	08	02	58	36.2	7.02N	72.11	39	5.0	23.73	170	3.56	0.3	2636.9	738.8	649.0	1.5	5.39	A
ANT											30.60	177	3.65	1.1	3400.3	930.8	18.0	1.4	2.54	C
ARE											23.34	178	3.49	2.3	2593.6	744.6	60.6	1.3	3.27	B
NNA											19.46	194	3.56	1.5	2162.5	607.3	77.5	1.2	3.59	C
BOG											3.87	219	3.66	2.0	343.3	93.8	744.0	1.0	4.33	C
LPB	80	XI	18	16	34	38.5	6.82N	72.92	171	4.9	23.68	168	3.53	1.0	2635.6	746.5	30.0	0.8	3.55	B
ARE											23.20	176	3.62	1.1	2583.4	711.5	14.0	1.2	2.41	C
CAR											6.97	58	3.66	1.9	793.1	216.5	240.0	1.0	4.19	C
LPB	81	VIII	05	12	58	28.0	3.98N	76.39	62	5.1	21.92	158	3.56	1.9	2436.3	685.0	80.0	1.0	3.68	A
ARE											20.83	176	3.43	4.0	2315.3	675.7	166.0	1.1	3.98	C
NNA											15.82	182	3.50	2.7	1750.8	502.0	107.0	1.0	3.18	C
SJG											17.30	35	3.58	1.0	1923.2	537.8	114.0	1.5	3.46	C
TRN											21.20	158	3.50	1.7	2434.1	521.2	137.5	1.5	3.78	C
LPB	82	VIII	15	07	26	28.3	6.74N	73.01	172	4.9	23.50	207	3.54	3.3	2616.7	730.7	99.0	1.2	4.12	C
NNA											8.73	191	3.57	1.1	970.5	271.7	40.0	0.8	1.90	C
PEL											39.70	177	3.67	1.2	4411.3	1201.7	8.4	0.5	3.02	C
TRN											12.12	70	3.55	0.5	1346.6	331.9	63.0	0.9	3.49	C
LPB	83	VIII	29	08	24	24.7	6.80N	73.00	169	5.0	23.70	168	3.65	4.4	2638.5	721.3	228.0	1.3	4.60	A
ARE											23.14	176	3.53	5.8	2576.2	729.8	215.0	1.8	4.25	C
NNA											19.00	3	3.44	1.6	2117.8	615.3	133.0	1.8	3.69	C
SJG											13.10	30	3.64	1.3	1465.3	402.7	46.0	1.1	2.92	C
										VENEZUELA										
LPB	76	XII	21	04	32	31.0	8.80N	61.70	40	4.7	25.92	194	3.68	1.9	2880.0	783.0	146.0	1.1	4.98	A
ARE											26.88	201	3.59	3.0	2986.9	831.1	82.5	1.5	4.24	B
NNA											25.24	216	3.67	4.5	2838.0	774.0	74.2	1.4	4.15	B
TRN					NO Lg						1.90	8			214.9					

LPB	77	XII	17	23	25	10.0	10.90N	65.50	14	4.6	27.38	186	3.54	9.5	3042.2	859.4	152.0	1.3	5.10	A
NNA											25.39	207	3.60	3.9	2821.1	765.2	67.0	1.8	4.04	B
TRN											3.93	93	3.66	3.6	443.5	121.2	650.0	1.0	5.24	C
LPB	79	VII	17	08	49	20.8	10.25N	62.24	40	4.6	27.00	193	3.54	6.6	3000.2	847.2	247.5	1.5	5.38	A
NNA											26.43	214	3.48	2.2	2936.9	843.8	178.0	1.8	4.92	B
SJG											8.69	335	3.56	2.9	966.4	271.2	117.5	1.6	3.35	C
TRN					NO Lg						0.91	64			100.7					

ARGENTINA

LPB	74	VIII	17	22	12	45.0	22.88S	64.41	47	4.7	7.21	331	3.63	3.0	802.5	221.1	54.2	1.2	3.13	B
ANT											5.58	260	3.51	2.1	521.3	177.0	503.0	1.5	4.70	B
ARE											9.23	313	3.68	1.4	1026.6	293.8	47.5	1.1	3.24	B
BOG											28.92	340	3.58	0.8	3213.3	898.1	126.0	1.4	4.72	C
NNA											15.05	310	3.60	1.4	1783.9	495.0	36.0	1.4	3.18	C
QUI											26.38	327	3.65	1.2	2931.5	801.0	106.4	0.6	5.24	B
LPB	74	IX	03	20	22	20.5	25.89S	67.64	45	4.8	9.30	357	3.40	6.8	1034.3	297.5	90.0	1.4	3.42	C
ARE											10.05	338	3.51	[illegible]	1117.6	318.0	281.0	2.0	4.15	B
ANT											3.34	310	3.64	2.5	373.8	102.5	45.2	0.6	2.91	C
LPB	76	V	04	02	07	11.3	27.30S	65.80	58	4.7	10.96	348	3.30	3.2	1219.1	359.6	75.0	1.4	3.55	C
ANT											5.53	310	3.59	6.9	617.2	171.8	289.0	1.1	4.48	A
ARE											11.23	348	3.35	2.4	1249.1	372.8	24.0	1.0	2.87	C
NNA											18.46	324	3.33	2.7	2051.9	616.7	70.2	2.0	3.56	C
PEL											7.41	213	3.55	3	825.4	232.7	585.0	1.6	4.85	A
LPB	77	I	25	00	50	49.0	33.59S	68.27	20	5.4	16.98	1	3.54	5.9	1806.7	533.0	239.2	1.5	3.55	B
ANT											10.03	349	3.58	4.0	1114.6	311.0	112.5	1.1	2.80	C
ARE											17.30	350	3.55	1.1	1922.3	541.0	330.0	1.5	3.04	B
BOG											30.39	351	3.66	0.2	4265.5	1163.5	55.2	0.9	3.30	C
LPA											8.18	100	3.63	1.7	909.1	250.0	1150.0	1.1	4.60	A
NNA											22.80	338	3.61	0.2	2542.3	704.0	67.5	1.7	2.57	C
LPB	77	XI	26	13	52	21.5	31.34S	67.49	33	5.0	14.75	358	3.65	0.7	1639.2	448.5	34.0	0.9	2.91	C
NNA											21.11	334	3.64	1.7	2345.8	630.0	52.0	1.4	3.16	C
PEL											3.25	236	3.62	1.6	362.6	100.0	364.0	0.6	4.34	C

LPB	80	V	25	21	46	11.8	31.33S	68.00	43	5.0	14.73	360	3.53	1.5	1637.2	463.2	22.5	0.8	2.66	C
ANT											7.89	344	3.62	5.3	876.6	263.8	89.9	1.2	3.08	B
ARE											15.10	168	3.66	1.8	1678.3	458.2	16.0	0.8	2.38	C
BOG											36.20	350	3.66	1.7	4022.4	1098.2	24.0	0.8	3.43	C
CAR											41.60	20	3.60	1.8	4622.4	1283.2	15.3	0.9	3.06	C
LPB	83	XII	04	02	06	35.4	31.77S	69.42	113	5.2	15.21	5	3.51	3.7	1693.7	482.5	90.0	1.4	3.04	B
ANT											8.08	354	3.52	4.0	904.8	256.8	100.0	1.0	2.99	C
CAR											42.00	10	3.56	2.7	4668.0	1308.0	85.2	1.5	3.75	B
NNA											19.00	345	3.51	0.7	2114.1	900.9	35.0	1.1	2.59	C

CHILE

LPB	72	V	15	09	12	56.6	29.70S	71.30	49	4.9	13.40	13	3.52	5.9	1489.7	423.4	112.0	1.4	3.68	C
ARE											13.15	359	3.69	2.8	1461.9	395.4	234.0	1.0	4.58	B
PEL											3.50	172	3.61	4.5	391.9	108.4	135.1	0.7	3.57	C
LPB	72	V	28	07	28	13.5	27.70S	71.30	53	4.8	11.47	15	3.66	16.3	1275.5	348.5	213.0	1.7	4.14	B
ARE											11.16	359	3.56	4.3	1240.7	348.8	256.0	1.0	4.74	B
BOG											32.22	355	3.58	1.1	3580.2	1000.2	42.0	0.6	4.42	B
CAR											38.18	7	3.67	1.3	4242.4	1155.5	146.0	1.8	4.70	B
LPA											13.49	126	3.69	7.7	1499.4	406.5	864.0	1.4	5.64	B
LPB	75	VI	14	10	40	20.3	32.52S	70.68	92	5.6	16.00	9	3.57	38.4	1780.1	497.7	420.0	1.8	3.50	B
ANT											8.79	2	3.62	17.0	980.9	269.7	992.5	1.1	4.65	B
ARE											16.00	357	3.51	0.3	1780.1	516.7	110.5	1.0	2.80	B
BOG											37.07	354	3.64	1.3	4119.9	1129.7	160.0	1.0	3.82	C
LPA											10.89	106	3.56	2.0	1213.5	397.7	367.2	0.9	3.70	B
LPB	82	X	26	03	24	30.1	29.70S	71.40	63	5.6	13.44	14	3.65	2.6	1494.6	409.9	237.5	1.1	3.20	B
ANT											6.03	8	3.54	2.4	672.9	189.9	39.2	0.7	1.58	B
BOG											34.22	355	3.62	0.1	3802.7	1049.9	40.0	1.0	2.55	C
CAR											40.20	7	3.60	1.3	4466.6	231.7	100.0	1.0	3.48	C
PEL											3.48	171	3.63	0.5	391.8	107.9	15.0	1.0	1.00	C
LPB	83	VII	05	16	48	6.6	24.03S	67.05	183	4.8	7.53	352	3.54	1.1	856.4	241.6	42.5	0.9	3.01	C
ARE											8.61	330	3.55	3.1	974.0	274.4	57.0	1.0	3.26	C
BOG											29.30	346	3.63	1.1	3260.7	898.4	15.0	0.5	3.60	C
CAR											34.30	0	3.64	1.0	3815.5	1048.4	10.0	0.6	3.23	C

LPB	83	VII	06	05	54	55.8	24.17S	67.09	189	4.4	7.65	353	3.64	0.5	849.1	233.3	22.5	0.8	3.29	C
ARE											8.71	331	3.52	2.0	986.0	279.8	27.2	0.9	2.16	C
BOG						NO Lg					29.40	346			3272.1					
CAR											34.50	0	3.64	1.3	3837.9	1055.3	18.0	0.8	4.21	C

LPB	83	VII	07	04	50	37.8	20.69S	68.96	112	4.9	4.21	11	3.53	2.5	480.9	136.2	560.0	0.7	4.92	B
ARE											4.84	330	3.37	2.4	549.3	162.8	637.5	0.9	4.90	C
BOG						NO Lg					25.60	348			2846.6					
CAR											31.10	4	3.63	0.[illegible]	3457.3	953.3	19.0	1.2	2.92	C

LPB	83	VII	08	02	03	16.0	20.70S	69.50	82	5.2	3.76	21	3.68	0.8	425.7	115.7	1326.0	0.9	4.84	C
ANT											3.72	193	3.63	1.2	450.0	116.3	91.5	0.8	2.64	C
ARE											4.07	332	3.56	7.6	459.6	129.0	1025.0	1.1	4.49	C
CAR											30.49	5	3.63	0.7	3[illegible]28.7	934.0	71.5	1.5	3.32	C
BOG											24.95	349	3.41	1.0	2773.4	813.6	98.8	1.3	3.56	C

LPB	83	VII	15	23	41	9.5	23.10S	68.20	172	---	6.56	1	3.59	2.1	748.9	208.5	62.0	1.2		C
NNA											13.80	322	3.60	5.6	1542.9	428.5	49.5	1.5		C

LPB	83	VII	19	04	33	24.5	22.06S	68.49	126	4.7	5.51	4	3.62	4.8	625.0	172.5	100.0	1.1	[illegible].56	C
ARE											6.25	333	3.61	15.3	705.8	195.5	185.3	0.9	4.35	C
CAR											32.40	3	3.60	2.2	3602.2	1005.8	21.7	0.7	3.90	C
LPA											15.80	146	3.62	5.6	1760.0	485.0	126.0	1.4	4.26	C
NNA											12.80	320	3.61	3.5	1427.8	395.5	33.7	1.4	2.96	C

LPB	83	VII	19	20	21	28.8	24.23S	67.07	192	4.3	7.72	352	3.57	0.4	878.9	246.5	40.0	1.0	3.78	C
ARE											8.78	331	3.49	5.2	994.3	284.7	34.6	1.8	4.10	C
CAR											34.50	0	3.62	0.6	3838.1	1058.0	32.5	1.1	4.63	B
LPA											13.39	145	3.62	1.1	1490.2	411.2	48.0	0.8	4.50	B
NNA											15.30	321	3.61	1.9	1710.8	473.2	77.4	1.8	4.09	C

LPB	83	VII	19	22	10	39.3	20.65S	69.50	158	---	4.30	18	3.60	1.4	503.2	139.7	53.0	1.1		C
ARE											4.57	335	3.39	5.2	531.8	156.7	142.0	1.0		C
CAR											31.10	5	3.60	6.6	3458.8	960.0	129.0	1.8		C
LPA											17.50	147	3.56	1.0	1950.2	545.7	42.0	0.8		C
NNA											11.10	320	3.56	6.4	1242.4	345.7	198.7	1.7		C

LPB	83	VII	20	05	40	52.5	22.80S	68.85	128	4.7	6.28	7	3.63	6.5	709.4	195.5	137.5	1.1	3.92	C
ARE											6.79	338	3.63	9.1	765.2	210.5	60.3	0.9	3.45	B
CAR											33.20	3	3.57	1.0	3691.1	1032.5	84.5	1.6	4.38	C
LPA											15.40	144	3.56	0.9	1715.9	480.5	36.0	0.8	3.64	C
NNA											13.20	323	3.55	2.8	1472.2	412.5	52.0	1.6	3.25	C

LPB	83	VII	20	22	11	54.0	25.37S	70.20	69	---	9.01	13	3.60	1.6	1003.5	278.6	28.0	0.7		C
ARE											8.95	352	3.40	4.6	996.8	295.0	53.2	1.1		C
CAR											35.90	5	3.56	1.1	3978.3	1116.0	88.0	1.5		C
LPA											14.20	135	3.58	0.9	1579.3	441.0	33.6	0.5		C
NNA											14.70	333	3.58	1.7	1633.4	456.0	33.7	1.4		C
LPB	83	VII	21	07	11	32.3	22.34S	68.54	119	5.5	5.79	4	3.60	4.7	654.2	181.7	3116.0	1.3	4.99	C
ARE											6.47	334	3.50	1.5	728.7	207.7	310.0	1.2	3.13	B
CAR											36.28	3	3.64	3.2	4032.9	1107.7	205.2	2.0	3.59	C
LPA											15.60	146	3.56	2.3	1737.4	487.7	640.0	1.0	4.51	B
NNA											12.98	321	3.58	3.8	1447.1	404.5	123.7	1.5	2.60	C

BRASIL

LPB	80	XI	20	03	29	41.8	4.50S	38.30	00	5.2	31.63	245	3.57	6.4	3514.4	983.2	1625.0	1.6	6.00	A
ARE											34.71	247	3.69	5.1	3856.6	1044.3	495.0	2.5	4.67	B
CAR											32.16	298	3.64	2.0	3573.3	980.7	203.0	1.5	4.27	B
LPB	86	XI	30	05	19	48.3	5.50S	35.70	5	4.9	33.52	248	3.58	2.2	3724.4	1040.3	115.0	1.2	4.55	A
CAR											34.86	297	3.44	10.3	3873.3	1121.0	103.0	1.8	4.13	B

PERU-BRASIL

LPB	78	V	28	06	07	3.8	6.70S	75.00	75	4.8	11.60	148	3.47	5.1	1291.1	372.1	205.0	1.2	4.42	B
ARE											10.10	164	3.76	2.3	1124.7	296.2	35.0	1.1	2.86	C
NNA											5.74	204	3.64	2.8	642.2	176.2	161.0	0.8	4.09	B
LPB	82	VIII	15	06	11	16.8	10.12S	76.47	117	5.5	10.34	129	3.52	4.6	1154.8	328.2	520.0	1.0	4.04	A
ANT											14.69	158	3.64	2.0	1636.4	453.2	258.0	1.8	3.17	C
NNA				NO Lg							1.89	191			240.4					
PEL											23.52	168	3.68	3.7	2613.3	710.2	247.0	2.5	3.20	C
TRN											25.50	36	3.63	2.2	2835.7	780.4	688.0	1.8	4.41	B
LPB	83	III	20	01	56	38.6	10.48S	74.88	18	5.4	8.90	133	3.55	12.8	989.0	278.4	372.3	0.9	3.93	A
NNA											2.44	232	3.60	1.2	271.7	75.4	170.0	1.0	2.79	C
PEL											22.88	171	3.43	0.8	2542.3	741.4	108.0	2.0	2.84	C

LPB 83	V	21	19	27	56.0	10.57S	74.78	10	5.2	8.79	133	3.63	8.2	976.7	268.6	275.0	1.1	3.84	B
ANT										13.70	163	3.65	6.9	1522.2	417.0	38.5	1.4	2.23	C
ARE										6.67	152	3.63	4.0	741.2	204.0	222.5	1.1	3.48	B
BOG										15.11	3	3.47	4.2	1678.9	484.0	117.8	1.2	3.40	C
CAR										22.35	21	3.45	1.9	2483.3	719.8	102.3	1.2	3.57	B
LPA										28.70	150	3.60	1.0	3188.9	884.0	28.0	0.6	3.25	C
NNA										2.46	335	3.69	2.2	273.5	74.0	310.0	1.2	3.07	B
PEL										22.78	171	3.48	2.4	2531.1	728.6	88.0	1.5	3.27	C

LPB 83	V	21	20	05	13.0	10.59S	74.79	10	5.2	8.79	133	3.62	6.4	976.6	269.8	260.0	1.0	3.88	A
ANT										13.70	163	3.40	2.8	1522.2	447.0	33.7	1.4	2.11	C
ARE										6.65	152	3.66	10.9	740.1	202.0	595.2	1.2	4.26	B
BOG										15.13	3	3.63	8.7	1681.1	462.0	280.5	1.5	4.26	B
CAR										22.37	21	3.61	0.7	2485.6	688.0	49.6	1.2	2.94	B
LPA										21.70	150	3.59	1.6	3188.9	887.0	136.8	1.3	3.96	C
NNA										2.44	235	3.61	3.5	271.3	69.0	110.2	1.3	2.10	C
PEL										22.76	171	3.58	8.1	2528.9	707.0	48.7	1.6	2.69	C

LPB 83	VI	21	09	23	56.2	8.56S	74.38	152	5.1	10.02	143	3.58	6.1	1123.6	313.8	362.5	1.1	4.35	A
ARE										8.34	161	3.50	2.2	939.0	268.4	115.0	0.9	3.53	B
BOG										13.10	1	3.50	2.1	1463.5	417.6	155.0	1.2	3.72	B
CAR										20.34	27	3.51	1.3	2265.1	644.4	92.0	1.1	3.66	B
PEL										24.70	173	3.62	6.0	2741.6	758.8	52.0	1.6	2.99	C

LPB 83	VII	15	20	16	54.1	17.63S	71.57	70	4.8	3.50	72	3.50	3.7	395.1	112.9	600.0	1.0	4.74	C
NNA										7.58	317	3.44	4.5	845.1	245.9	275.0	1.5	4.19	B
SJG										35.92	9	3.67	1.0	3991.7	1085.9	39.0	0.9	4.30	C

LPB 83	XII	03	18	39	51.0	17.61S	69.51	178	---	1.72	52	3.61	1.5	261.2	72.3	800.0	1.0		C
ANT										6.10	188	3.61	0.5	700.7	194.0	12.0	0.8		B
CAR										28.10	5	3.56	0.5	3127.3	879.0	10.5	0.8		C
NNA										9.03	307	3.53	3.1	1019.0	288.0	47.2	1.4		C

LPB 83	XII	05	07	00	31.0	16.80S	72.50	92	---	4.23	86	3.60	2.8	478.9	133.0	84.0	1.2		C
ANT										7.10	164	3.62	8.4	794.2	219.0	7.0	0.6		C
CAR										27.70	12	3.56	3.1	3079.1	864.0	67.5	1.4		C
NNA										6.40	318	3.60	1.5	717.0	199.0	12.5	1.1		C

ECUADOR

LPB	83	VII	21	06	46	4.9	1.33S	80.99	54	5.0	19.74	141	3.55	1.3	2194.0	617.6	165.0	1.5	4.06 C
ARE											17.17	149	3.57	1.5	1968.5	535.1	125.5	1.1	3.98 C
CAR											18.28	50	3.59	1.2	2031.8	565.1	60.0	1.0	3.48 C
LPA											11.40	159	3.57	0.7	1267.8	355.1	42.0	0.8	3.02 C
NNA											11.36	159	3.56	1.4	1263.4	355.1	186.0	1.2	3.96 B

Lg apparent velocity and normalized amplitude appear independent of the distance in spite of data dispersion, as it appears in figures 6 and 7 .

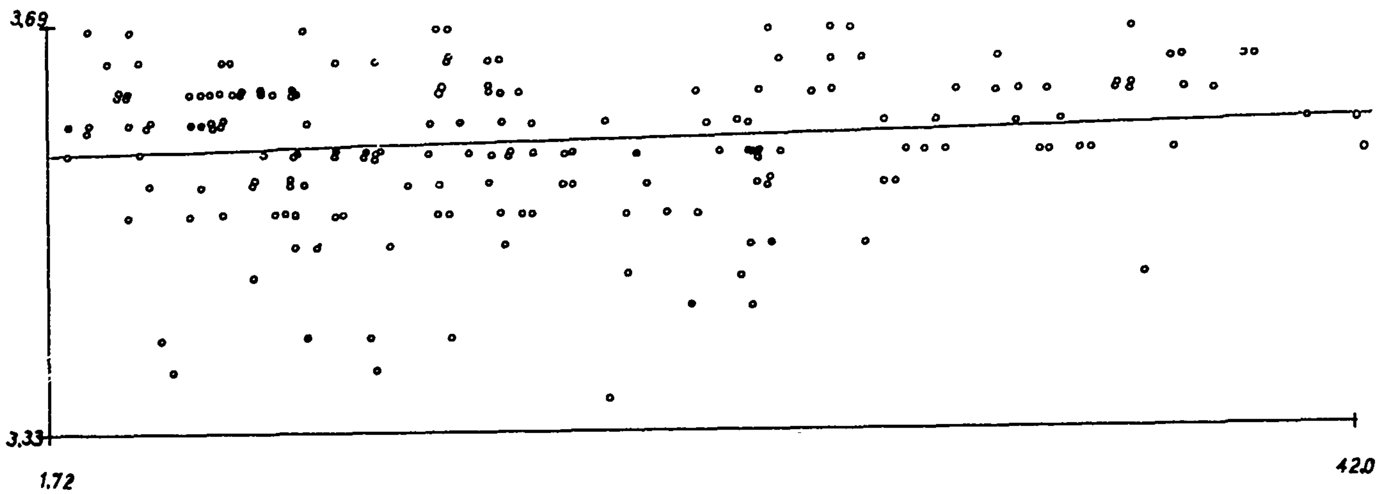

Fig. 6 .- Lg apparent velocity vs. distance.

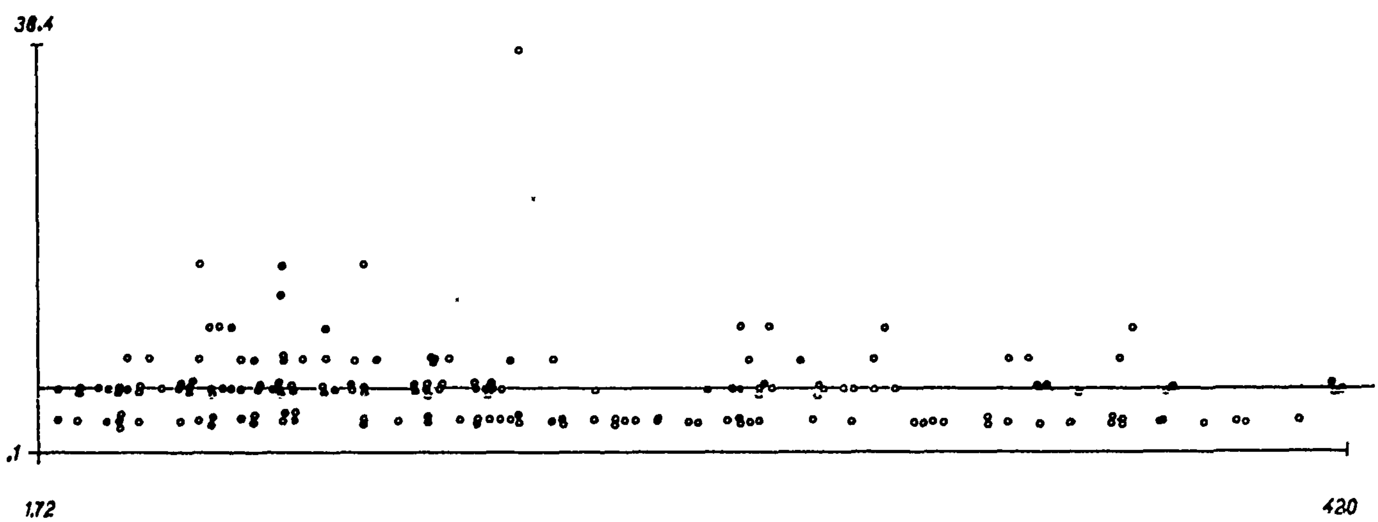

Fig. 7 .- Lg/P vs. distance.

Comparison of Lg/P and e is presented in fig. 8, again with a high data dispersion.

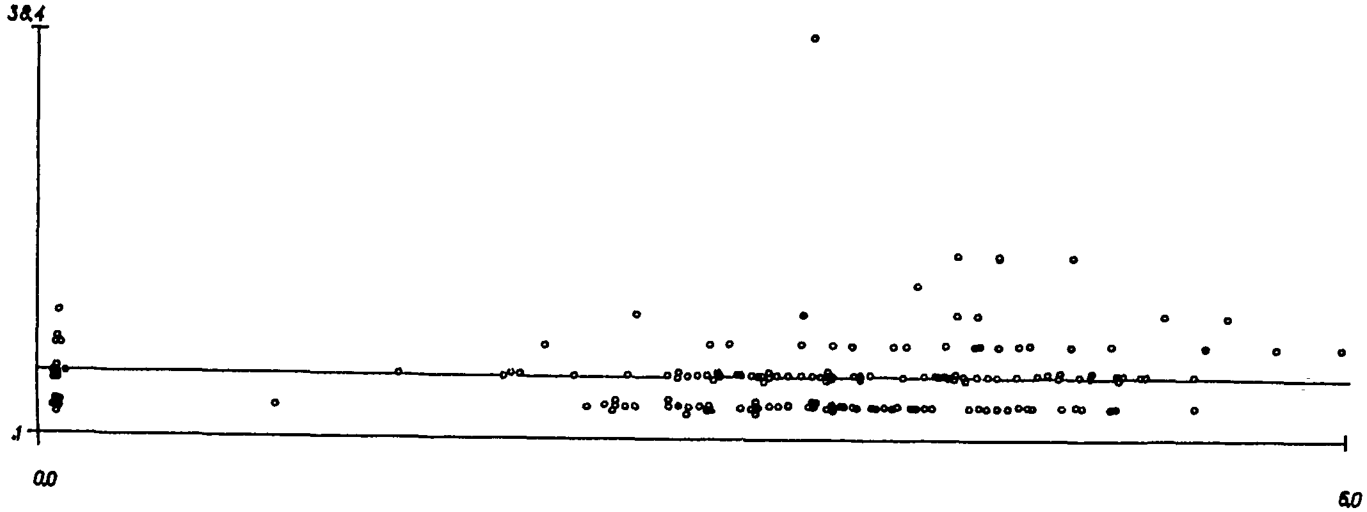

Fig. 8 .- Lp/P vs. energy.

Table III shows the frequency of occurrence of each apparent velocity interval; practically data extends between 3.48 and 3.68 km/s, what may seem a too broad range, but it happens because in most cases Lg has an emergent character.

Table III .- Lg apparent velocity.

----CLASS	LIMITS----		FREQUENCY	PERCENT (%)	
3.30	-	3.32	0	.00	
3.32	-	3.34	1	.56	)-
3.34	-	3.36	1	.56	)-
3.36	-	3.38	1	.56	)-
3.38	-	3.40	2	1.13	)--
3.40	-	3.42	3	1.69	)---
3.42	-	3.44	2	1.13	)--
3.44	-	3.46	4	2.26	)----
3.46	-	3.48	2	1.13	)--
3.48	-	3.50	5	2.82	)-----
3.50	-	3.52	12	6.78	)-------------
3.52	-	3.54	9	5.08	)----------
3.54	-	3.56	13	7.34	)--------------
3.56	-,	3.58	23	12.99	)-------------------------
3.58	-	3.60	14	7.91	)--------------
3.60	-	3.62	22	12.43	)-----------------------
3.62	-	3.64	25	14.12	)----------------------------
3.64	-	3.66	15	8.47	)-----------------
3.66	-	3.68	14	7.91	)----------------
3.68	-	3.70	9	5.08	)-----------
		TOTAL	177	100.00	

Table IV sets off that commonly Lg amplitude equals P amplitude (in South America in many cases Rg phase is much larger than Lg; it should be carefully analysed in the future). An exception of abnormally high Lg/P = 38 acquires a special relief.

Table IV .- Normalized amplitude Lg/P

****CLASS	LIMITS****	FREQUENCY	PERCENT (%)	
.00	- 1.00	25	14.12	)*************
1.00	- 2.00	54	30.51	)*****************************
2.00	- 3.00	32	18.08	)****************
3.00	- 4.00	16	9.04	)********
4.00	- 5.00	14	7.91	)*******
5.00	- 6.00	11	6.21	)*****
6.00	- 7.00	10	5.65	)*****
7.00	- 8.00	2	1.13	)*
8.00	- 9.00	4	2.26	)**
9.00	- 10.00	2	1.13	)*
10.00	- 11.00	2	1.13	)*
11.00	- 12.00	0	.00	)
12.00	- 13.00	1	.56	)
13.00	- 14.00	0	.00	)
14.00	- 15.00	0	.00	)
15.00	- 16.00	1	.56	)
16.00	- 17.00	1	.56	)
17.00	- 18.00	1	.56	)
38.00	- 39.00	1	.56	)
		TOTAL 177	100.00	

Looking for a more detailed analysis, it will be convenient to consider Lg characteristics separately both by seismogenic regions and by recording stations; actually most of wave paths are partly cordilleran and partly shield.

Table V
Number of each Lg character in South America stations

STA	CHARACTER A	B	C	TOTAL
LPB	12	10	19	41
ANT	1	4	5	10
ARE	0	14	13	27
BOG	0	3	7	10
CAR	0	6	5	11
NNA	0	7	13	20
PEL	1	0	8	9
QUI	0	1	0	1
SJG	0	0	4	4
TRN	0	1	3	4

Table VI shows together apparent velocity, normalized amplitude and normalized energy according to origin regions. It merits some comments:

It is evident that Lg velocity is the same either for all the origin regions or for all the stations considered, since the largest standard deviation calculated was 0.05 km/s in ARE less than for LPB and 0.05 km/s in SJG more than for LPB.

Table VI

REGION	Lg VELOCITY			Lg/P			ENERGY			NO.
	min	max	mean	min	max	mean	min	max	mean	MEASURES
Colombia	3.43	3.66	3.56	0.5	8.3	2.4	2.4	5.4	3.7	19
Venezuela	3.48	3.68	3.60	1.9	9.5	4.2	3.3	5.3	4.6	9
Argentina	3.33	3.68	3.60	0.2	8.1	2.6	2.4	5.2	3.6	32
Chile	3.37	3.69	3.58	0.1	33.4	3.9	0	5.6	3.0	65
Brazil	3.44	3.69	3.58	2.0	10.3	5.2	4.1	6.0	4.7	5
Peru	3.40	3.76	3.58	0.2	12.0	3.4	0	4.7	3.2	42
Ecuador	3.55	3.59	3.57	0.7	1.5	1.2	3.0	4.1	3.7	5

Amplitude Lg/P is larger in LPB than in the other stations in 72 cases, is minor in 28 cases (for 20 earthquakes among 41 LPB has the largest normalized amplitude).

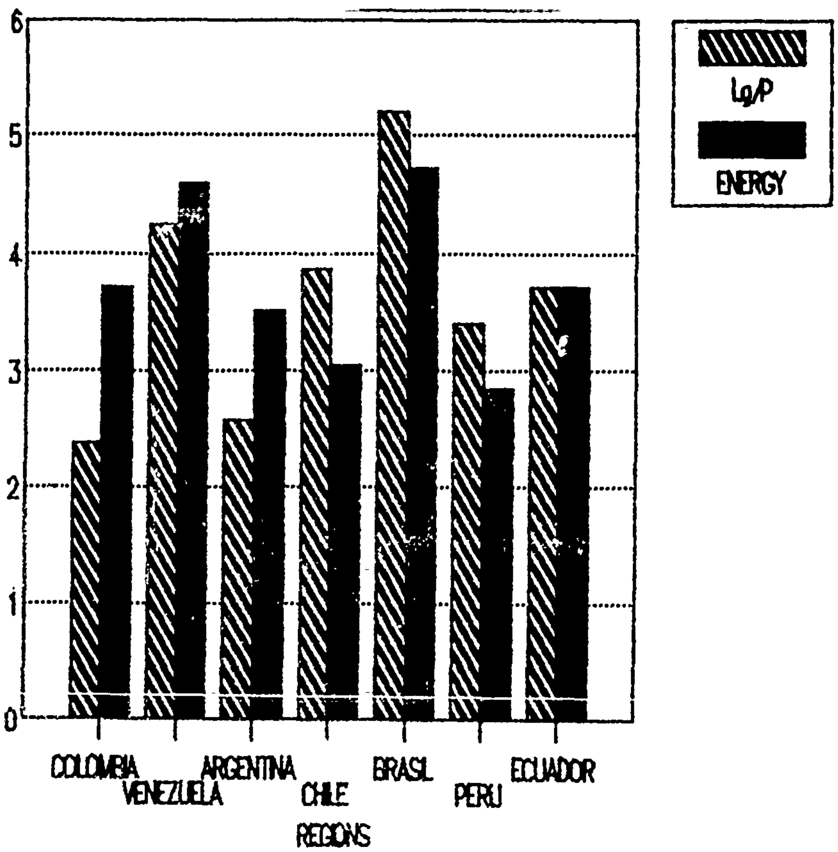

Fig. 9 .- Energy and Lg/P .

Fig. 9 shows the normalized Lg/P and e, but we have to remark again that data for Brazil (reasonable) and Ecuador (unreasonable) are not representative, because they are supported by a small number of cases.

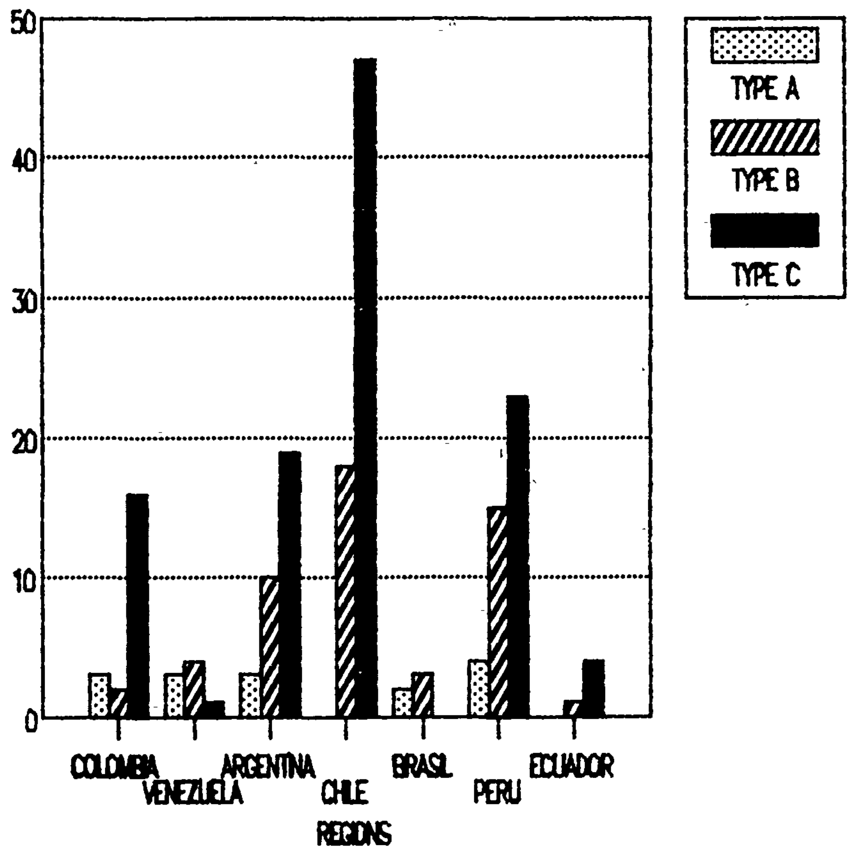

Fig. 10 .- Character of Lg according to origin regions.

Fig. 10 shows the type of Lg recording. We see that for most of the region type C is prevalent, but not so for Venezuela and Brazil.

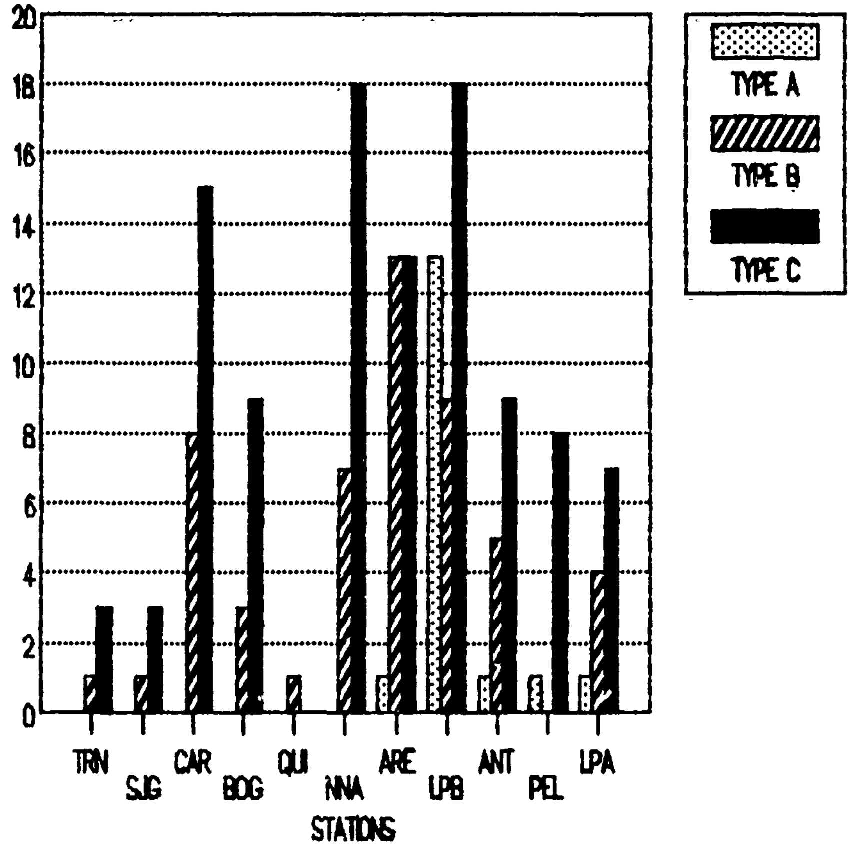

Fig. 11 .- Character of Lg in recording stations.

The Fig. 11 shows the frequency of each type of recording in the stations revised.

Fig. 12 shows schematically South America structure; it has been adapted from Alcócer (1989).

Fig. 13 and 14 show Lg paths epicenter-station, with the indication of Lg recording character. Comparison with fig. 12 is self explanatory.

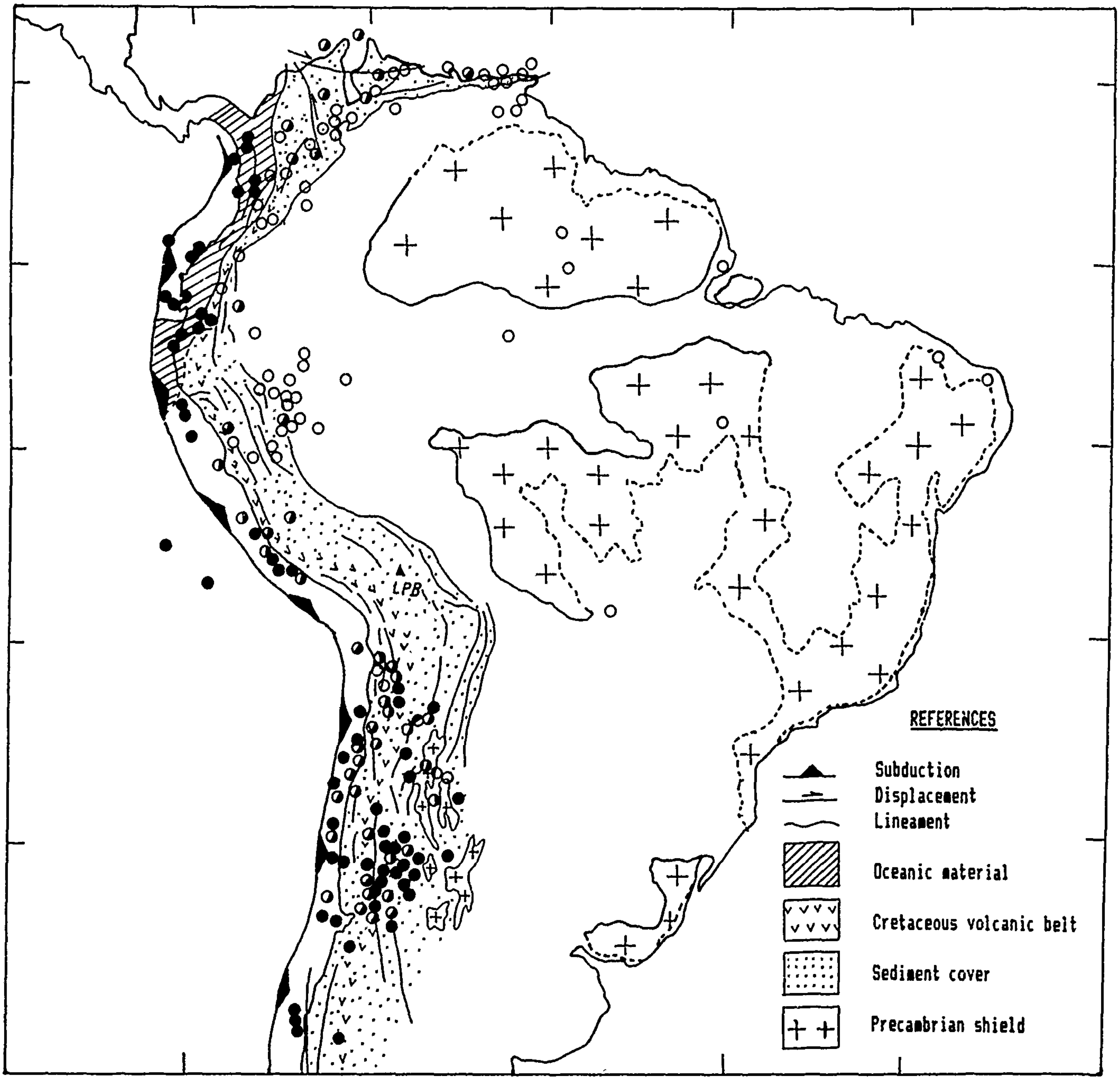

Fig. 12 .- South American tectonic structure (adapted from Alcócer, 1989).

○ Type A : efficiency transmission of Lg
◐ Type B : mean efficiency transmission of Lg
● Type C : inefficiency transmission of Lg

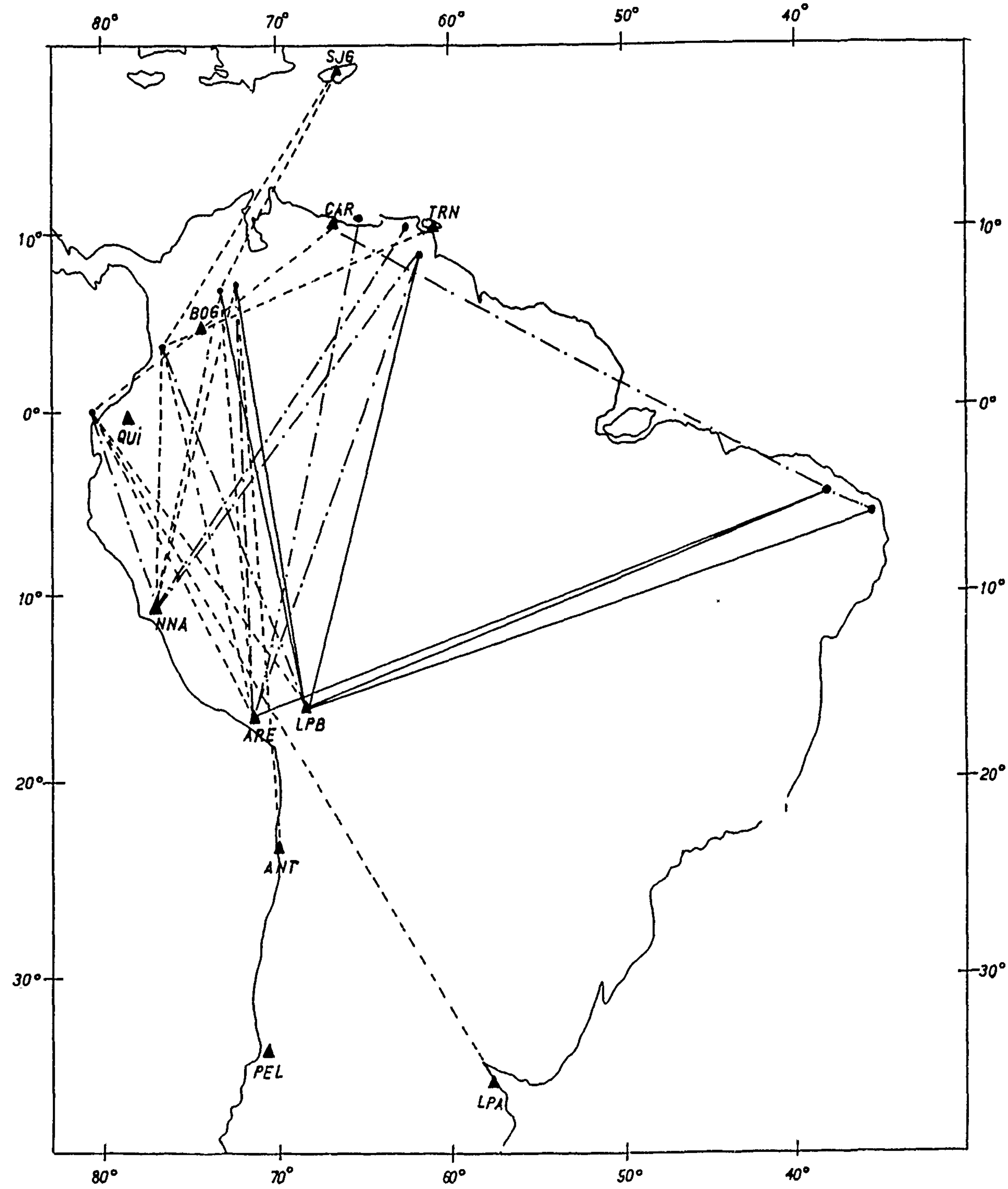

Fig. 13 .- Paths from northern part of South America and recording type.

———	Efficiency path
—·—·—	Median efficiency path
- - - - -	Inefficiency path
•	Epicenter
▲	Station

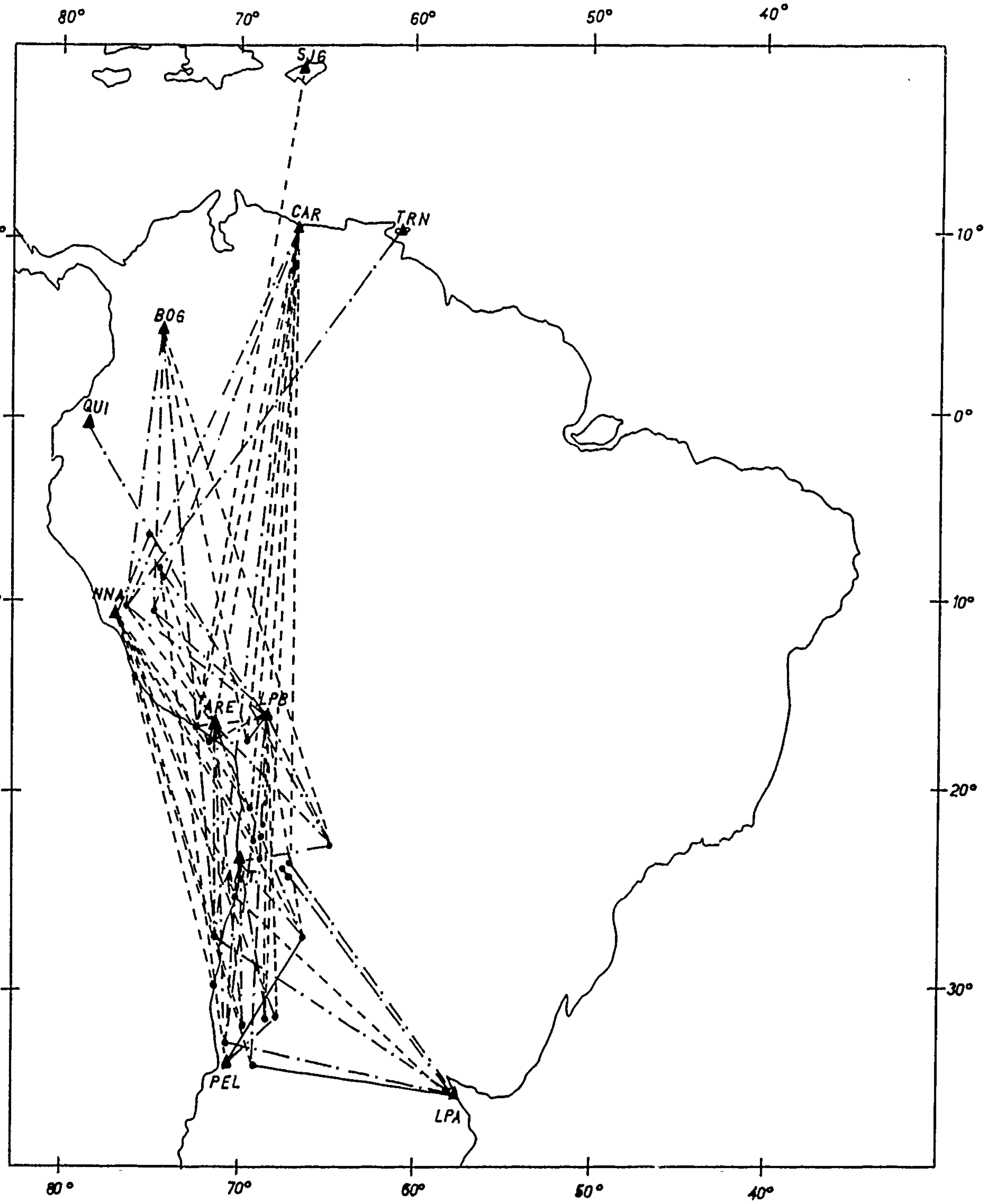

Fig. 14 .- Paths from southern part of South America and recording type.

———	Efficiency path
—·—·—	Median efficiency paths
-----	Inefficiency paths
•	Epicenter
▲	Station

LPB, a privileged station ?

A question arises from several points in the present report: why La Paz is in a better condition than other stations both concerning the amplitude and the clearer type of Lg.

Looking for a convincing answer, we acknowledge that LPB is running on the cordilleran structure not far from its border, that is to say, cordilleran path is short, then it should attenuate waves by absorbing their energy, not destroying such energy, but changing it trough a local enlargement of waves. They may appear an antinomy, but a similar phenomenon is well known in local earthquakes when the higher is the attenuation the stronger are destructive effects.

Conclusions

Lg phase is made up of transverse waves, SH type, guided within a layer in the continental crust.

Mean apparent velocity is 3.57 km/s; extreme values are 3.35 and 3.69 km/s. It does not change either for seismogenic regions or for recording stations.

Predominant period in LPB is 1.1 to 1.3; in several cases it is shorter to 0.7 s or longer to 2.5 s.

Normalized amplitude Lg/P in general approaches unity, (though it exceptionally reached 38). It depends on the path nature.

In general it is coherent with Bath's normalized energy.

Brasilian and Guayana Shield are efficient transmitters of Lg.

Western Colombia and Ecuador earthquakes give poor Lg records, apparently because of the difficulty of generation rather than of transmission.

Argentinian and Chilean earthquakes have a cordilleran path to La Paz; such path is inefficient for shorter periods, not so much for longer periods until 2.5 s.

Earthquakes from Peru and Peru-Brazil Border give uneven Lg in LPB, probably because of crustal structure complexities, but prevailing a transmission of medium efficiency.

Lg may originate for earthquakes deep almost 200 km in subduction zones.

Comparison of Lg recording in South America stations shows clearer and larger Lg waves in LPB for most of earthquakes. It is interpreted as an effect of local attenuation within a short cordilleran path.

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