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Old seismologic reports

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SEISMIC OBSERVATIONS
AT FABRA OBSERVATORY IN 1990

by M^a TERESA SUSAGNA VIDAL

The Observatory has the following seismographs:

Station FONT (Coordinates 41°45,7'N, 2°26,1'E)

— Three short period «Teledyne Geotech» seismograph, vertical and horizontal components, with ink recording.

Station FBR (Coordinates 41°25,0'N, 2°07,5'E).

— One short period «Hiller-Stuttgart» seismograph, vertical component, with mechanic recording.

— Two long period «Mainka» seismograph, horizontal components, with mechanic recording.

— One short period «Vicentini» seismograph, vertical component, with mechanic recording.

We symbolize by ZT Teledyne Geotech vertical components, by NT and ET the Teledyne Geotech horizontal components, by ZH the Hiller-Stuttgart vertical component, by NM and EM the Mainka horizontal components and by ZV the Vicentini vertical component.

For the most outstanding earthquakes, we describe their epicentral characteristics, calculated by the Seismic Section of this Observatory, together with «Servei Geològic de Catalunya» (SGC) or provided by the United States Geological Survey (GS), by the «Centre Seismologique Europeo-Mediterranean» (CSEM), by the «Instituto Geográfico Nacional» (I.G.N.) or by the Laboratoire de Détection et de Géophysique (LDG).

The average instrumental constants have been:

1) Electromagnetic seismograph (electronic and ink recording):

Type	Component	Mass (kg)	Period(s) To	Amplification (m/ms ⁻¹)	Damping
Teledyne Geotech	Z (ZT)	5	1	7.200	0,7
	N-S (NT)	5	1	7.200	0,7
	E-W (ET)	5	1	7.200	0,7
Mark- Lennartz	Z (ZL)	1	1	510	0,7
	N-S (NL)	1	1	510	0,7
	E-W (EL)	1	1	510	0,7

2) Mechanical seismographs (recording on smoke paper):

Type	Component	Mass (kg)	Period(s) To	Damping E	Friction r/T o ²	Amplification V
Mainka	N-S (NM)	141	7,0	3,00	0,015	37,9
	E-W (EM)	144	6,2	3,91	0,013	58,9
Vicentini	Z (ZV)	56	0,9	—	—	125



SEISMIC OBSERVATIONS

1990

Date	Comp.	Phase	Time TU			Δ Km	Remarks
			h	m	s		
1 Jan	ZT	P	17	41		17.140	Ep.: 19,15 S; 163,31 E; H = 17:21:38,8 h = 10 km; M = 5,2 (GS) Vanuatu islands region
2	ZT	P	20	35			Ep.: 13,41 N; 144,44 E; H = 20:21:32,6 h = 13 km; M = 5,7 (GS) Mariana islands
3	ZT	Pn	01	48	16,7		Ep.: 43,5 N; 0,6 W; H = 01:47:29,5 h = 11 km; M = 3,4 (LDG) Pau
4	ZT	P	05	52		16.990	Ep.: 15,40 S; 172,85 W; H = 05:32:2,0 h = 54 km; M = 6,4 (GS) Samoa islands region
8	ZT	P	19	57		9.545	Ep.: 52,04 N; 169,45 W; H = 19:44:34,6 h = 33 km; M = 5,6 (GS) Fox islands, Aleutian islands
9	ZT	P	02	40		7.630	Ep.: 6,15 S; 148,95 E; H = 02:29:26,6 h = 79 km; M = 5,5 (GS) Tibet
9	ZT	Pn	10	28	08,5		Ep.: 43,1 N; 0,4 W; H = 10:28:22,6 h = 2 km; M = 3,3 (LDG) Pau
9	ZT	P	19	03	05,3	8.420	Ep.: 24,75 N; 95,24 E; H = 18:51:29,2 h = 119 km; M = 6,1 (GS) Burma
13	ZT NT	Pg Sg	01 01	05 05	07,7 18,9		Ep.: See pag. 107
13	ZT	P	07	20		16.200	Ep.: 10,81 S; 166,01 E; H = 20:18:17,7 h = 47 km; M = 4,9 (GS) Santa Cruz islands
14	ZT	P	03	14		7.285	Ep.: 37,82 N; 91,97 E; H = 03:03:19,2 h = 12 km; M = 6,1 (GS) Qinghai province, China
16	ZT	P	20	21		9.420	Ep.: 40,23 N; 124,14 W; H = 20:08:22,0 h = 2 km; M = 5,1 (GS) Near coast of northern California
21	ZT ET	Pn Sn	21 21	05 05	07,0 24,3		Ep.: See pag. 107
28	ZT	Pn	04	22	11,5		Ep.: 36,70 N; 2,43 E; H = 04:20:58,5 h = - km; M = 3,6 (IGN) W Argel
3 Feb	ZT	P	01	08			Ep.: 36,42 N; 1,63 E; H = 01:07:13,6 h = 16 km; M = 3,4 (IGN) Algeria



SEISMIC OBSERVATIONS

1990

Date	Comp.	Phase	Time TU			Δ Km	Remarks
			h	m	s		
5 Feb	ZT	P	05	25		5.770	Ep.: 37,05 N; 71,25 E; H = 05:16:46,1 h = 110 km; M = 6,1 (GS) Afghanistan-USSR border region
5	ZT	Pn	07	19	00,7		Ep.: 36,89 N; 2,31 E; H = 07:17:44,5 h = 17 km; M = 3,7 (IGN); W Argel
8	ZT	Pg	00	50	23,6		Ep.: See pag. 107
	ZT	Sg	00	50	50,7		
8	ZT	P	15	50		1.405	Ep.: 36,26 N; 12,10 W; H = 15:47:31,4 h = 10 km; M = 5,0 (GS) North Atlantic ocean
9	ZT	Pn	04	22	27,0		Ep.: See pag. 107
	ET	Sn	04	22	49,0		
9	ZT	P	09	33	03,3		Ep.: 36,77 N; 2,48 E; H = 09:31:47,6 h = 12 km; M = 5,0 (GS) Algeria
9	ZT	P	11	18	11,3		Ep.: 36,70 N; 2,50 E; H = 11:16:54,5 h = 10 km; M = 4,3 (GS) Algeria
9	ZT	P	11	21	14,3		Ep.: 36,64 N; 2,58 E; H = 11:19:56,4 h = 10 km; M = — (GS) Algeria
9	ZT	P	13	11			Ep.: 36,71 N; 2,48 E; H = 13:09:58,8 h = 10 km; M = 4,1 (GS) Algeria
10	ZT	P	13	20	46,3		Ep.: 36,64 N; 2,58 E; H = 13:19:30,2 h = 10 km; M = 4,2 (GS) Algeria
11	ZT	P	07	01			Ep.: 45,0 N; 7,6 E; H = 07:00:37,6 h = 2 km; M = 4,8 (LDG) Gap (F)
11	ZT	Pn	20	13	40,7		Ep.: 43,0 N; 0,2 W; H = 20:13:01,3 h = 2 km; M = 3,7 (LDG) Pau (F)
	ZT	Su	20	14	14,0		
14	ZT	Pn	15	57	17,1		Ep.: 46,3 N; 6,7 E; H = 15:55:55,2 h = 2 km; M = 4,0 (LDG) Thonon (F)
16	ZT	Pn	17	38	47,3		Ep.: 43,0 N; 0,4 W; H = 17:38:04,4 h = km; M = 3,0 (LDG) Pau (F)
	ET	Sn	17	39	18,0		
19	ZT	P	05	54		19.440	Ep.: 40,35 S; 176,10 E; H = 05:34:37,0 h = 24 km; M = 5,9 (GS) New Zealand



SEISMIC OBSERVATIONS

1990

Date	Comp.	Phase	Time TU			Δ Km	Remarks
			h	m	s		
19 Feb	ZT	P	07	08		16.690	Ep.: 15,47 S; 166,38 E; H = 06:48:10,1 h = 12 km; M = 6,4 (GS) Vanuatu islands
20	ZT	P	07	07		10.440	Ep.: 34,71 N; 136,25 E; H = 06:53:39,8 h = 14 km; M = 6,1 (GS) Near coast of Honshu
21	ZT	Pg	16	58	37,7		Ep.: See pag. 107
	ZT	Sg	16	58	40,7		
21	ZT	P	18	30		6.685	Ep.: 16,90 N; 62,33 W; H = 18:20:14,5 h = 110 km; M = 5,9 (GS) Leeward islands
22	ZT	P	17	04		8.790	Ep.: 11,46 S; 66,38 E; H = 16:51:51,0 h = 12 km; M = 5,7 (GS) Mid-Indian rise
23	ZT	P	23	03		2.160	Ep.: 34,44 N; 25,59 E; H = 22:59:13,3 h = 54 km; M = 4,5 (GS) Crete
28	ZT	Pg	09	04	47,5		Ep.: See pag. 108
	ET	Sg	09	05	02,8		
28	ZT	Pn	13	24	28,0		Ep.: 42,85 N; 1,08 W; H = 13:23:43,6 h = 2 km; M = 3,9 (IGN) Valle de Salazar, Na
1 Mar	ZT	Pn	23	02	00,5		Ep.: 39,98 N ; 5,63 E; H = 23:01:17,1 h = 30 km; M = 3,7 (IGN) E = Menorca
	ET	Sn	23	02	35,3		
2	ZT	Pn	01	20	11,3		Ep.: See pag. 108
	NT	Sg	01	20	40,3		
2	ZT	Pn	07	49	44,0		Ep.: 36,83 N; 6,27 E; H = 07:48:20,7 h = 8 km; M = 3,6 (IGN) El Milia, Arg.
2	ZT	Pn	16	20	43,9		Ep.: 46,3 N; 7,5 E; H = 16:20:33,8 h = 2 km; M = 3,0 (LDG) Thonon, F.
4	ZT	P	17	41		16.750	Ep.: 15,54 S; 167,57 E; H = 17:21:59,0 h = 141 km; M = 5,4 (GS) Vanuatu islands
5	ZT	P	20	56		5.920	Ep.: 36,91 N; 73,02 E; H = 20:47:00,7 h = 12 km; M = 5,8 (GS) Northwestern Kashmir
6	ZT	P	21	49			Ep.: 36,91 N; 73,09 E; H = 21:39:50,2 h = 24 km; M = 5,2 (GS) Northwestern Kashmir



SEISMIC OBSERVATIONS

1990

Date	Comp.	Phase	Time TU			Δ Km	Remarks
			h	m	s		
8 Mar	ZT	P	01	39			Ep.: 36,99 N; 0,55 W; H = 01:37:12,2 h = 637 km; M = 4,3 (IGN) Durcal, Gr.
8	ZT	P	09	54		8.635	Ep.: 58,39 N; 152,96 W; H = 09:47:45,3 h = 67 km; M = 5,8 (GS) Kodiak islands region
11	ZT	Pn	08	29	43,7		Ep.: 36,81 N; 2,50 E; H = 08:28:31,3 h = 25 km; M = 3,9 (IGN) W Argel
12	ZT	P	13	51		13.180	Ep.: 3,16 S; 128,84 E; H = 13:32:55,5 h = 26 km; M = 5,2 (GS) Ceram
12	ZT	P	14	54		14.260	Ep.: 51,48; N; 175,03 W; H = 14:41:19,4 h = 14 km; M = 6,0 (GS) Andeanof islands
12	ZT	P	23	27		17.950	Ep.: 13,23 S; 167,04 E; H = 23:18:14,3 h = 163 km; M = 5,1 (GS) Vanuatu islands
13	ZT	P	00	43		11.300	Ep.: 73,33 N; 134,91 E; H = 00:32:59,1 h = 18 km; M = 5,5 (GS) Laptev Sea
13	ZT	Pn	14	59	01,3		Ep.: See pag. 108
	ZT	Sn	14	59	31,0		
13	ZT	P	19	52		9.375	Ep.: 3,43 S; 76,91 W; H = 19:40:33,6 h = 112 km; M = 5,7 (GS) Northern Peru
13	ZT	P	23	15		6.345	Ep.: 3,99 S; 39,92 E; H = 23:05:29,4 h = 10 km; M = 5,3 (GS) Kenya
15	ZT	Pn	21	42	48,0		Ep.: See pag. 108
	ZT	Sn	21	43	07,3		
16	ZT	Pg	07	05	40,3		Ep.: See pag. 108
	ZT	Sg	07	05	50,0		
21	ZT	P	17	05		18.810	Ep.: 31,09 S; 179,09 W; H = 16,46:05,4 h = 145 km; M = 6,2 (GS) Kermadec islands region
23	ZT	Pn	04	19	02,0		Ep.: 42,67 N; 4,54 W; H = 04:17:45,7 h = 15 km; M = 3,5 (IGN)
23	ZT	P	14	19		9.510	Ep.: 16,13 N; 96,28 W; H = 14:07:15,4 h = 63 km; M = 5,2 (GS) Oxaca, Mexico



SEISMIC OBSERVATIONS

1990

Date	Comp.	Phase	Time TU			Δ Km	Remarks
			h	m	s		
24 Mar	ZT	Pg	16	14	14,4		Ep.: See pag. 108
	ET	Sg	16	14	24,0		
25	ZT	P	13	35		9.050	Ep.: 9,92 N; 84,81 W; H = 13:22:55,6 h = 22 km; M = 6,2 (GS) Costa Rica
25	ZT	P	14	26		5.905	Ep.: 37,03 N ; 7.294 W; H = 14:17:18,8 h = 33 km; M = 6,0 (GS) Tajik SSR
27	ZT	Pn	03	32	57,3		Ep.: 43,1 N; 0,7 E; H = 03:32:13,0 h = 10 km; M = 3,6 (LDG) Pau, F.
27	ZT	Pn	10	41	54,6		Ep.: 43,1 N; 0,6 W; H = 10:41:10,5 h = 8 km; M = 3,2 (LDG) Pau, F.
29	ZT	Pn	03	11	19,3		Ep.: 38,27 N; 0,14 D; H = 03:10:21,4 h = 9 km; M = 3,7 (IGN) SE. Alicante
1 Apr	ZT	Pn	19	14	23,7		Ep.: 43,2 S; 1,4 W; H = 19:13:34,5 h = 9 km; M = 3,8 (LDG) Pau, F.
3	ZT	P	13	49			Ep.: 52,3 N; 2,9 W; H = 15:47:31,4 h = 9 km; M = 5,2 (LDG)
5	ZT	P	21	31		12.740	Ep.: 15,13 N; 147,60 E; H = 21:12:35,5 h = 11 km; M = 6,5 (GS) Mariana islands region
6	ZT	P	06	29		16.995	Ep.: 15,15 S; 172,13 W; H = 06:09:03,0 h = 33 km; M = 5,3 (GS) Samoa islands region
12	ZT	Pn	22	49	08,3		Ep.: 36,87 N; 2,42 E ; H = 22:47:57,0 h = — km; M = 4,7 (IGN) W Argel
13	ZT	Pg	11	28	48,3		Ep.: See pag. 109
	ET	Sg	11	29	01,3		
13	ZT	P	22	19			Ep.: 35,62 N; 4,82 W; H = 22:17:15,1 h = 70 km; M = 4,1 (IGN) Gibraltar
15	ZT	P	00	40			Ep.: 36,64 N; 2,53 E; H = 00:39:30,8 h = — km; M = 3,5 (IGN) W Argel



SEISMIC OBSERVATIONS

1990

Date	Comp.	Phase	Time TU			Δ Km	Remarks
			h	m	s		
15 Apr	ZT	P	07	51			Ep.: 43,5 N; 7,8 E; H = 07:50:35,9 h = 2 km; M = 4,2 (LDG) Nice, F.
16	ZT ET	Pg Sg	08 08	14 14	33,3 40,0		Ep.: See pag. 109
16	ZT	P	22	50		16.675	Ep.: 14,86 S; 167,28 E; H = 22:37:11,2 h = 119 km; M = 5,5 (GS) Vanuatu islands
17	ZT	P	02	08		5.930	Ep.: 39,44 N; 74,90 E; H = 01:59:33,4 h = 33 km; M = 6,0 (GS) Southern Xinjiang, China
19	ZT ET	Pg Sg	12 12	38 38	26,9 36,7		Ep.: See pag. 109
24	ZT	Pn	10	42	53,7		Ep.: See pag. 109
26	ZT	P	09	48		7.800	Ep.: 35,99 N; 100,25 E; H = 09:37:15,0 h = 8 km; M = 6,5 (GS) Qinghai province, China
26	ZT ET	Pg Sg	14 14	48 48	24,0 49,8		Ep.: See pag. 109
28	ZT	P	01	35		9.010	Ep.: 8,89 N; 83,50 W; H = 01:23:11,5 h = 23 km; M = 5,9 (GS) Costa Rica
1 May	ZT	P	16	24		8.660	Ep.: 58,84 N; 156,86 W; H = 16:12:21,4 h = 2 km; M = 6,1 (GS) Alaska peninsula
2	ZT	Pn	16	42	14,1		Ep.: 36,55 N; 4,52 W; H = 16:40:27,1 h = 95 km; M = 4,2 (IGN) S. Málaga
2	ZT	P	23	09		14.870	Ep.: 05,60 S; 150,16 E; H = 22:50:29,5 h = 82 km; M = 6,2 (GS) New Britain region
5	ZT	P	07	23		1.120	Ep.: 40,77 N; 15,77 E; H = 07:21:29,5 h = 10 km; M = 5,3 (GS) Southern Italy
7	ZT	P	05	29		8.000	Ep.: 36,03 N; 100,34 E; H = 05:17:37,6 h = 33 km; M = 5,3 (GS) Qinghai province, China
8	ZT NT	Pn Sn	23 23	32 32	31,1 48,7		Ep.: See pag. 110



SEISMIC OBSERVATIONS

1990

Date	Comp.	Phase	Time TU			Δ Km	Remarks
			h	m	s		
9 May	ZT	Pn	00	49	42,1		Ep.: See pag. 110
	NT	Sn	00	49	59,7		
9	ZT	P	17	04		16.500	Ep.: 13,16 S; 167,22 E; H = 16:44:54,6 h = 195 km; M = 4,9 (GS) Vanuatu islands
11	ZT	P	13	21		9.370	Ep.: 41,82 N; 130,86 E; H = 13:10:20,2 h = 579 km; M = 5,7 (GS) North Korea
12	ZT	P	05	01		9.160	Ep.: 49,04 N; 141,85 E; H = 04:50:08,7 h = 606 km; M = 6,5 (GS) Sakhalin island
12	ZT	Pg	19	33	26,1		Ep.: See pag. 110
	ZL	Pg	19	33	32,6		
	ZL	Sg	19	33	40,4		
12	ZT	Pg	22	51	16,1		Ep.: 45,0 N ; 3,1 W; H = 22:50:15,3 h = 2 km; M = 3,1 (LDG) Aurillac, F.
13	ZT	P	04	43		19.440	Ep.: 40,30 S; 176,06 E; H = 04:23:09,6 h = 21 km; M = 6,0 (GS) North island New Zeland
15	ZT	P	14	34		5.760	Ep.: 36,04 N; 70,43 E; H = 14:25:20,6 h = 113 km; M = 5,9 (GS) Hindu Kush region
17	ZT	P	11	16		9.925	Ep.: 18,08 S; 69,63 W; H = 11:03:24,7 h = 106 km; M = 5,6 (GS) Northern Chile
19	ZT	Pg	20	35	46,7		Ep.: See pag. 110
	ZT	Sg	20	35	58,0		
	ZL	Pg	20	35	39,5		
	ZL	Sg	20	35	46,5		
20	ZT	P	02	30		5.020	Ep.: 5,12 N; 32,14 E; H = 02:22:01,6 h = 15 km; M = 6,7 (GS) Sudan
21	ZT	P	13	12		9.325	Ep.: 53,56 N; 163,54 W; H = 13:00:09,7 h = 33 km; M = 5,7 (GS) Unimak islands region
23	ZT	Pn	22	53	35,5		Ep.: 35,70 N; 1,20 W; H = 22:52:00,3 h = — km; M = 3,9 (IGN) W Oran
24	ZT	P	19	43		4.990	Ep.: 5,23 N; 31,83 E; H = 19:34:44,2 h = 17 km; M = 5,9 (GS) Sudan



SEISMIC OBSERVATIONS

1990

Date	Comp.	Phase	Time TU			Δ Km	Remarks
			h	m	s		
24 May	ZT	P	20	08		4.980	Ep.: 53,6 N; 31,58 E; H = 20:00:08,1 h = 16 km; M = 6,5 (GS) Sudan
24	ZT	P	22	24		4.975	Ep.: 5,44 N; 31,88 E; H = 22:16:03,3 h = 10 km; M = 5,5 (GS) Sudan
26	ZT	P	05	30		16.945	Ep.: 17,93 S; 168,44 E; H = 05:11:13,2 h = 223 km; M = 4,9 (GS) Vanuatu islands
26	ZT	P	08	10		6.825	Ep.: 41,57 N; 88,69 E; H = 07:59:57,8 h = 0 km; M = 5,4 (GS) Southern Xinjiang, China
26	ZT	P	09	23		1.255	Ep.: 38,31 N; 11,63 W; H = 09:21:05,6 h = 14 km; M = 4,7 (GS) North Atlantic ocean
27	ZT	P	21	56		5.405	Ep.: 7,72 N; 36,96 W; H = 21:52:55,7 h = 10 km; M = 5,3 (GS) Central mid-Atlantic ridge
27	ZT	P	22	01		5.380	Ep.: 8,47 N; 37,50 W; H = 21:57:44,2 h = 10 km; M = 4,7 (GS) Central mid-Atlantic ridge
28	ZT	Pg	18	40	37,0		Ep.: See pag. 110
	ZT	Sg	18	40	56,0		
29	ZT	Pn	22	20	46,1		Ep.: See pag. 110
	ET	Sn	22	21	04,0		
30	ZT	P	02	46		9.600	Ep.: 6,02 S; 77,23 W; H = 02:34:05,8 h = 24 km; M = 6,1 (GS) Northern Peru
30	ZT	P	10	44		1.990	Ep.: 45,84 N; 26,67 E; H = 10:40:06,1 h = 89 km; M = 6,7 (GS) Romania
31	ZT	P	07	48		9.770	Ep.: 17,26 N; 100,71 W; H = 07:35:27,00 h = 23 km; M = 5,8 (GS) Guerrero, México
1 Jun	ZT	P	01	35		10.140	Ep.: 35,52 N; 140,34 E; H = 01:22:11,5 h = 67 km; M = 5,7 (GS) Near east coast of Honshu, Japan
2	ZT	Pn	14	34	41,7	540	Ep.: 46,5 N; 1,5 E; H = 14:33:12,0 h = 2 km; M = 3,5 (LDG) Poitiers, France



SEISMIC OBSERVATIONS

1990

Date	Comp.	Phase	Time TU			Δ Km	Remarks
			h	m	s		
2 Jun	ZT	Pn	14	44	11,7		Ep.: 42,0 N; 2,1 E; H = 14:43:18,1 h = 2 km; M = 3,0 (LDG) Perpignan, France
4	ZT	P	03	50	56,7	710	Ep.: 44,56 N; 10,32 E; H = 03:49:22,1 h = 20 km; M = — (GS) Northern Italy
11	ZT	Pg	01	11	57,0		Ep.: See pag. 110
	ET	Sg	01	11	23,3		
12	ZT	Pn	18	49	38,5		Ep.: 43,2 N; 0,3 W; H = 17:48:58,3 h = 13 km; M = 4,2 (LDG) Pau, F.
13	ZT	P	16	12		9.255	Ep.: 37,26 N; 116,52 W; H = 16:00:00,0 h = 0 km; M = 5,7 (GS) Souther Nevada
14	ZT	P	07	58		11.490	Ep.: 11,76 N; 121,90 E; H = 07:40:56,2 h = 18 km; M = 6,0 (GS) Panay, Philippine islands
14	ZT	P	12	57		6.235	Ep.: 47,87 N; 85,08 E; H = 12:47:28,8 h = 58 km; M = 6,1 (GS) Kazakh-Xinjiang border region
15	ZT	Pg	04	43	06,7		Ep.: See pag. 110
	ET	Sg	04	43	17,4		
	ZL	Pg	04	43	10,5		
	ZL	Sg	01	43	23,1		
15	ZT	P	08	35		14.940	Ep.: 5,04 S; 152,08 E; H = 08:12:26,2 h = 60 km; M = 5,5 (GS) New Britain region
15	ZT	Pn	10	38	03,0		Ep.: 43,1 N; 0,4 W; H = 10:37:20,4 h = 7 km; M = 3,2 (LDG) Pau, F.
15	ZT	Pg	19	25	31,3		Ep.: 43,0 N; 0,4 W; H = 19:24:45,3 h = 6 km; M = 3,1 (LDG) Pau, F.
	ZT	Sg	19	26	03,8		
16	ZT	P	02	19		1.550	Ep.: 30,26 N; 20,53 E; H = 02:16:21,1 h = 32 km; M = 5,6 (GS) Geece-Albania border region
17	ZT	P	05	01		5.875	Ep.: 27,40 N; 675,72 E; H = 04:51:45,5 h = 15 km; M = 5,9 (GS) Pakistan
17	ZT	Pg	08	27	46,0		Ep.: See pag. 110
	ZT	Sg	08	28	13,3		



SEISMIC OBSERVATIONS

1990

Date	Comp.	Phase	Time TU			Δ Km	Remarks
			h	m	s		
19 Jun	ZT	Pg	21	24	46,3		Ep.: See pag. 110
	ET	Sg	21	24	53,6		
	ZL	Sg	21	25	05,7		
19	ZT	Pn	21	49	02,3		Ep.: 42,82 N; 1,67 W; H = 21:48:11,9 h = 3 km; M = 3,6 (IGN) Pamplona, NA
23	ZT	P	21	57		17.730	Ep.: 21,57 S; 176,48 W; H = 21:38:18,7 h = 181 km; M = 6,4 (GS) Fiji islands region
23	ZT	P	23	27		16.490	Ep.: 13,38 S; 166,28 E; H = 23:07:31,6 h = 79 km; M = 4,9 (GS) Vanuatu islands
24	ZT	P	08	55		17.750	Ep.: 21,61 S; 176,50 W; H = 08:35:24,9 h = 193 km; M = 5,6 (GS) Fiji islands region
25	ZT	Pn	06	35	28,5		Ep.: See pag. 110
27	ZT	Pg	04	07	46,7		Ep.: See pag. 110
	ET	Sg	04	07	51,2		
27	ZT	Pg	04	08	06,3		Ep.: See pag. 110
	ET	Sg	04	08	10,7		
27	ZT	Pg	04	09	26,3		Ep.: See pag. 110
	ET	Sg	04	09	30,7		
27	ZT	Pg	04	16	33,6		Ep.: See pag. 111
	ET	Sg	04	16	38,0		
27	ZT	Pg	04	37	29,0		Ep.: See pag. 111
	ET	Sg	04	37	33,3		
28	ZT	Pn	02	39	14,8		Ep.: See pag. 111
	ET	Sg	02	39	39,7		
6 Jul	ZT	Pg	01	14	19,0		Ep.: See pag. 111
	ZT	Sg	01	14	31,0		
7	ZT	Pn	23	31	27,7		Ep.: 40,66 N; 3,58 W; H = 23:30:17,8 h = 1 km; M = 3,3 (IGN) S. Agustin de Guadalix, M
	ET	Sn	23	32	20,5		
9	ZT	P	11	26		2.240	Ep.: 35,07 N; 26,64 E; H = 11:22:20,3 h = 60 km; M = 4,9 (GS) Crete



SEISMIC OBSERVATIONS

1990

Date	Comp.	Phase	Time TU			Δ Km	Remarks
			h	m	s		
9 Jul	ZT	Pg	20	42	32,0	Ep.: See pag. 111	
	ET	Sg	20	42	40,0		
	ZL	Pg	20	42	39,6		
	ZL	Sg	20	42	51,8		
10	ZT	P	03	37		15.935	Ep.: 10,35 S; 161,12 E; H = 03:17:59,2 h = 66 km; M = 6,0 (GS) Salomon islands
11	ZT	Pg	02	12	13,8		Ep.: See pag. 111
12	ZT	P	23	18		6.690	Ep.: 14,67 N; 60,46 W; H = 23:08:22,5 h = 28 km; M = 5,5 (GS) Windward islands
13	ZT	P	14	29		5.770	Ep.: 36,12 N; 70,79 E; H = 14:20:43,4 h = 217 km; M = 5,6 (GS) Hindu Kush region
14	ZT	P	04	07		15.960	Ep.: 10,48 S; 161,41 E; H = 03:48:32,4 h = 92 km; M = 5,4 (GS) Salomon islands
14	ZT	P	06	02		5.050	Ep.: 0,00 N; 17,38 W; H = 05:54:25,4 h = 11 km; M = 6,2 (GS) North of Ascension islands
14	ZT	P	07	33		5.060	Ep.: 0,07 S; 17,52 W; H = 07:24:39,6 h = 12 km; M = 5,8 (GS) North of Ascension islands
14	ZT	Pg	09	24	54,0		Ep.: See pag. 111
	ET	Sg	09	24	57,8		
	ZL	Sg	09	25	07,8		
15	ZT	P	21	54		2.085	Ep.: 36,49 N; 25,52 E; H = 21:50:36,3 h = 23 km; M = 4,5 (GS) Dodecanese islands
16	ZT	P	07	40		11.060	Ep.: 15,68 N; 121,17 E; H = 07:26:34,6 h = 25 km; M = 6,5 (GS) Luzon, Philippine islands
17	ZT	P	21	28		10.986	Ep.: 16,49 N; 120,98 E; H = 21:14:43,8 h = 23 km; M = 6,1 (GS) Luzon, Philippine islands
18	ZT	P	11	34		2.385	Ep.: 36,99 N; 29,60 E; H = 11:29:24,9 h = 17 km; M = 5,2 (GS) Turkey
18	ZT	P	17	40		13.595	Ep.: 15,73 N; 119,41 E; H = 17:42:11,0 h = 33 km; M = 4,4 (GS) Luzon, Philippine islands



SEISMIC OBSERVATIONS

1990

Date	Comp.	Phase	Time TU			Δ Km	Remarks
			h	m	s		
20 Jul	ZT	P	15	22		16.630	Ep.: 16,93 N; 126,94 E; H = 15:11:17,8 h = 17 km; M = 5,5 (GS) Luzon, Philippine islands
22	ZT	Pn	03	25	18,1		Ep.: 43,1 N; 0,4 W; H = 03:24:37,5
	ZT	Sn	03	25	51,8		h = 12 km; M = 3,7 (LDG) Pau, F.
22	ZT	P	09	45		17.955	Ep.: 23,62 S; 179,89 W; H = 09:26:14,6 h = 531 km; M = 5,9 (GS) South of Fiji islands
23	ZT	Pg	16	54	57,0		Ep.: See pag. 111
24	ZT	Pn	20	29	38,5		Ep.: 43,0 N; 0,6 W; H = 20:28:54,6
	ZT	Sn	20	30	14,7		h = 2 km; M = 3,6 (LDG) Pau, F.
25	ZT	P	14	55		9.210	Ep.: 53,70 N; 156,71 W; H = 14:42:42,0 h = 48 km; M = 5,7 (GS) South of Alaska
26	ZT	P	07	03		5.860	Ep.: 27,25 N; 65,51 E; H = 06:53:56,3 h = 19 km; M = 5,8 (GS) Pakistan
26	ZT	Pg	16	06	37,3		Ep.: See pag. 111
	ET	Sg	16	06	41,5		
26	ZT	Pn	16	26	45,1		Ep.: 42,55 N; 1,17 W; H = 16:26:00,2 h = 3 km; M = 2,8 (IGN) Javier, Na
26	ZT	Pn	16	30	19,8		Ep.: 42,58 N; 1,19 W; H = 16:29:35,0 h = 3 km; M = 3,6 (IGN) Javier, Na
26	ZT	Pn	18	14	33,0		Ep.: 36,77 N; 2,75 E; H = 18:13:19,1 h = — km; M = 3,7 (IGN) Argelia
27	ZT	Pn	00	45	51,3		Ep.: See pag. 111
	ET	Sn	00	46	07,1		
27	ZT	P	12	57		16.725	Ep.: 15,36 S; 167,46 E; H = 12:37:59,5 h = 126 km; M = 6,4 (GS) Vanuatu islands
28	ZT	P	09	02		16.725	Ep.: 15,43 S; 167,40 E; H = 08:42:51,2 h = 113 km; M = 5,5 (GS) Vanuatu islands
28	ZT	Pn	13	58	06,3		Ep.: 36,9 N; 3,0 E; H = 13:56:55,6 h = — km; M = 3,5 (LDG)



SEISMIC OBSERVATIONS

1990

Date	Comp.	Phase	Time TU			Δ Km	Remarks
			h	m	s		
30 Jul	ZT	P	17	57			Ep.: 34,48 N; 25,54 E; H = 17:52:37,6 h = 45 km; M = 4,3 (GS) Crete
31	ZT	P	06	53			Ep.: 37,25 N; 21,46 E; H = 06:49:31,7 h = 58 km; M = 4,8 (GS) Southern Greece
1 Aug	ZT	P	03	04		16.285	Ep.: 11,78 S; 166,55 E; H = 02:44:57,0 h = 31 km; M = 5,6 (GS) Santa Cruz islands
2	ZT	Pg	07	58	52,5		Ep.: See pag. 111
3	ZT	P	08	56		17.020	Ep.: 14,67 S; 173,39 W; H = 08:36:30,5 h = 37 km; M = 5,1 (GS) Samoa islands region
3	ZT ZL	P P	09 09	24 24		6.220	Ep.: 47,96 N; 84,96 E; H = 09:15:06,1 h = 33 km; M = 6,0 (GS) Kazakh - Xinjiasng border region
5	ZT	P	01	47		10.845	Ep.: 29,55 N; 137,63 E; H = 01:34:55,8 h = 496 km; M = 6,0 (GS) South of Honshu
5	ZT	P	03	49		10.365	Ep.: 36,31 N; 141,07 E; H = 03:36:22,2 h = 27 km; M = 5,8 (GS) Neart east coast of Honshu, Japan
5	ZT	P	17	50		5.030	Ep.: 1,08 S; 13,89 W; H = 17:42:32,1 h = 10 km; M = 5,6 (GS) Noerth of Ascension island
5	ZT	P	18	37		2.630	Ep.: 40,20 N; 33,90 E; H = 18:31:50,2 h = 25 km; M = 4,8 (GS) Turkey
5	ZT ET ZL ZL	Pn Sn Pn Sn	21 21 21 21	32 33 32 33	46,8 02,0 47,6 03,7		Ep.: See pag. 112
9	ZT	P	18	28		565	Ep.: 36,78 N; 2,36 E; H = 18:26:49,0 h = — km; M = 3,7 (IGN) W Argel
10	ZT	P	05	57		17.255	Ep.: 20,20 S; 168,33 E; H = 05:37:52,1 h = 47 km; M = 5,8 (GS) Loyalty islands
10	ZT	P	18	06		17.545	Ep.: 19,80 S; 177,39 W; H = 17:47:36,7 h = 373 km; M = 6,0 (GS) Fiji islands region



SEISMIC OBSERVATIONS

1990

Date	Comp.	Phase	Time TU			Δ Km	Remarks
			h	m	s		
12 Aug	ZT	Pg	08	08	55,0	Ep.: See pag. 112	
	ZT	Sg	08	09	09,2		
12	ZT	Pg	11	42	27,3	Ep.: See pag. 112	
	ZT	Sg	11	42	50,1		
12	ZT	P	21	45	17.215	Ep.: 19,44 S; 169,13 E; H = 21:25:21,9 h = 140 km; M = 6,3 (GS) Vanuatu islands	
12	ZT	Pg	23	38	26,1	Ep.: See pag. 112	
	ET	Sg	23	38	35,3		
	ZL	Pg	23	38	11,8		
	ZL	Sg	23	38	24,7		
13	ZT	Pn	19	13	29,5	Ep.: 43,1 N; 0,6 W; H = 19:12:46,8 h = 4 km; M = 3,5 (LDG) Pau, F.	
	ZT	Sn	19	14	06,0		
13	ZT	P	23	16	8.430	Ep.: 60,12 N; 152,01 W; H = 23:04:28,5 h = 88 km; M = 5,3 (GS) Southern Alaska	
16	ZT	P	05	10	6.830	Ep.: 41,56 N; 88,77 E; H = 05:59:57,6 h = 0 km; M = 6,2 (GS) South Xinjiang, China	
17	ZT	P	13	26	16.065	Ep.: 11,16 S; 162,00 E; H = 13:07:17,4 h = 29 km; M = 6,8 (GS) Solomon islands	
17	ZT	P	22	05	16,065	Ep.: 11,20 S; 162,11 E; H = 21:46:82,8 h = 15 km; M = 5,6 (GS) Solomon islands	
20	ZT	P	00	15	9.450	Ep.: 46,19 N; 142,29 E; H = 00:03:52,7 h = 309 km; M = 5,7 (GS) Sakhalin islands	
20	ZT	Pg	04	17	05,8	Ep.: See pag. 112	
	ET	Sg	04	17	16,0		
20	ZT	Pn	12	23	10,0	Ep.: 39,98 N; 0,46 E; H = 12:22:33,4 h = 7 km; M = 3,3 (IGN) Mediterráneo	
26	ZT	P	08	09	7.780	Ep.: 19,59 N; 77,87 W; H = 07:53:41,6 h = 10 km; M = 5,9 (GS) Cuba region	



SEISMIC OBSERVATIONS

1990

Date	Comp.	Phase	Time TU			Δ Km	Remarks
			h	m	s		
2 Sep	ZT	P	04	39		9.400	Ep.: 0,14 S; 80,28 W; H = 04:26:48,0 h = 10 km; M = 5,8 (GS) Neart coast of Ecuador
3	ZT	P	00	09		2.375	Ep.: 37,02 N; 29,53 E; H = 00:04:45,4 h = 25 km; M = 4,1 (GS) Turkey
3	ZT	P	02	49		5.755	Ep.: 36,41 N; 70,67 E; H = 02:40:59,1 h = 202 km; M = 4,9 (GS) Hindu Kush region
8	ZT	P	19	42		5.895	Ep.: 27,50 N; 66,09 E; H = 19:33:18,8 h = 28 km; M = 5,1 (GS) Pakistan
9	ZT	P	02	20		3.090	Ep.: 56,65 N; 34,39 W; H = 02:14:51,0 h = 10 km; M = 5,4 (GS) North Atlantic ridge
9	ZT	P	05	48		15.930	Ep.: 5,18 S; 151,73 E; H = 05:35:45,9 h = 74 km; M = 5,8 (GS) New Britain region
23	ZT	P	18	14		16.990	Ep.: 17,73 S; 167,71 E; H = 17:54:02,9 h = 10 km; M = 5,4 (GS) Vanuatu islands
24	ZT	Pg	05	25	59,5		Ep.: See pag. 112
	NT	Sg	05	26	05,5		
	ZL	Pg	05	26	00,5		
	ZL	Sg	05	26	06,5		
26	ZT	P	23	19		8.150	Ep.: 28,01 S; 26,73 E; H = 23:08:23,9 h = 5 km; M = 4,2 (GS) Republic of south Africa
28	ZT	P	20	04		16.515	Ep.: 13,56 S; 167,08 E; H = 19:44:47,1 h = 176 km; M = 6,0 (GS) Vanuatu islands
	ZL	P	20	04			
29	ZT	Pg	13	38	45,7		Ep.: See pag. 113
	ZT	Sg	13	39	02,3		
2 Oct	ET	Pn	20	46	07,3		Ep.: 43,5 N; 0,6 W; H = 20:45:20,5 h = 6 km; M = 3,5 (LDG) Pau, F.
15	ZT	P	01	48		10.150	Ep.: 2,21 S; 92,25 E; H = 01:35:44,4 h = 43 km; M = 5,9 (GS) Southwest of Sumatera
15	ZT	P	06	39		5.500	Ep.: 15,31 N; 46,35 W; H = 06:30:20,3 h = 10 km; M = 5,2 (GS) North Atlantic ridge



SEISMIC OBSERVATIONS

1990

Date	Comp.	Phase	Time TU			Δ Km	Remarks
			h	m	s		
17 Oct	ZT	P	14	41		9.460	Ep.: 10,97 S; 70,78 W; H = 14:30:13,1 h = 599 km; M = 6,7 (GS) Peru-Brazil border region
18	ZT	Pg	01	20	10,7		Ep.: See pag. 113
	NT	Sg	01	20	24,0		
	ZL	Pg	01	20	13,2		
	ZL	Sg	01	20	27,3		
18	ZT	Pg	16	18	01,8		Ep.: See pag. 113
	ZT	Sg	16	18	14,4		
21	ZT	P	15	23		9.450	Ep.: 3,99 S; 77,27 W; H = 15:10:43,7 h = 116 km; M = 5,7 (GS) Peru-Ecuador border region
22	ZT	Pn	01	13	38,5	430	Ep.: 42,22 N; 2,54 W; H = 01:12:42,4 h = 17 km; M = 2,6 (IGN) Tierra de Cameros, Lo
24	ZT	P	15	05		4.420	Ep.: 73,36 N; 54,71 E; H = 14:57:58,1 h = 0 km; M = 5,7 (GS) Novaya Kemlya
24	ZT	P	23	56		6.345	Ep.: 44,12 N; 83,86 E; H = 23:38:15,1 h = 20 km; M = 5,2 (GS) Northern Xinjiang, China
25	ZT	P	05	03		5.830	Ep.: 35,12 N; 70,49 E; H = 04:53:59,9 h = 114 km; M = 6,0 (GS) Hindu Kush region
25	ZT	Pg	19	03	25,7		Ep.: See pag. 113
	ET	Sg	19	03	39,8		
26	ZT	Pn	08	57	18,0		Ep.: See pag. 113
	ET	Sn	08	57	35,0		
27	ZT	Pg	23	59	49,3		Ep.: 41,7 N; 4,2 E; H = 23:59:29,8 h = — km; M = 3,0 (LDG) E. Barcelona
31	ZT	Pn	06	47	33,3		Ep.: 43,4 N; 0,6 W; H = 06:46:48,0 h = 10 km; M = 4,1 (LDG) Pau, F.
31	ZT	Pn	19	30	15,9		Ep.: See pag. 114
	ZT	Sn	19	30	44,7		
2 Nov	ZT	Pg	17	25	22,7		Ep.: See pag. 114
	NT	Sg	17	25	35,3		



SEISMIC OBSERVATIONS

1990

Date	Comp.	Phase	Time TU			Δ Km	Remarks
			h	m	s		
2 Nov	ZT	Pn	21	26	10,0		Ep.: 43,1 N; 0,5 W; H = 21:25:27,0 h = 6 km; M = 4,1 (LDG) Pau, F.
	ZL	Pn	21	26	10,2		
3	ZT	Pn	13	54	31,3	490	Ep.: 38,39 N; 1,36 W; H = 13:53:25,5 h = 3 km; M = 3,9 (IGN) Sierra Larga
3	ZT	P	16	49		5.685	Ep.: 39,03 N; 71,43 E; H = 16:39:57,7 h = 51 km; M = 5,6 (GS) Tajik SSR
4	ZT	P	16	02		16.650	Ep.: 14,65 S; 167,22 E; H = 15:43:07,1 h = 149 km; M = 4,9 (GS) Vanuatu islands
6	ZT	P	18	54		4.970	Ep.: 28,25 N; 55,46 E; H = 18:45:52,2 h = 10 km; M = 6,2 (GS) Southern Iran
6	ZT	P	20	21		9.350	Ep.: 53,45 N; 169,87 E; H = 20:14:29,7 h = 25 km; M = 6,3 (GS) Komandorsky islands region
9	ZT	Pn	10	59	55,5		Ep.: 43,8 N; 6,4 E; H = 10:59:01,9 h = 3 km; M = 3,3 (LDG) Nice, F.
10	ZT	Pn	04	56	16,1		Ep.: 43,4 N; 0,7 W; H = 04:55:29,2 h = 9 km; M = 3,5 (LDG) Pau, F.
11	ZT	Pn	15	07	11,0		Ep.: See pag. 114
	ET	Sn	15	07	25,7		
	ZL	On	25	07	12,3		
	ZL	Sn	15	07	26,6		
12	ZT	P	12	38		5.990	Ep.: 42,96 N; 78,07 E; H = 12:28:51,5 h = 19 km; M = 5,9 (GS) Alma-Ata region
13	ZT	P	02	47		9.320	Ep.: 46,10 N; 138,64 E; H = 02:35:07,8 h = 14 km; M = 6,2 (GS) Near E. coast of eastern USSR
13	ZT	Pg	07	12	03,5		Ep.: See pag. 114
	ZL	Pg	07	12	11,0		
	ZL	Sg	07	12	26,0		
13	ZT	P	20	21		5.030	Ep.: 0,06 S; 16,67 W; H = 20:13:29,3 h = 10 km; M = 5,0 (GS) North of Ascension island
14	ZT	P	18	54		5.900	Ep.: 27,44 N; 66,09 E; H = 18:45:03,8 h = 37 km; M = 5,3 (GS) Pakistan



SEISMIC OBSERVATIONS

1990

Date	Comp.	Phase	Time TU			Δ Km	Remarks
			h	m	s		
14 Nov	ZT	Pn	20	31	26,9	530	Ep.: 42,73 N; 3,88 W; H = 20:30:17,1 h = 11 km; M = 3,7 (IGN) Valle de Sedano
15	ZT	P	02	47		10.130	Ep.: 3,91 N; 97,46 E; H = 02:34:32,4 h = 48 km; M = 6,0 (GS) Noerthern Sumatera
21	ZT	P	02	01		9.610	Ep.: 51,65 N; 171,33 W; H = 01:48:26,4 h = 33 km; M = 5,8 (GS) Fox islands Aleutian islands
21	ZT	Pg	11	01	48,9		Ep.: See pag. 114
	ZT	Sg	11	02	07,7		
23	ZT	P	22	57		8.660	Ep.: 4,71 N; 75,57 W; H = 22:35:34,7 h = 145 km; M = 5,7 (GS) Colombia
26	ZT	Pn	13	56	38,4		Ep.: 43,0 N; 0,9 W; H = 13:55:51,6 h = 9 km; M = 2,9 (LDG) Pau, F.
27	ZT	P	04	40		1.180	Ep.: 43,85 N; 16,63 E; H = 04:37:58,5 h = 24 km; M = 5,1 (GS) Yugoslavia
27	ZT	P	04	54		1.185	Ep.: 43,89 N; 16,64 E; H = 04:51:36,4 h = 10 km; M = 5,1 (GS) Yugoslavia
13 Dec	ZT	P	00	27		1.230	Ep.: 37,30 N; 15,44 E; H = 00:24:25,7 h = 11 km; M = 5,5 (GS) Sicily
19	ZT	Pg	10	08	06,1		Ep.: See pag. 114
	ET	Sg	10	08	18,3		
19	ZT	P	14	00		9.310	Ep.: 52,62 N; 160,72 E; H = 13:48:22,6 h = 22 km; M = 5,9 (GS) Off east of Kamchatka
20	ZT	P	07	12		5.670	Ep.: 37,61 N; 70,34 E; H = 07:02:59,3 h = 8 km; M = 5,5 (GS) Afghanistan-USSR border region
21	ZT	P	07	01		1.660	Ep.: 41,00 N; 22,30 E; H = 06:57:42,9 h = 13 km; M = 5,8 (GS) Yugoslavia
22	ZT	P	19	21		16.715	Ep.: 14,95 S; 168,04 E; H = 19:01:41,8 h = 27 km; M = 5,8 (GS) Vanuatu islands



SEISMIC OBSERVATIONS

1990

Date	Comp.	Phase	Time TU			Δ Km	Remarks
			h	m	s		
23 Dec	ZT	P	18	08		16.630	Ep.: 15,18 S; 167,39 E; H = 17:48:40,4 h = 143 km; M = 5,6 (GS) Vanuatu islands
26	ZT	Pg	20	59	01,0		Ep.. See pag. 114
	ZT	Sg	20	59	17,7		
28	ZT	P	22	44		9.100	Ep.: 14,88 S; 66,78 E; H = 22:32:17,2 h = 17 km; M = 6,0 (GS) Mid-Indian rise
30	ZT	P	19	33		14.875	Ep.: 5,10 S; 150,97 E; H = 19:14:18,9 h = 179 km; M = 6,6 (GS) New Britain region

