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Centroid moment tensor solutions for deep earthquakes predating the digital era: the World-Wide Standardized Seismograph Network dataset (1962–1976)

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Abstract

Centroid moment tensor solutions are presented for 104 deep earthquakes covering the years 1962–1976. These solutions are obtained by applying the algorithm used for modern events to restricted datasets of analog (WWSSN, World-Wide Standardized Seismograph Network) seismograms.

1. Introduction

We present a catalogue of 104 centroid moment tensor solutions for deep earthquakes ($h \geq 300$ km), covering the years 1962–76, and obtained by applying the inversion algorithm routinely used in the Harvard CMT project to analog records from the World-Wide Standardized Seismograph Network (WWSSN). The catalogue is believed to be complete for moments $M_0 \geq 2.5 \times 10^{25}$ dyn-cm, and represents a doubling of the population of reliable CMT solutions for these moment and depth windows.

We refer to Dziewonski et al. (1995) for the most recent update of the Harvard CMT catalogue, and for a complete set of references to the other 54 CMT reports published by the Harvard group over the past few years.

A full discussion of the geophysical implications of the results of this experiment will be given elsewhere. We simply present here a brief outline of the operational procedure used to build the WWSSN catalogue.

2. Rationale

This research effort is aimed at alleviating the sampling shortfall of the present-day CMT catalogue, which covers only 18 years. The possibility of using a limited number of narrow-band records (such as WWSSN seismograms) to invert for the moment tensor of deep earthquakes was discussed in detail in Huang et al. (1994). It stems fundamentally from the fact that deep earthquakes excite overtone surface waves efficiently, thus making up (in terms of the richness of resolving kernels) for restricted azimuthal coverage or for poor sampling in the frequency domain due to the narrow-band character of the older instruments. In particular, we showed in Huang et al. (1994) that it was possible to obtain reliable moment

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TABLE 1 (Left)

	Centroid parameters														
No.	Date			Time				Latitude		Longitude		Depth			
	D	M	Y	h	m	s	δt_0	λ	$\delta\lambda_0$	ϕ	$\delta\phi_0$	h	δh_0		
1	7	3	1962	11	1	7.8 ± 0.5	3.2	18.95 ± .04	-0.25	144.91 ± .05	-0.19	660.7 ± 3.2	-24.3		
2*	21	5	1962	21	15	50.8 ± 0.4	20.8	-19.41 ± .04	0.39	-177.23 ± .04	0.17	396.0 ± 1.9	54.0		
3	10	9	1962	15	44	7.5 ± 1.0	8.1	-21.03 ± .12	0.07	-178.84 ± .06	0.36	658.9 ± 4.6	18.9		
4	29	9	1962	15	17	54.2 ± 0.9	6.5	-26.95 ± .07	0.05	-63.06 ± .08	0.54	588.6 ± 3.6	13.6		
5	7	12	1962	14	3	47.1 ± 0.5	10.1	29.37 ± .04	0.17	139.35 ± .06	0.15	422.7 ± 2.5	11.7		
6	8	12	1962	21	27	29.0 ± 0.3	6.8	-25.92 ± .02	-0.12	-63.38 ± .04	0.02	589.2 ± 1.5	-30.8		
7*	15	8	1963	17	25	31.4 ± 0.2	25.5	-13.46 ± .02	0.34	-69.64 ± .02	-0.34	573.3 ± 1.4	30.3		
8	25	8	1963	12	18	21.9 ± 0.3	9.4	-17.84 ± .03	-0.34	-178.77 ± .03	0.03	593.8 ± 1.8	28.8		
9	8	9	1963	19	50	38.1 ± 0.7	8.3	-23.83 ± .11	-0.23	-179.61 ± .04	0.59	534.8 ± 2.3	-15.2		
10	9	11	1963	21	15	44.5 ± 0.3	14.1	-8.72 ± .06	0.28	-71.38 ± .06	0.12	596.1 ± 2.2	-3.9		
11	15	12	1963	19	34	52.9 ± 0.4	7.4	-5.09 ± .05	-0.29	108.33 ± .03	0.33	661.1 ± 2.4	11.1		
12	18	3	1964	4	37	30.7 ± 0.4	3.8	52.47 ± .04	-0.03	152.96 ± .10	-0.64	426.3 ± 2.1	-13.7		
13	21	3	1964	3	42	25.6 ± 0.3	6.0	-6.38 ± .04	0.02	128.00 ± .03	0.10	361.3 ± 1.9	-5.7		
14	13	8	1964	0	31	16.0 ± 0.2	1.9	-6.19 ± .03	-0.79	154.81 ± .03	0.51	384.5 ± 1.3	1.5		
15	18	10	1964	12	32	34.6 ± 0.3	10.5	-7.48 ± .04	-0.48	123.90 ± .04	-0.10	575.5 ± 2.5	1.5		
16	25	11	1964	9	24	10.2 ± 0.6	1.3	-4.47 ± .05	-0.17	121.72 ± .04	-0.48	610.0 ± 0.0	0.0		
17	28	11	1964	16	41	38.7 ± 2.2	5.3	-7.70		-71.20		627.3 ± 17.7	1.3		
18	9	12	1964	13	35	48.4 ± 0.4	6.0	-27.61 ± .04	-0.11	-62.98 ± .05	0.22	587.3 ± 2.6	1.3		
19	28	12	1964	16	16	17.4 ± 0.3	6.4	-21.44 ± .05	0.66	-179.63 ± .03	-0.03	610.7 ± 2.5	-0.3		
20	10	4	1965	22	32	56.6 ± 0.5	10.0	-17.69 ± .05	0.11	-178.91 ± .05	-0.11	549.1 ± 2.0	6.1		
21	10	4	1965	22	53	7.7 ± 1.3	2.9	-12.99 ± .09	0.41	170.54 ± .14	0.24	631.3 ± 5.7	-12.7		
22	22	5	1965	10	31	42.5 ± 0.9	3.0	-20.84 ± .14	0.26	-178.78 ± .10	-0.08	547.8 ± 6.0	-30.2		
23	6	7	1965	18	36	50.7 ± 0.6	3.3	-4.62 ± .05	-0.12	155.01 ± .06	-0.09	520.3 ± 4.3	10.3		
24	15	7	1965	18	33	34.5 ± 0.7	3.8	7.84 ± .07	0.14	124.11 ± .05	0.31	590.0 ± 0.0	0.0		
25	20	8	1965	5	54	54.4 ± 0.3	3.9	-5.73 ± .05	-0.03	128.46 ± .03	-0.14	339.3 ± 1.9	12.3		
26	1	10	1965	13	22	29.0 ± 2.3	0.6	-20.27 ± .35	-0.37	174.34 ± .07	-0.16	561.9 ± 3.9	15.9		
27	3	11	1965	1	39	7.5 ± 0.7	4.4	-9.26 ± .08	-0.16	-71.22 ± .06	0.18	636.0 ± 3.4	43.0		
28	18	11	1965	20	0	25.8 ± 0.6	6.3	-18.80		-177.80		438.4 ± 4.1	18.4		
29	9	12	1965	13	13	0.6 ± 1.3	4.9	-18.43 ± .13	-0.33	-177.78 ± .21	0.32	666.5 ± 11.8	13.5		
30	25	12	1965	2	58	2.8 ± 1.2	4.3	-17.95 ± .13	0.15	-179.22 ± .11	-0.12	625.9 ± 7.7	-0.1		
31	17	3	1966	15	50	39.6 ± 0.5	6.5	-20.88 ± .06	0.22	-178.91 ± .03	0.29	642.8 ± 2.4	3.8		
32	22	6	1966	20	29	14.9 ± 0.2	8.8	-6.97 ± .03	0.23	124.58 ± .02	-0.12	515.5 ± 1.9	-21.5		
33	20	12	1966	12	27	2.6 ± 1.2	8.0	-26.10		-63.20		581.6 ± 8.3	-4.4		
34	17	1	1967	1	7	57.9 ± 1.0	3.6	-27.29 ± .08	0.07	-63.01 ± .13	0.26	585.5 ± 6.8	-2.5		
35	15	2	1967	16	11	16.2 ± 0.4	4.7	-8.88 ± .05	0.19	-71.43 ± .04	-0.05	597.3 ± 2.7	2.3		
36	24	3	1967	9	0	23.3 ± 0.6	4.2	-6.09 ± .05	-0.10	112.09 ± .07	-0.24	601.7 ± 5.4	6.7		
37	13	8	1967	20	6	55.8 ± 0.8	5.2	34.98 ± .07	-0.32	134.86 ± .12	-0.44	357.7 ± 3.5	0.7		
38	9	9	1967	10	6	50.5 ± 0.3	6.4	-27.40 ± .03	0.30	-63.40 ± .04	-0.30	586.5 ± 2.2	8.5		
39	9	10	1967	17	21	53.6 ± 0.4	4.1	-21.12 ± .05	-0.02	-179.61 ± .05	-0.31	657.5 ± 3.3	3.5		
40	9	11	1967	2	18	49.2 ± 1.6	3.7	-7.20		123.60		560.0 ± 0.0	0.0		
41	20	1	1968	21	21	38.4 ± 0.7	6.8	-29.49 ± .11	0.41	-179.52 ± .07	-0.02	355.1 ± 3.4	6.1		
42	30	1	1968	3	44	29.9 ± 0.6	5.5	-6.42 ± .06	-0.32	113.48 ± .06	0.18	618.4 ± 5.2	24.4		
43	28	2	1968	12	8	3.4 ± 0.6	1.9	32.81 ± .07	-0.09	137.56 ± .10	-0.14	349.0 ± 3.7	0.0		
44	26	3	1968	0	42	4.9 ± 0.7	8.0	-6.54 ± .07	0.06	116.30 ± .06	0.20	566.4 ± 4.2	46.4		
45	24	5	1968	15	43	52.8 ± 0.6	-1.4	-6.79 ± .05	0.05	118.83 ± .09	-0.04	629.5 ± 8.8	20.5		
46	18	8	1968	18	38	41.2 ± 0.3	10.6	-9.94 ± .04	0.17	160.00 ± .03	0.13	546.0 ± 2.4	8.0		
47	23	8	1968	22	36	58.4 ± 0.4	7.1	-22.37 ± .05	-0.38	-64.04 ± .05	-0.38	554.2 ± 2.7	17.2		
48	12	9	1968	22	44	12.9 ± 0.4	6.4	-21.66 ± .04	-0.11	-179.24 ± .07	0.12	635.0 ± 0.0	0.0		
49	7	10	1968	19	20	28.4 ± 0.2	8.1	26.34 ± .02	0.05	140.24 ± .03	-0.36	490.3 ± 1.4	-25.7		
50	12	10	1968	19	17	43.6 ± 0.7	3.7	-20.57 ± .05	0.31	-178.95 ± .08	-0.17	607.0 ± 0.0	0.0		
51	4	11	1968	9	7	44.3 ± 0.5	5.8	-13.91 ± .06	0.27	171.87 ± .05	-0.16	594.5 ± 3.1	9.5		
52	24	1	1969	2	33	9.7 ± 0.4	6.2	-21.98 ± .06	-0.10	-179.54 ± .04	0.04	599.0 ± 3.0	4.0		
53	10	2	1969	22	58	12.3 ± 0.4	6.5	-22.65 ± .05	0.06	178.59 ± .04	-0.02	669.6 ± 3.1	-3.4		
54	11	2	1969	22	16	18.1 ± 0.3	4.6	-6.95 ± .05	-0.25	126.54 ± .03	-0.31	432.5 ± 2.1	-17.5		
55	31	3	1969	19	25	30.7 ± 0.4	3.5	38.48 ± .04	0.15	133.59 ± .08	-1.01	424.1 ± 2.3	7.1		
56	10	4	1969	14	54	12.3 ± 1.1	8.4	41.98		130.95		551.4 ± 7.3	-3.6		
57	13	5	1969	14	30	20.0 ± 1.2	0.4	-7.12 ± .11	0.08	120.81 ± .08	-0.07	642.6 ± 8.6	26.6		
58	4	8	1969	17	19	25.3 ± 0.9	5.7	-5.59 ± .27	0.06	125.27 ± .06	-0.08	566.4 ± 5.4	45.4		
59	18	12	1969	13	32	10.3 ± 1.0	5.1	46.04 ± .07	-0.25	142.31 ± .11	-0.19	344.1 ± 2.4	0.1		
60	28	1	1970	23	6	6.6 ± 0.6	4.9	-20.71 ± .05	-0.03	-178.65 ± .09	0.20	620.6 ± 5.1	12.6		

TABLE 1 (Right)

Half	Scale	Principal Axes									Best Double-Couple						
Drtn	Factor	T-axis			N-axis			P-axis			M_0	Plane 1			Plane 2		
	10^{ex}	σ	δ	ξ	σ	δ	ξ	σ	δ	ξ		ϕ_s	θ	λ	ϕ_s	θ	λ
6.6	26	2.40	10	227	0.54	17	134	-2.94	70	345	2.7	337	38	-61	122	57	-111
13.6	27	2.03	40	110	-0.08	1	201	-1.96	50	292	2.0	188	5	-103	21	85	-89
4.2	25	5.70	11	97	0.37	35	195	-6.07	53	352	5.9	152	46	-143	34	64	-50
3.7	25	4.78	16	278	1.00	20	182	-5.78	64	44	5.3	35	34	-52	172	64	-112
5.1	25	9.20	32	70	0.43	20	174	-9.63	50	290	9.4	111	23	-155	357	81	-69
9.4	26	6.52	39	269	0.20	9	172	-6.72	49	71	6.6	52	10	-30	171	85	-99
16.1	27	3.03	13	300	1.76	23	205	-4.79	63	57	3.9	58	38	-50	191	62	-117
7.9	26	4.25	31	108	0.22	30	358	-4.47	44	234	4.4	252	31	-13	354	83	-120
4.1	25	5.85	61	72	-1.27	23	214	-4.58	16	311	5.2	71	36	133	202	65	64
15.7	27	3.26	3	79	0.43	9	170	-3.68	80	329	3.5	160	42	-103	358	49	-78
8.3	26	4.55	11	225	-0.01	32	128	-4.54	56	331	4.5	348	44	-41	110	63	-126
3.8	25	4.32	44	141	-0.01	9	239	-4.32	45	338	4.3	153	9	-176	59	89	-81
5.6	26	1.58	31	149	0.42	41	270	-2.00	34	35	1.8	184	41	-177	91	88	-49
7.7	26	3.63	7	67	-0.57	6	158	-3.06	81	287	3.3	151	38	-99	343	52	-83
7.1	26	2.68	1	329	1.00	22	239	-3.68	68	61	3.2	80	48	-60	219	50	-119
2.6	25	1.24	13	98	0.15	54	349	-1.40	33	197	1.3	233	57	-15	331	77	-146
2.4	24	5.29	18	260	-0.03	6	168	-5.26	71	61	5.3	359	27	-77	165	63	-96
3.6	25	3.58	26	274	0.80	17	176	-4.38	58	57	4.0	39	24	-44	170	73	-108
5.8	26	1.41	48	168	0.15	21	53	-1.56	34	308	1.5	344	22	20	236	83	111
4.4	25	6.30	43	356	-0.83	33	124	-5.47	28	235	5.9	16	35	165	118	81	56
3.5	25	3.52	1	199	-0.48	68	105	-3.04	22	289	3.3	332	74	-15	66	76	-163
2.7	25	1.40	8	92	0.28	11	184	-1.68	76	329	1.5	169	39	-108	12	54	-76
3.1	25	3.11	28	357	0.08	3	266	-3.20	62	170	3.2	95	18	-80	265	73	-93
2.1	24	10.11	10	55	2.01	33	151	-12.13	55	310	11.1	111	45	-140	351	63	-52
5.6	26	1.34	28	297	0.21	36	185	-1.55	41	56	1.5	79	37	-13	179	82	-126
3.0	25	2.52	16	137	0.30	50	248	-2.82	35	35	2.7	182	53	-165	82	78	-38
5.4	26	1.24	3	251	0.29	4	341	-1.52	85	128	1.4	337	43	-96	165	48	-85
4.3	25	5.80	43	118	0.31	28	238	-6.12	34	350	6.0	137	29	170	236	85	61
3.0	25	2.48	7	190	-0.77	82	36	-1.71	3	280	2.1	325	83	2	235	88	173
3.2	25	2.33	13	3	0.58	7	95	-2.90	75	214	2.6	83	33	-104	280	58	-81
4.8	25	11.05	27	125	1.07	9	220	-12.13	61	328	11.6	193	20	-118	43	72	-80
7.8	26	3.51	10	253	0.11	28	349	-3.62	60	145	3.6	313	42	-135	186	61	-57
3.3	25	3.68	30	263	-0.53	10	359	-3.15	58	104	3.4	326	17	-124	181	76	-80
3.0	25	2.92	23	270	-0.14	18	172	-2.78	60	47	2.8	31	27	-47	165	70	-109
7.3	26	4.04	12	259	-0.10	0	168	-3.94	78	77	4.0	349	33	-89	168	57	-90
5.0	26	1.43	29	15	0.02	12	111	-1.45	59	221	1.4	75	19	-127	294	75	-78
3.0	25	3.34	23	338	-0.56	19	240	-2.78	60	113	3.1	100	28	-46	232	70	-110
5.2	26	1.43	23	248	0.03	2	339	-1.47	67	73	1.5	333	22	-95	159	68	-88
9.5	26	9.07	37	131	-0.71	7	227	-8.36	52	327	8.7	184	11	-133	48	82	-83
3.3	25	2.33	8	219	-0.10	18	311	-2.23	70	106	2.3	289	40	-118	144	55	-68
2.8	25	1.91	13	93	0.21	15	187	-2.12	70	324	2.0	164	35	-118	16	60	-72
2.9	25	3.03	15	49	-0.05	4	317	-2.98	75	213	3.0	144	30	-82	315	60	-95
2.5	25	3.16	57	118	-0.32	13	7	-2.85	30	270	3.0	326	19	48	191	76	103
2.2	25	1.80	7	194	-0.09	15	286	-1.71	74	80	1.8	268	40	-113	117	53	-72
3.0	25	3.04	7	164	-0.60	27	70	-2.44	62	268	2.7	282	45	-49	52	58	-123
9.7	26	9.74	1	313	0.06	23	222	-9.80	67	45	9.8	64	49	-58	201	50	-121
3.2	25	3.33	9	77	0.53	0	347	-3.87	81	254	3.6	168	36	-89	347	54	-91
2.5	25	1.99	5	143	0.00	14	234	-1.99	75	36	2.0	218	42	-111	66	51	-72
10.7	26	11.62	10	224	-0.39	23	130	-11.23	65	336	11.4	340	41	-53	115	59	-117
2.6	24	13.77	26	149	-0.55	17	51	-13.21	58	291	13.5	273	24	-45	45	73	-108
4.0	25	6.48	13	277	0.81	8	185	-7.29	74	65	6.9	18	32	-75	180	59	-99
5.1	26	1.31	37	88	-0.24	21	195	-1.07	46	307	1.2	119	21	-166	16	85	-69
9.0	26	7.62	8	255	1.36	47	156	-8.98	42	352	8.3	24	55	-27	130	68	-142
9.5	26	8.91	33	226	-1.21	16	125	-7.70	52	14	8.3	3	19	-31	123	80	-106
4.5	25	9.57	37	150	4.05	35	28	-13.61	34	270	11.6	302	35	3	209	88	125
1.9	24	7.37	40	56	-0.28	31	177	-7.09	34	291	7.2	80	31	174	175	87	59
2.6	25	4.34	21	193	0.37	13	288	-4.72	65	49	4.5	261	27	-120	114	67	-76
3.5	25	4.60	62	33	-0.96	18	161	-3.63	20	258	4.1	17	29	129	154	68	70
3.4	25	3.82	46	35	0.68	43	198	-4.50	9	296	4.2	64	52	149	174	66	42
2.6	25	1.88	8	185	0.22	9	94	-2.10	78	313	2.0	286	38	-75	87	53	-102

TABLE 1 (Left; continued)

	Centroid parameters													
No.	Date			Time				Latitude		Longitude		Depth	
	D	M	Y	h	m	s	δt_0	λ	$\delta\lambda_0$	ϕ	$\delta\phi_0$	h	δh_0
61	13	2	1970	15	43	31.0 ± 0.7	2.3	-6.53 ± .07	-0.58	113.33 ± .06	0.30	624.0 ± 4.4	-12.0
62	10	5	1970	20	5	19.7 ± 2.4	3.8	18.77 ± .18	0.19	145.29 ± .14	0.05	599.8 ± 5.3	-2.2
63	27	5	1970	12	5	10.7 ± 0.3	4.7	27.24 ± .03	0.02	140.59 ± .04	0.47	391.3 ± 2.0	9.3
64	28	6	1970	11	9	56.0 ± 0.6	1.8	-21.51 ± .08	0.11	-179.43 ± .04	0.09	612.0 ± 3.1	-11.0
†65*	31	7	1970	17	8	29.3 ± 0.2	23.9	-1.86 ± .00	-0.40	-72.29 ± .00	0.27	623.1 ± 0.0	-27.9
66	7	8	1970	7	51	12.6 ± 1.3	0.6	-18.27 ± .17	-0.56	-178.36 ± .08	-0.07	573.4 ± 4.6	-10.6
67	18	8	1970	16	52	31.8 ± 1.3	6.5	4.54		123.02		515.6 ± 11.7	-45.4
68	30	8	1970	17	46	15.9 ± 0.3	6.9	52.32 ± .03	-0.06	151.53 ± .06	-0.07	649.6 ± 2.9	4.6
69	5	9	1970	7	52	31.1 ± 0.5	3.2	52.10 ± .05	-0.13	150.99 ± .09	-0.44	560.7 ± 3.4	-19.3
70	29	1	1971	21	58	9.2 ± 0.3	3.8	51.45 ± .03	-0.27	151.02 ± .05	0.07	524.5 ± 1.8	-19.5
71	15	2	1971	7	51	9.0 ± 0.3	6.4	-25.22 ± .03	0.00	178.51 ± .03	0.16	584.2 ± 2.1	0.2
72	4	3	1971	0	28	37.1 ± 2.9	0.8	30.31 ± .18	-0.09	138.41 ± .36	0.09	435.9 ± 13.4	7.9
73	6	4	1971	11	6	31.3 ± 0.4	0.7	-22.07 ± .05	0.15	-179.56 ± .04	0.01	602.7 ± 3.4	-0.3
74	20	11	1971	7	28	6.2 ± 0.4	5.2	-23.07 ± .04	0.33	179.93 ± .05	-0.16	554.2 ± 2.3	3.2
75	12	1	1972	9	59	9.8 ± 0.6	-0.5	-6.30 ± .07	0.56	-71.89 ± .06	-0.07	548.8 ± 3.9	-31.2
76	21	1	1972	19	19	4.7 ± 1.1	7.5	-6.37 ± .10	0.34	-71.70 ± .07	0.19	550.1 ± 5.0	-11.9
77	26	1	1972	23	0	23.6 ± 0.5	-0.8	-20.52 ± .07	-0.34	-178.79 ± .04	0.16	649.4 ± 3.9	-18.6
78	30	3	1972	5	34	58.7 ± 0.4	4.0	-25.60 ± .07	0.09	179.54 ± .04	0.15	478.0 ± 2.6	-54.0
79	4	4	1972	22	43	8.3 ± 0.2	1.6	-7.66 ± .02	-0.23	125.85 ± .03	0.27	399.2 ± 1.4	22.2
80	28	4	1972	23	32	19.9 ± 0.3	9.7	-4.94 ± .03	0.14	154.09 ± .03	-0.14	419.8 ± 1.7	10.8
81	27	5	1972	4	6	50.9 ± 1.3	0.5	54.99		156.27		411.4 ± 8.1	2.4
82	11	6	1972	16	41	11.2 ± 0.6	10.3	3.63 ± .04	-0.31	124.47 ± .07	0.15	332.5 ± 2.6	7.5
83	21	8	1972	6	23	57.7 ± 0.7	8.8	49.49 ± .06	-0.02	146.64 ± .11	-0.40	607.2 ± 5.8	29.2
84	27	11	1972	15	17	40.7 ± 0.9	-0.1	-4.79 ± .17	0.51	126.97 ± .16	0.38	437.9 ± 5.0	12.9
85	31	1	1973	20	55	58.3 ± 0.3	5.2	28.18 ± .03	-0.03	138.86 ± .04	-0.37	506.2 ± 2.4	8.2
86	21	7	1973	4	19	24.2 ± 0.5	7.1	-24.81		-179.22		429.5 ± 2.8	18.5
87	10	9	1973	7	43	38.2 ± 0.4	7.7	42.39 ± .03	-0.06	130.36 ± .06	-0.55	556.9 ± 2.9	24.9
88	20	9	1973	20	43	41.2 ± 0.4	1.4	9.30 ± .05	0.25	123.79 ± .03	0.00	523.8 ± 2.8	-36.2
89	29	9	1973	0	44	7.3 ± 0.4	6.5	42.16 ± .04	0.27	131.12 ± .07	0.25	593.0 ± 3.3	18.0
90	25	10	1973	14	9	3.6 ± 0.4	4.1	-21.96 ± .04	0.03	-63.93 ± .04	-0.27	559.2 ± 2.2	30.2
91	28	12	1973	5	31	16.4 ± 0.4	10.0	-24.25 ± .04	-0.38	179.58 ± .04	-0.38	539.8 ± 2.2	-9.2
92	22	2	1974	0	37	2.5 ± 0.3	8.7	33.02 ± .04	-0.13	136.80 ± .06	-0.11	386.4 ± 2.3	1.4
93	23	3	1974	14	28	44.6 ± 0.3	9.2	-24.23 ± .03	-0.30	-179.97 ± .04	0.25	537.2 ± 2.0	2.2
94	21	10	1974	4	12	35.1 ± 0.7	5.7	-17.79 ± .09	0.12	-178.37 ± .06	0.24	603.7 ± 5.1	1.7
95	29	11	1974	22	5	28.1 ± 0.3	5.7	30.93 ± .03	0.23	138.40 ± .04	0.08	407.9 ± 1.6	-11.1
96	22	2	1975	22	4	43.5 ± 0.3	5.8	-24.89 ± .05	0.00	-178.81 ± .04	0.25	373.8 ± 2.2	-1.2
97	29	6	1975	10	37	46.6 ± 0.3	5.2	38.43 ± .04	-0.33	129.83 ± .04	-0.16	571.0 ± 2.0	11.0
98	21	12	1975	10	54	24.0 ± 0.2	6.3	51.84 ± .03	-0.10	151.75 ± .04	0.17	544.8 ± 1.5	-9.2
99	23	1	1976	5	45	35.9 ± 0.4	5.4	-7.42 ± .05	0.06	119.76 ± .07	-0.15	637.0 ± 3.5	23.0
100	10	4	1976	17	12	15.0 ± 0.9	5.8	-17.91 ± .14	-0.25	-177.91 ± .07	0.59	582.0 ± 4.7	22.0
101	10	7	1976	11	37	17.8 ± 0.6	5.0	47.41 ± .08	0.05	145.37 ± .09	-0.35	421.3 ± 4.5	34.3
102	12	8	1976	20	53	54.6 ± 0.6	5.5	3.60 ± .08	0.05	124.55 ± .06	0.22	349.6 ± 3.6	-7.4
103	25	11	1976	14	6	34.1 ± 0.7	-1.3	-20.32 ± .06	-0.82	-177.32 ± .07	0.39	471.1 ± 3.3	29.1
104	12	12	1976	1	8	53.2 ± 0.5	3.1	28.08 ± .06	0.04	139.54 ± .08	-0.04	499.0 ± 3.7	8.0

tensor solutions with as few records as two components from a single station.

3. Selection of events

We targeted for inversion all events spanning the 'WWSSN years' (1962–1976) with a reported depth $h \geq 300$ km, and at least one reported magnitude M (most often m_b) ≥ 5.8. Our experience was that smaller events could not be reliably inverted. Out of the 119 such earthquakes, we obtained 104 centroid moment tensors. One earthquake (Marianas, 15 August 1969) relocated to a depth of 279 km, and was dropped from the catalogue, leaving 103 solutions deeper than 300 km. For each event, stations well

TABLE 1 (Right; continued)

Half	Scale	Principal Axes									Best Double-Couple						
Drtn	Factor	T-axis			N-axis			P-axis			M_0	Plane 1			Plane 2		
	10^{ex}	σ	δ	ξ	σ	δ	ξ	σ	δ	ξ		ϕ_s	θ	λ	ϕ_s	θ	λ
3.8	25	5.97	30	169	0.19	11	265	-6.16	58	13	6.1	229	18	-128	88	76	-79
2.4	25	1.53	12	265	0.14	41	165	-1.67	46	8	1.6	34	49	-29	144	69	-135
7.9	26	4.97	24	208	1.86	7	115	-6.83	65	11	5.9	313	22	-72	113	69	-97
3.6	25	4.54	37	109	0.45	15	211	-4.98	49	319	4.8	144	16	-158	33	84	-75
20.0	28	1.36	20	259	0.17	0	349	-1.53	70	79	1.4	349	25	-90	169	65	-90
2.7	25	1.82	15	140	-0.06	59	23	-1.76	26	238	1.8	277	60	-8	11	83	-150
1.9	24	6.03	13	89	2.94	26	353	-8.97	60	203	7.5	210	39	-46	338	63	-120
10.5	27	1.17	8	129	-0.08	9	38	-1.09	78	260	1.1	229	38	-76	31	53	-101
3.7	25	5.68	34	85	1.52	11	182	-7.21	54	287	6.4	137	15	-136	4	79	-79
6.3	26	2.41	27	133	0.16	14	36	-2.57	59	281	2.5	254	22	-50	31	73	-105
4.0	25	8.13	6	225	-0.08	40	130	-8.05	50	322	8.1	350	52	-36	104	62	-136
2.3	24	10.31	31	18	-0.79	42	140	-9.52	33	265	9.9	53	42	-178	321	89	-48
3.0	25	2.09	74	347	-0.39	14	196	-1.70	8	104	1.9	178	39	67	26	54	108
4.0	25	6.74	45	56	-0.58	1	325	-6.17	45	234	6.5	255	1	20	145	90	91
3.6	25	5.34	5	65	-1.01	19	157	-4.33	71	322	4.8	136	44	-118	352	52	-66
2.4	25	1.65	6	95	0.09	3	186	-1.73	83	303	1.7	181	39	-95	8	52	-86
4.6	25	7.61	40	127	0.55	19	234	-8.15	44	343	7.9	151	19	-173	54	88	-71
8.2	26	9.35	37	57	-0.02	38	184	-9.33	30	301	9.3	85	39	173	181	86	52
6.5	26	2.00	1	7	-0.30	18	277	-1.70	72	101	1.9	115	46	-65	260	49	-114
9.4	26	7.82	4	246	0.04	11	337	-7.86	78	135	7.8	324	42	-107	166	50	-75
2.4	24	8.10	30	161	0.56	34	48	-8.65	41	281	8.4	304	35	-11	43	84	-124
14.1	27	4.99	23	107	-0.49	12	12	-4.50	63	256	4.7	221	24	-59	7	69	-103
3.3	25	2.98	61	170	-0.39	15	52	-2.59	25	315	2.8	16	24	51	237	71	106
3.6	25	3.95	5	134	-0.21	61	234	-3.75	28	41	3.8	181	66	-163	84	74	-25
6.6	26	2.44	25	28	0.09	37	138	-2.52	43	273	2.5	70	39	-163	327	79	-52
3.5	25	3.76	39	97	-0.42	17	202	-3.34	46	310	3.5	125	17	-168	23	86	-73
5.4	26	1.24	53	84	-0.07	6	183	-1.17	36	278	1.2	40	11	127	182	81	83
4.2	25	6.51	9	263	2.59	48	163	-9.09	41	1	7.8	33	55	-25	138	69	-142
10.0	27	4.96	50	68	0.01	14	175	-4.97	36	275	5.0	56	16	152	173	83	76
5.4	26	1.10	6	97	-0.11	0	187	-0.99	84	279	1.0	187	39	-90	7	51	-90
5.9	26	1.72	67	85	0.15	7	192	-1.87	22	285	1.8	28	24	107	189	67	83
5.1	25	9.87	56	94	-0.08	9	351	-9.79	33	255	9.8	315	15	53	173	78	99
4.8	26	4.38	65	97	-0.45	10	210	-3.93	22	304	4.2	53	24	116	206	68	79
3.6	25	3.58	30	15	-0.52	50	149	-3.06	24	270	3.3	51	50	175	144	86	40
8.5	26	4.83	30	57	1.12	13	155	-5.94	57	265	5.4	113	19	-133	338	76	-77
6.5	26	2.29	28	77	-0.01	21	178	-2.28	54	300	2.3	125	26	-146	4	76	-68
8.6	26	5.33	61	148	0.65	6	46	-5.98	28	313	5.7	26	18	69	228	73	97
6.5	26	2.17	32	139	-0.15	5	46	-2.02	57	308	2.1	247	14	-68	44	77	-95
4.9	26	0.69	13	172	0.61	0	262	-1.31	77	354	1.0	262	32	-91	83	58	-90
4.0	25	4.07	18	118	0.12	41	11	-4.19	43	226	4.1	252	45	-21	357	75	-133
3.0	25	2.12	36	161	-0.41	7	65	-1.71	53	325	1.9	284	11	-50	64	81	-97
3.3	25	4.83	32	145	-0.84	9	49	-3.99	56	306	4.4	264	15	-55	48	78	-99
4.2	25	6.51	15	251	-0.59	23	154	-5.93	62	11	6.2	10	36	-48	142	64	-116
3.5	25	4.42	41	52	2.03	19	159	-6.46	43	268	5.4	73	19	-177	339	89	-71

distributed in azimuth were selected after inspection of the individual records; their number varied from 2 to 10 and averaged 5. A processing window consisting of the generalized body waves (P group, S group, and the mantle reverberations such as PS, SS, etc.) was isolated, lasting from 2 mn before the P arrival to 2 mn after the arrival of fundamental Love waves. Records were digitized and equalized to a common sampling $\delta t = 1$ s, identical to that used on long-period channels of present-day digital networks. The inversion proceeded by using exactly the same algorithm as utilized in the routine CMT determination of Dziewonski et al. Tables 1 and 2 and Fig. 1 present our dataset in the same format as used throughout the quarterly reports, the only (trivial) exception being the inclusion of the year as the

TABLE 2

No.	Scale	Elements of Moment Tensor					
	10^{ex}	M_{rr}	$M_{\theta\theta}$	$M_{\phi\phi}$	$M_{r\theta}$	$M_{r\phi}$	$M_{\theta\phi}$
1	26	-2.48 ± 0.09	1.00 ± 0.10	1.48 ± 0.12	-1.30 ± 0.10	-0.06 ± 0.11	-1.00 ± 0.11
2*	27	-0.32 ± 0.04	-0.04 ± 0.06	0.36 ± 0.06	-0.70 ± 0.05	-1.83 ± 0.04	0.12 ± 0.05
3	25	-3.54 ± 0.24	-1.87 ± 0.48	5.40 ± 0.37	-3.19 ± 0.38	-1.38 ± 0.36	0.31 ± 0.34
4	25	-4.20 ± 0.24	0.41 ± 0.32	3.79 ± 0.42	-1.77 ± 0.41	2.85 ± 0.35	1.15 ± 0.32
5	25	-2.98 ± 0.25	0.66 ± 0.36	2.32 ± 0.41	-0.36 ± 0.39	-8.37 ± 0.35	-3.34 ± 0.40
6	26	-1.25 ± 0.10	-0.10 ± 0.13	1.36 ± 0.17	-1.16 ± 0.15	6.33 ± 0.14	0.84 ± 0.14
7*	27	-3.36 ± 0.06	1.67 ± 0.08	1.69 ± 0.08	-1.29 ± 0.08	2.48 ± 0.08	1.15 ± 0.09
8	26	-0.91 ± 0.08	-0.34 ± 0.12	1.25 ± 0.11	0.82 ± 0.11	-3.60 ± 0.12	2.05 ± 0.10
9	25	3.94 ± 0.20	-2.43 ± 0.31	-1.52 ± 0.20	0.36 ± 0.19	-3.52 ± 0.19	-2.01 ± 0.25
10	27	-3.56 ± 0.14	0.44 ± 0.14	3.12 ± 0.15	-0.55 ± 0.13	-0.51 ± 0.13	-0.56 ± 0.17
11	26	-2.99 ± 0.09	1.11 ± 0.15	1.88 ± 0.14	-2.42 ± 0.14	-0.41 ± 0.15	-2.79 ± 0.15
12	25	-0.08 ± 0.12	-0.50 ± 0.15	0.58 ± 0.22	-3.66 ± 0.17	-2.19 ± 0.16	0.34 ± 0.15
13	26	-0.03 ± 0.04	-0.06 ± 0.06	0.09 ± 0.05	-1.35 ± 0.05	0.38 ± 0.04	1.16 ± 0.06
14	26	-2.93 ± 0.07	0.04 ± 0.11	2.90 ± 0.12	0.08 ± 0.11	-0.86 ± 0.10	-1.48 ± 0.10
15	26	-3.04 ± 0.12	2.08 ± 0.20	0.96 ± 0.17	-0.77 ± 0.19	1.41 ± 0.18	1.01 ± 0.20
16	25	-0.25 ± 0.08	-0.82 ± 0.09	1.07 ± 0.07	0.64 ± 0.11	-0.45 ± 0.09	0.45 ± 0.11
17	24	-4.18 ± 3.92	-0.02 ± 1.70	4.20 ± 3.20	-1.06 ± 1.15	2.97 ± 1.17	-0.59 ± 5.75
18	25	-2.36 ± 0.12	0.37 ± 0.18	2.00 ± 0.19	-1.20 ± 0.18	3.05 ± 0.17	0.84 ± 0.17
19	26	0.30 ± 0.04	0.25 ± 0.07	-0.55 ± 0.05	-1.10 ± 0.05	-0.76 ± 0.05	-0.45 ± 0.05
20	25	1.47 ± 0.11	1.75 ± 0.18	-3.21 ± 0.16	4.66 ± 0.19	-1.32 ± 0.23	1.98 ± 0.19
21	25	-0.84 ± 0.18	2.88 ± 0.31	-2.03 ± 0.24	-0.38 ± 0.25	-0.81 ± 0.21	-1.88 ± 0.22
22	25	-1.55 ± 0.16	0.20 ± 0.26	1.35 ± 0.21	-0.39 ± 0.23	-0.38 ± 0.21	-0.01 ± 0.26
23	25	-1.83 ± 0.11	1.76 ± 0.23	0.07 ± 0.23	2.58 ± 0.26	0.28 ± 0.25	-0.01 ± 0.18
24	24	-7.31 ± 0.90	2.77 ± 0.95	4.54 ± 0.84	-3.45 ± 1.09	-6.19 ± 1.01	-5.97 ± 1.22
25	26	-0.31 ± 0.04	0.08 ± 0.06	0.22 ± 0.05	-0.27 ± 0.04	1.14 ± 0.05	0.82 ± 0.04
26	25	-0.56 ± 0.15	0.01 ± 0.22	0.55 ± 0.14	-1.63 ± 0.14	0.44 ± 0.20	2.00 ± 0.19
27	26	-1.51 ± 0.06	0.38 ± 0.08	1.13 ± 0.08	0.08 ± 0.07	0.16 ± 0.07	-0.30 ± 0.08
28	25	0.83 ± 0.66	-3.30 ± 0.97	2.47 ± 0.41	-4.23 ± 0.29	-2.94 ± 0.34	0.46 ± 0.73
29	25	-0.72 ± 0.21	2.31 ± 0.25	-1.59 ± 0.38	-0.38 ± 0.35	0.01 ± 0.43	-0.70 ± 0.28
30	25	-2.58 ± 0.20	2.08 ± 0.44	0.51 ± 0.38	1.10 ± 0.37	-0.51 ± 0.32	0.01 ± 0.31
31	25	-7.08 ± 0.27	1.55 ± 0.39	5.53 ± 0.38	-7.00 ± 0.34	-6.24 ± 0.35	2.38 ± 0.38
32	26	-2.55 ± 0.07	-0.24 ± 0.11	2.79 ± 0.11	1.15 ± 0.11	1.52 ± 0.11	-1.38 ± 0.10
33	25	-1.33 ± 0.47	-0.54 ± 0.49	1.86 ± 0.77	0.07 ± 0.46	2.97 ± 0.52	-0.55 ± 0.42
34	25	-1.67 ± 0.19	-0.44 ± 0.23	2.11 ± 0.35	-0.78 ± 0.26	1.93 ± 0.24	0.32 ± 0.22
35	26	-3.58 ± 0.15	0.05 ± 0.21	3.53 ± 0.23	-0.35 ± 0.20	1.63 ± 0.24	-0.73 ± 0.21
36	26	-0.73 ± 0.07	0.81 ± 0.09	-0.08 ± 0.10	1.07 ± 0.09	-0.58 ± 0.09	-0.07 ± 0.10
37	25	-1.65 ± 0.14	2.20 ± 0.19	-0.55 ± 0.25	1.66 ± 0.24	1.41 ± 0.15	0.96 ± 0.22
38	26	-1.03 ± 0.04	0.19 ± 0.06	0.84 ± 0.06	-0.34 ± 0.06	0.98 ± 0.05	-0.35 ± 0.06
39	26	-2.03 ± 0.23	0.05 ± 0.33	1.98 ± 0.34	-6.18 ± 0.36	-5.55 ± 0.33	1.81 ± 0.33
40	25	-1.95 ± 0.53	1.34 ± 0.70	0.62 ± 0.79	-0.06 ± 0.68	0.85 ± 0.55	-1.23 ± 0.74
41	25	-1.75 ± 0.24	0.03 ± 0.44	1.72 ± 0.27	-0.64 ± 0.18	-0.81 ± 0.16	-0.04 ± 0.26
42	25	-2.57 ± 0.16	1.07 ± 0.23	1.51 ± 0.24	1.13 ± 0.34	-0.97 ± 0.29	-1.34 ± 0.33
43	25	1.52 ± 0.19	-0.09 ± 0.26	-1.43 ± 0.32	-0.74 ± 0.25	-2.49 ± 0.22	0.43 ± 0.26
44	25	-1.56 ± 0.08	1.66 ± 0.13	-0.10 ± 0.11	-0.29 ± 0.12	0.48 ± 0.14	-0.42 ± 0.12
45	25	-1.97 ± 0.14	2.72 ± 0.24	-0.75 ± 0.26	-0.41 ± 0.28	-0.89 ± 0.29	0.95 ± 0.28
46	26	-8.27 ± 0.25	3.72 ± 0.42	4.54 ± 0.36	-2.45 ± 0.38	2.61 ± 0.44	5.59 ± 0.34
47	25	-3.67 ± 0.16	0.66 ± 0.25	3.01 ± 0.25	0.29 ± 0.27	-1.13 ± 0.24	-0.56 ± 0.25
48	25	-1.85 ± 0.10	1.17 ± 0.11	0.67 ± 0.12	-0.53 ± 0.11	0.19 ± 0.13	1.01 ± 0.17
49	26	-8.91 ± 0.19	3.97 ± 0.25	4.94 ± 0.30	-5.24 ± 0.29	-0.34 ± 0.24	-6.57 ± 0.26
50	24	-6.97 ± 0.78	7.57 ± 0.80	-0.60 ± 0.88	-6.89 ± 0.94	-8.15 ± 0.90	3.90 ± 1.03
51	25	-6.38 ± 0.27	0.78 ± 0.46	5.61 ± 0.41	-0.74 ± 0.47	3.19 ± 0.49	0.85 ± 0.40
52	26	-0.12 ± 0.04	-0.38 ± 0.06	0.50 ± 0.05	-0.23 ± 0.04	-1.07 ± 0.05	-0.22 ± 0.05
53	26	-3.10 ± 0.23	-3.86 ± 0.30	6.96 ± 0.29	-5.32 ± 0.27	0.14 ± 0.26	-2.35 ± 0.30
54	26	-2.16 ± 0.17	-0.18 ± 0.29	2.34 ± 0.25	-6.26 ± 0.24	4.12 ± 0.33	-2.94 ± 0.28
55	25	0.55 ± 0.32	6.71 ± 0.55	-7.26 ± 0.60	-2.30 ± 0.54	-9.49 ± 0.50	1.53 ± 0.48
56	24	0.70 ± 0.79	0.51 ± 1.38	-1.21 ± 0.83	0.94 ± 0.86	-6.09 ± 0.78	-3.64 ± 0.77
57	25	-3.33 ± 0.28	3.28 ± 0.49	0.04 ± 0.46	-2.55 ± 0.86	1.76 ± 0.50	-0.33 ± 0.46
58	25	3.07 ± 1.04	-0.20 ± 2.11	-2.86 ± 1.12	2.10 ± 0.62	-2.10 ± 0.69	-0.09 ± 0.69
59	25	2.19 ± 0.13	0.71 ± 0.18	-2.90 ± 0.22	0.94 ± 0.22	-1.60 ± 0.18	-2.71 ± 0.18
60	25	-1.97 ± 0.12	1.79 ± 0.19	0.18 ± 0.19	-0.54 ± 0.20	-0.33 ± 0.24	-0.19 ± 0.22

TABLE 2 (continued)

No.	Scale	Elements of Moment Tensor					
	10^{ex}	M_{rr}	$M_{\theta\theta}$	$M_{\phi\phi}$	$M_{r\theta}$	$M_{r\phi}$	$M_{\theta\phi}$
61	25	-2.87 ± 0.23	2.61 ± 0.35	0.26 ± 0.31	-5.27 ± 0.35	0.14 ± 0.35	1.21 ± 0.33
62	25	-0.75 ± 0.08	-0.69 ± 0.12	1.44 ± 0.10	-0.92 ± 0.15	0.41 ± 0.12	0.01 ± 0.13
63	26	-4.80 ± 0.20	2.40 ± 0.28	2.40 ± 0.32	-4.26 ± 0.26	1.15 ± 0.25	-0.82 ± 0.31
64	25	-1.14 ± 0.14	-0.62 ± 0.22	1.76 ± 0.20	-2.70 ± 0.20	-3.61 ± 0.18	-0.35 ± 0.20
†65*	28	-1.17 ± 0.02	0.20 ± 0.03	0.98 ± 0.03	-0.18 ± 0.01	0.93 ± 0.01	-0.16 ± 0.01
66	25	-0.26 ± 0.09	0.58 ± 0.12	-0.32 ± 0.10	-0.01 ± 0.12	-0.87 ± 0.12	1.48 ± 0.12
67	24	-5.89 ± 0.99	0.48 ± 3.03	5.41 ± 3.02	4.71 ± 4.30	-2.72 ± 2.98	1.03 ± 2.12
68	27	-1.03 ± 0.04	0.41 ± 0.05	0.62 ± 0.05	-0.07 ± 0.05	-0.32 ± 0.05	0.61 ± 0.05
69	25	-2.96 ± 0.23	1.28 ± 0.39	1.68 ± 0.39	-1.06 ± 0.34	-5.85 ± 0.39	-1.13 ± 0.35
70	26	-1.40 ± 0.06	0.97 ± 0.08	0.43 ± 0.08	-0.84 ± 0.07	-1.84 ± 0.07	0.76 ± 0.07
71	25	-4.63 ± 0.16	1.91 ± 0.26	2.72 ± 0.23	-3.70 ± 0.23	-1.82 ± 0.26	-5.68 ± 0.23
72	24	-0.42 ± 1.03	6.57 ± 1.81	-6.16 ± 1.91	4.96 ± 2.24	-5.46 ± 1.67	-1.92 ± 2.27
73	25	1.88 ± 0.08	-0.28 ± 0.14	-1.59 ± 0.12	0.69 ± 0.14	0.32 ± 0.14	-0.25 ± 0.11
74	25	0.37 ± 0.16	-0.43 ± 0.25	0.06 ± 0.24	3.68 ± 0.23	-5.30 ± 0.24	-0.32 ± 0.24
75	25	-3.92 ± 0.25	-0.13 ± 0.43	4.05 ± 0.40	-0.60 ± 0.41	-1.10 ± 0.38	-2.58 ± 0.38
76	25	-1.68 ± 0.10	0.09 ± 0.14	1.59 ± 0.18	-0.14 ± 0.14	-0.37 ± 0.12	0.13 ± 0.09
77	25	-0.77 ± 0.27	-2.06 ± 0.39	2.83 ± 0.32	-6.25 ± 0.39	-4.03 ± 0.32	0.76 ± 0.36
78	26	1.11 ± 0.29	-0.16 ± 0.50	-0.95 ± 0.31	0.36 ± 0.30	-7.25 ± 0.34	-5.78 ± 0.31
79	26	-1.57 ± 0.04	1.96 ± 0.07	-0.39 ± 0.08	0.14 ± 0.07	0.40 ± 0.05	-0.31 ± 0.07
80	26	-7.48 ± 0.20	1.16 ± 0.24	6.32 ± 0.32	0.90 ± 0.30	1.67 ± 0.25	-3.05 ± 0.25
81	24	-1.54 ± 0.59	5.37 ± 1.06	-3.83 ± 1.11	-4.00 ± 1.00	-5.56 ± 1.85	0.75 ± 0.95
82	27	-2.84 ± 0.18	-0.14 ± 0.26	2.98 ± 0.29	-0.18 ± 0.22	-3.46 ± 0.20	1.49 ± 0.24
83	25	1.79 ± 0.18	-0.51 ± 0.23	-1.28 ± 0.25	-2.00 ± 0.25	-0.84 ± 0.26	-0.77 ± 0.28
84	25	-0.97 ± 0.37	0.20 ± 0.58	0.76 ± 0.35	-1.39 ± 0.41	0.69 ± 0.43	3.42 ± 0.54
85	26	-0.71 ± 0.06	1.60 ± 0.09	-0.88 ± 0.08	0.71 ± 0.07	-1.72 ± 0.08	-0.88 ± 0.08
86	25	-0.28 ± 0.18	-0.97 ± 0.32	1.24 ± 0.21	-1.20 ± 0.19	-3.15 ± 0.20	-0.37 ± 0.22
87	26	0.38 ± 0.03	-0.08 ± 0.04	-0.31 ± 0.05	-0.01 ± 0.05	-1.14 ± 0.05	-0.14 ± 0.05
88	25	-2.32 ± 0.23	-4.03 ± 0.36	6.35 ± 0.34	-5.86 ± 0.31	0.69 ± 0.34	-0.39 ± 0.32
89	27	1.22 ± 0.16	0.27 ± 0.23	-1.48 ± 0.27	0.71 ± 0.23	-4.61 ± 0.18	-1.00 ± 0.21
90	26	-0.97 ± 0.04	-0.09 ± 0.05	1.06 ± 0.06	-0.03 ± 0.05	-0.23 ± 0.05	0.15 ± 0.05
91	26	1.20 ± 0.05	0.04 ± 0.08	-1.24 ± 0.07	-0.13 ± 0.07	-1.24 ± 0.07	-0.44 ± 0.07
92	25	3.93 ± 0.28	-0.50 ± 0.43	-3.43 ± 0.45	0.77 ± 0.37	-8.87 ± 0.35	1.90 ± 0.38
93	26	3.02 ± 0.12	-1.37 ± 0.18	-1.65 ± 0.20	-0.90 ± 0.17	-2.85 ± 0.16	-1.28 ± 0.18
94	25	0.11 ± 0.16	2.33 ± 0.25	-2.44 ± 0.20	1.71 ± 0.25	-1.40 ± 0.25	-0.79 ± 0.21
95	26	-2.87 ± 0.13	1.91 ± 0.18	0.96 ± 0.21	1.17 ± 0.18	-4.58 ± 0.16	-1.07 ± 0.19
96	26	-1.00 ± 0.06	-0.11 ± 0.12	1.11 ± 0.10	-0.33 ± 0.08	-1.85 ± 0.08	-0.74 ± 0.09
97	26	2.82 ± 0.14	-1.00 ± 0.21	-1.82 ± 0.21	-3.54 ± 0.21	-3.03 ± 0.20	-2.11 ± 0.19
98	26	-0.82 ± 0.04	0.58 ± 0.05	0.23 ± 0.05	-1.30 ± 0.05	-1.36 ± 0.06	0.56 ± 0.05
99	26	-1.21 ± 0.06	0.60 ± 0.07	0.61 ± 0.09	-0.43 ± 0.06	-0.05 ± 0.05	0.00 ± 0.07
100	25	-1.49 ± 0.25	-0.20 ± 0.38	1.69 ± 0.27	0.94 ± 0.31	-2.60 ± 0.29	2.62 ± 0.32
101	25	-0.38 ± 0.09	0.75 ± 0.14	-0.37 ± 0.15	-1.65 ± 0.14	-0.76 ± 0.16	0.30 ± 0.13
102	25	-1.40 ± 0.19	1.53 ± 0.29	-0.13 ± 0.27	-2.96 ± 0.26	-2.64 ± 0.24	1.45 ± 0.32
103	25	-4.27 ± 0.26	-1.02 ± 0.38	5.29 ± 0.36	-2.76 ± 0.39	2.10 ± 0.49	-1.82 ± 0.42
104	25	-0.90 ± 0.21	2.55 ± 0.27	-1.65 ± 0.26	0.91 ± 0.26	-5.16 ± 0.28	-0.47 ± 0.29

fourth column of Table 1. The format of the tables is described in detail in Dziewonski et al. (1987), to which the reader is referred. In the case of a few small earthquakes, a blank entry for the precision of the coordinates λ, ϕ of the centroid indicates that the epicenter was fixed during the inversion. However, in all cases, the depth was inverted.

3.1. Case of the 31 July 1970 Colombian earthquake

This event, and the 15 August 1963, Peru–Brazil earthquake, were the subject of a detailed investigation by Gilbert and Dziewonski (1975), which can be regarded as the prototype of the centroid-moment-tensor inversion project. Because of the long dura-

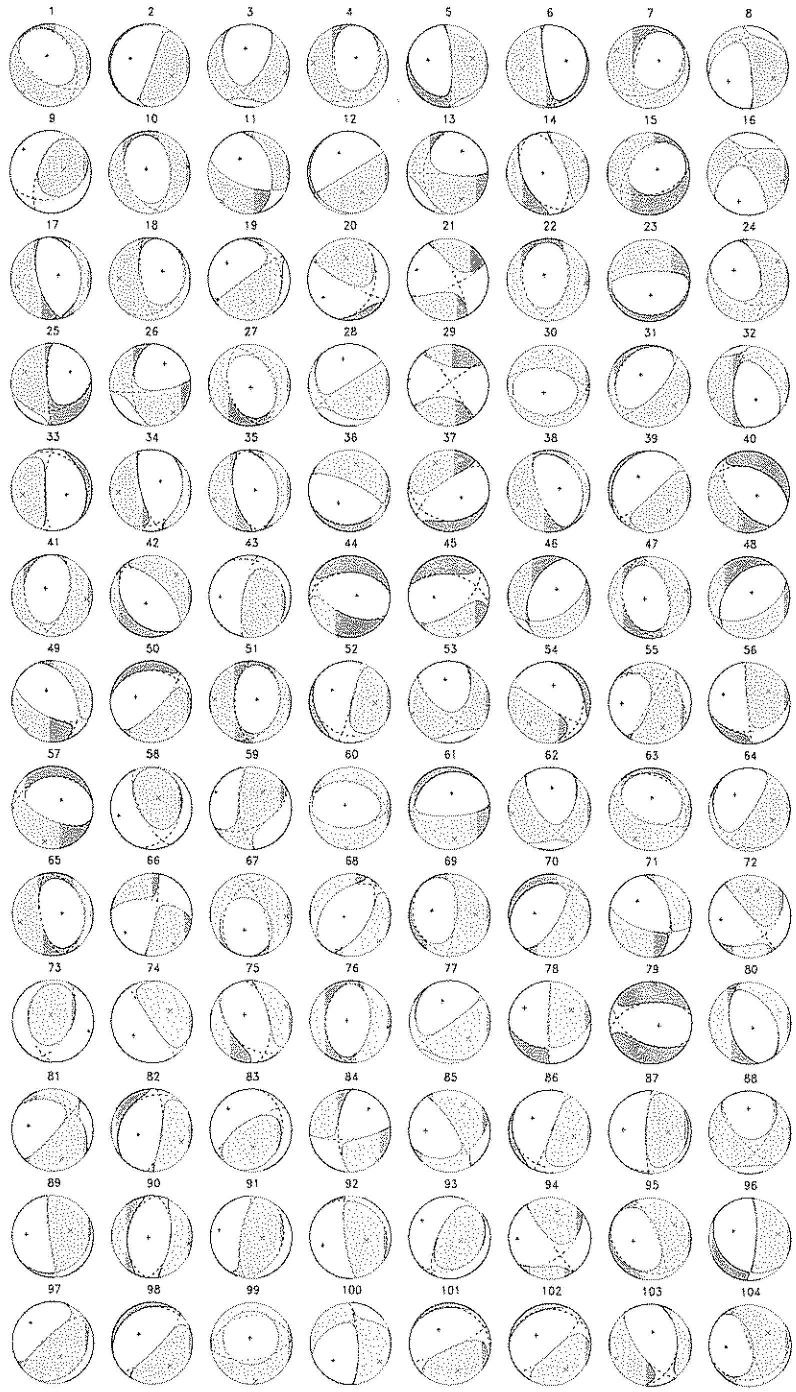

Fig. 1. Equal-area representation of the moment tensors listed in Table 2. Solid lines are the projections of the nodal surfaces of the full moment tensors; dashed lines represent the fault planes of the best double-couples, as listed in the last columns of Table 1. The compression and tension axes are shown by plus signs and crosses, respectively.

tion of its source, the 1970 Colombian earthquake could not be inverted by the standard algorithm, which targets periods of at most 135 s. We include in our catalogue the results of a similar inversion (D. Russakoff, personal communication, 1996), carried out at periods $T \geq 200$ s, using records at 56 stations from the original dataset of Gilbert and Dziewonski (1975). This brings back the total population of the catalogue to 104 earthquakes. Note that this study solved for the full six-component tensor (without constraining the isotropic part to zero; we report in the catalogue the deviatoric part of the resulting moment tensor). The special character of this particular entry is flagged by a dagger (†) in Tables 1 and 2.

4. Discussion

The total moment release for the 84 events in the catalogue (including the 1970 Colombian earthquake) above the estimated threshold of completeness ($M_0 \geq 2.5 \times 10^{25}$ dyn-cm) is 5.1×10^{28} dyn-cm, corresponding to a rate of 3.4×10^{27} dyn-cm year^{-1}, as compared with 102 events and 4.9×10^{28} dyn-cm (2.7×10^{27} dyn-cm year^{-1}) for the 1977–94 Harvard CMT catalogue (including the 1994 Bolivian shock). If the gigantic 1970 Colombian and 1994 Bolivian earthquakes are excluded, the corresponding rates become 2.4×10^{27} dyn-cm year^{-1} (1962–76) and 1.3×10^{27} dyn-cm year^{-1} (1977–94). That the rate of seismic moment release was actually greater during the WWSSN years constitutes in itself an important a posteriori justification of our endeavor.

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