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NIED Seismic Moment Tensor Catalogue January – December 1998

By
Eiichi Fukuyama*, Mizuho Ishida*, Shigeki Horiuchi*, Hiroshi Inoue*, Sadaki Hori*, Shoji Sekiguchi*, Hiroyuki Kawai†, and Hiroshi Murakami‡

*National Research Institute for Earth Science and Disaster Prevention
†Sun Microsystems K.K.
‡ Earthquake Observation Research Technology Center

Abstract

We have routinely estimated the moment tensors of earthquakes occurring in and around Japanese islands. This report compiles all the moment tensor solutions we have estimated in 1998. In these computations, we used the FREESIA/KIBAN broadband seismic network developed by NIED (National Research Institute for Earth Science and Disaster Prevention) and STA (Science and Technology Agency). We mainly used STS-1 broadband seismometer records. VSE311 (now upgrading to VSE355) strong motion velocity-meter was additionally used in cases when STS-1 waveforms were unavailable. Moment tensor estimation is triggered by the JMA (Japan Meteorological Agency) e-mail of emergent hypocenter location information. This catalogue includes most M >4.0 earthquakes and some M >3.5 earthquakes. However, due to either incomplete station distribution or the quality of available data, our catalog missed several earthquakes that had been detected by JMA.

Key words: Seismic moment tensor, Earthquake catalogue

1. Method

Below is a brief description of the method used here to determine seismic moment tensors and their centroid depths. Fukuyama et al. (1998) describes the method and it would be helpful to refer to this in more details. All the informations concerning this catalogue are also displayed at the World Wide Web page[1].

Moment tensor analysis is triggered by the JMA (Japan Meteorological Agency) emergency hypocenter report received by e-mail. The following information is used from the report: origin time (in minutes), epicentral location (in 0.1 degree), depth (in 10km) and magnitude. This e-mail is dispatched for earthquakes with a maximum JMA scale intensity

[1]http://argent.geo.bosai.go.jp

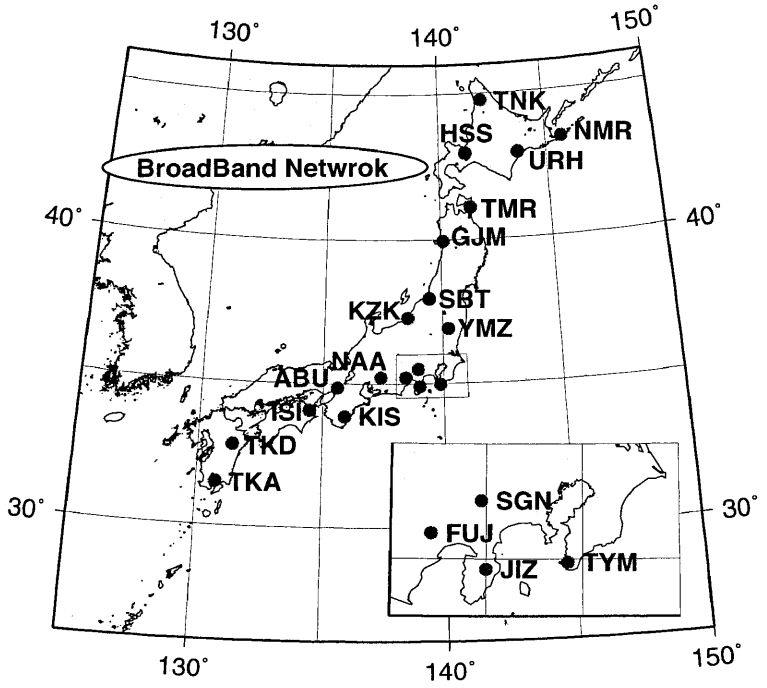

Fig. 1 Broadband station distribution used in the analysis.

greater than 1 in the Kanto-Shinetsu-Chubu region (central part of Japan) and its surroundings. For other regions, the e-mail is dispatched only for earthquakes with a maximum intensity 3 or more. This information covers most M >3.5 earthquakes. However, it sometimes misses off shore or deep M >3.5 earthquakes, thus we used the information from the JWA (Japan Weather Association) World Wide Web page[2] as a supplement.

All the stations used in this analysis are shown in Fig. 1 and Table 1. Three stations at most are used for the moment tensor estimation. Filter coefficients and minimum epicentral distance are chosen according to the JMA magnitude (see Table 2). The JMA magnitude is used only for this purpose. The criterion for choosing stations is basically on its epicentral distance. The closest three stations within the epicentral distance range are chosen as a first (automatic) trial. We then update it manually by examining station combinations, adjusting origin time offsets, or adjusting source depth. This is because if the waveforms are contaminated by long period noise, the solution is no more reliable. Manual operation is mainly to remove these noisy records. If the dataset is well examined, the moment tensor solution can be determined stably and uniquely by adjusting origin time offset and its source depth. In this catalogue, all solutions have been inspected and re-computed as final solutions.

Filtered displacement waveforms are used for the moment tensor inversion. The filter coefficients vary according to JMA magnitude (Table 2). 1 Hz sampling displacement data produced from the original 20Hz data stream (VBB components) are used in order to reduce the latency caused by packeting during the transmission from each station.

The moment tensor estimation consists of two steps, an automatic process and a manual

[2]http://tenki.or.jp/quake.html

Table 1 Locations of stations used in the analysis.

Station Name	Station Code	Latitude (^oN)	Longitude (^oE)	Height (m)	Cooperative Organization	Funding Project
Abuyama	ABU	34.8603	135.5734	138	Kyoto U.	KIBAN
Fujigawa	FUJ	35.2267	138.4217	640	Tokyo U.	FREESIA
Gojyome	GJM	39.9517	140.1167	105	Tohoku U.	KIBAN
Sapporo	HSS	42.9647	141.2328	230	Hokkaido U.	FREESIA
Tokushima	ISI	34.0572	134.4580	27	Kyoto U.	FREESIA
Nakaizu	JIZ	34.9129	138.9972	263	—	FREESIA
Kiwa	KIS	33.8627	135.8933	70	Kyoto U.	FREESIA
Kashiwazaki	KZK	37.2951	138.5156	220	Tokyo U.	FREESIA
Asahi	NAA	35.2217	137.3650	200	Nagoya U.	FREESIA
Nemuro	NMR	43.3650	145.7430	20	Hokkaido U.	FREESIA
Shibata	SBT	37.9656	139.4538	160	Tohoku U.	KIBAN
TsuruSugeno	SGN	35.5054	138.9475	800	—	FREESIA
Takakuma	TKA	31.5125	130.7853	535	Kagoshima U.	FREESIA
Takeda	TKD	32.8140	131.3900	751	Kyushu U.	FREESIA
Tomari	TMR	41.0990	141.3868	120	Hirosaki U.	KIBAN
Nakagawa	TNK	44.7757	142.0830	60	Hokkaido U.	FREESIA
Tateyama	TYM	34.9708	139.8481	30	Geogr. Surv. Jpn.	FREESIA
Urahoro	URH	42.9270	143.6746	75	Hokkaido U.	KIBAN
Yamizo	YMZ	36.9241	140.2479	555	Tohoku U.	KIBAN

one with human inspections. In the automatic stage, by using JMA e-mail, three stations are chosen automatically to prepare the waveform dataset. Using these waveforms, a moment tensor inversion is conducted with several trial depths within ±30km from the JMA hypocenter depth. Assumed depth points are shown in Table 3. In the manual determination stage, the combination of stations, optimum zero offset and depth have been examined by the operator in a Monte Carlo manner. At this point, the error function is set to variance reduction ($VarRed$) defined as follows:

$$VarRed = 100 \times \sum_i w_i \int \left(1 - \frac{(s_i(t) - o_i(t))^2}{|s_i(t)||o_i(t)|}\right) dt \ \ [\%] \tag{1}$$

where $s_i(t)$ and $o_i(t)$ are synthetic and observed waveforms respectively. w_i is a weighting function proportional to the hypocentral distance.

The velocity structure used for Green's function is shown in Table 4. This structure is constructed by referring to Ukawa et al. (1984) for the shallower part and Fukao (1977) for the deeper part. Green's function is computed by using the discrete wavenumber method developed by Saikia (1994). The program named *tdmt_inv* is used for the moment tensor estimation which is developed by Pasyanos et al. (1996). *tdmt_sched.pl* is a Perl script developed here and used in the routine process. *tdmt_sched.pl* controls the automatic procedure. *tdmt_manual.pl* then supports the human inspection of the automatic moment tensor solution by referring to the automatic solution. In this inversion, since the time offset is shifted either automatically or manually, the centroid location is not estimated. This offset

Table 2 Minimum epicentral distance, filter coefficients, and data length for initial magnitude reported by JMA

Magnitude range	Epicentral Dist. (km)	Frequency range (Hz)	Data length ($seconds$)
3.5 <M <5.0	>50	0.02 – 0.05	120
5.0 <M <6.5	>100	0.01 – 0.05	120
6.5 <M <7.5	>300	0.01 – 0.05	150
7.5 <M	>600	0.005 – 0.02	180

Table 3 Assumed source depths in km used in the analysis.

5 8 11 14 17 20 23 26 29 32 35 38 41 44 47 50 53 56 59 62 65 68
71 74 77 80 83 86 89 92 95 98 101 104 107 110 113 116 119 122
125 130 135 140 145 150 155 160 165 170 175 180 185 190 195 200
210 220 230 240 250 260 270 280 290 300 320 340 360 380 400

adjustment corrects both velocity structure misfit and centroid location misfit. As shown in Fukuyama et al. (1998), the shape of Green's function does not change for slight epicentral distance change, so that the above procedure works.

2. Results

The results are shown in Table 4, Figs. 2 and 3. In Table 3, origin times, latitudes, longitudes and region names are provided by JMA e-mail. Other parameters such as D (depth), Mw (moment magnitude) etc., are determined by this analysis. VarRed represents variance

Table 4 Velocity structure for Green's functions.

Depth (km)	Thickness (km)	P Velocity (km/s)	S Velocity (km/s)	Density (kg/m^3)	Q_P	Q_S
0	3	5.50	3.14	2300	600	300
3	15	6.00	3.55	2400	600	300
18	15	6.70	3.83	2800	600	300
33	67	7.80	4.46	3200	600	300
100	125	8.00	4.57	3300	600	300
225	100	8.40	4.80	3400	600	300
325	100	8.60	4.91	3500	600	300
425	–	9.30	5.31	3700	600	300

reduction, showing as percentages. (Str1, Dip1, Rak1) and (Str2, Dip2, Rak2) are two fault planes. Str, Dip, and Rak indicate strike, dip and rake angles, respectively. M_{xx}, M_{xy}, M_{xz}, M_{yy}, M_{yz}, and M_{zz} are the moment tensor components normalized by M_o (total scalar moment). In Fig. 2, the best fit double couples are shown with their epicentral locations. The numerals appearing above each focal mechanism represent the event ID shown in Table 5. In Fig 3, moment tensors are shown with lower hemisphere projection. P- and T- axes are also shown. Superscripted numerals again indicate event ID.

3. Conclusion

We have estimated 284 seismic moment tensors and their centroid depths by using FREESIA /KIBAN broadband waveforms.

Acknowledgments

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NIED 地震モーメントテンソルカタログ 1998年1月－12月

福山英一*・石田瑞穂*・堀内茂木*・井上公*・
堀貞喜*・関口渉次*・川井啓廉†・村上寛‡

要旨

我々は，日本及びその周辺で発生する地震のモーメントテンソルを定常的に決めている．このレポートは、1998年に決められたすべての地震のモーメントテンソル解をコンパイルしたものである．防災科学技術研究所及び科学技術庁により整備された広帯域地震観測網のデータを用いて計算を行った．解析には主にSTS-1型広帯域地震計の波形を用いたが，利用できない場合は，VSE311型速度型強震計 (一部はその後継機種のVSE355型に置き換えられている) を用いた．気象庁から発信される緊急震源情報を含んだ電子メールにより解析を開始させた．本カタログは，ほとんどのマグニチュード4以上の地震といくつかのマグニチュード3.5以上の地震をカバーしている．しかしながら，観測点分布の偏りや，波形データのノイズ状況により，気象庁により検知された地震のいくつかは解が決まらず，カタログからは洩れている．

キーワード：モーメントテンソル，地震カタログ

*防災科学技術研究所
†サン・マイクロシステムズ株式会社
‡有限会社 地震観測技術センター

Table 5 Estimated moment tensors. A detailed explanation is given in the text.

No.	Origion Time(UT)	Lat(N)	Lon(E)	D(km)	Mw	Mo(Nm)	VarRed	Region name	Str1	Dip1	Rak1	Str2	Dip2	Rak2	Mxx	Mxy	Mxz	Myy	Myz	Mzz	used Stations		
1	1998/01/02,18:20	42.9	145.5	47	5.0	3.69e16	58.47	off Nemuro peninsula	31	63	71	249	33	123	-0.4547	0.4804	0.1575	-0.3028	-0.5529	0.7574	HSS	NMR	
2	1998/01/08,02:11	28.1	130.3	5	4.7	1.38e16	67.40	near Amami-Oshima island	173	77	58	63	34	157	0.2351	0.4564	0.0882	-0.5831	0.7385	0.3480	TKA		
3	1998/01/08,14:46	37.8	137.7	5	4.0	1.01e15	85.33	Sadogashima is reg	182	59	74	31	34	114	0.0165	0.2714	0.1093	-0.8495	0.4592	0.8330	KZK	NAA	SGN
4	1998/01/09,04:46	34.4	139.2	5	3.9	7.20e14	65.26	near Niijima island	138	69	-122	18	38	-37	-0.2495	0.2515	-0.5353	0.8202	-0.3498	-0.5707	FUJ	JIZ	TYM
5	1998/01/10,05:02	31.8	130.3	17	4.4	4.41e15	80.22	NW Kagoshima pref	194	85	173	285	83	5	0.4604	-0.8652	-0.1134	-0.4996	0.0899	0.0392	TKA	TKD	
6	1998/01/13,17:17	35.6	140.3	71	4.9	2.28e16	80.02	central Chiba pref	319	88	-24	50	66	-178	0.9155	0.1473	0.2498	-0.8865	0.3210	-0.0290	FUJ	KZK	SGN
7	1998/01/16,01:58	35.2	140.3	59	4.5	5.36e15	86.36	Kujukuri coast Boso pen	9	79	-150	272	60	-12	0.2612	-0.8450	0.0689	-0.0590	0.4765	-0.2023	JIZ	SGN	
8	1998/01/16,16:57	34.1	135.3	5	3.8	5.02e14	87.80	NW Wakayama pref	177	61	95	346	29	80	-0.0921	-0.1162	-0.0218	-0.7841	0.5454	0.8762	ISI	KIS	NAA
9	1998/01/20,11:24	33.3	140.7	56	4.5	5.88e15	69.56	E off Hachijojima island	344	77	56	236	36	158	0.2957	0.3609	-0.2847	-0.6503	-0.6874	0.3546	JIZ	SGN	TYM
10	1998/01/21,20:11	36.5	140.6	53	3.7	3.71e14	72.39	northern Ibaraki pref	25	70	98	183	21	69	-0.0701	0.1186	0.3798	-0.5911	-0.6693	0.6612	SGN	YMZ	
11	1998/01/22,20:53	34.1	139.1	5	3.7	3.60e14	85.63	near Niijima island	52	58	-69	195	37	-120	0.1968	-0.5200	-0.4225	0.6158	0.1317	-0.8125	FUJ	JIZ	SGN
12	1998/01/23,21:32	34.2	135.1	5	3.8	4.95e14	75.00	NW Wakayama pref	210	52	119	348	46	58	0.1201	0.1803	-0.3698	-0.9638	0.0370	0.8437	ISI	KIS	NAA
13	1998/01/26,02:16	35.9	139.6	62	3.8	6.19e14	62.02	eastern Saitama pref	259	74	108	30	24	44	-0.4466	0.4221	-0.7828	-0.0190	0.1192	0.4656	KZK	SGN	YMZ
14	1998/01/30,15:50	41.4	142.1	62	5.6	2.45e17	74.96	E off Aomori pref	26	71	87	214	19	98	-0.1510	0.2739	0.3287	-0.4658	-0.7124	0.6168	GJM	HSS	TMR
15	1998/02/04,11:34	41.9	142.3	59	4.6	9.90e15	69.80	S off Urakawa	20	68	73	240	28	127	-0.2046	0.4822	0.1683	-0.4215	-0.6640	0.6261	HSS	NMR	TMR
16	1998/02/06,03:01	35.4	140.5	26	3.7	3.71e14	66.65	Kujukuri coast Boso pen	65	76	93	233	14	78	-0.3638	0.2521	0.8021	-0.0771	-0.3617	0.4409	JIZ	SGN	YMZ
17	1998/02/06,05:40	33.6	141.2	53	4.2	1.90e15	83.25	E off Hachijojima island	213	60	135	330	52	39	0.5383	0.0783	-0.2253	-1.1711	0.1407	0.6328	FUJ	JIZ	SGN
18	1998/02/06,11:43	35.1	135.4	8	3.4	1.27e14	77.04	mid Kyoto pref	276	87	18	185	72	177	0.2153	-0.9305	-0.3146	-0.1408	0.0622	-0.0745	ISI	KIS	NAA
19	1998/02/09,16:03	36.5	140.6	53	3.3	1.10e14	66.14	northern Ibaraki pref	40	78	92	210	12	80	-0.1799	0.0923	0.6022	-0.2779	-0.6884	0.4578	YMZ		
20	1998/02/09,16:20	35.7	137.1	8	4.1	1.39e15	85.38	SE Gifu pref	333	90	12	243	78	180	0.7611	0.5739	-0.0804	-0.8211	-0.2000	0.0600	FUJ	NAA	SGN
21	1998/02/11,02:25	42.0	142.4	56	5.0	3.56e16	81.14	S off Urakawa	21	72	81	228	20	116	-0.1489	0.3288	0.2408	-0.4226	-0.7571	0.5715	GJM	HSS	TMR
22	1998/02/13,16:21	36.3	141.4	20	4.0	9.78e14	87.02	far E off Ibaraki pref	14	71	77	231	23	124	-0.0403	0.3863	0.1598	-0.4941	-0.7558	0.5345	KZK	SGN	YMZ
23	1998/02/15,03:43	31.8	130.3	11	3.8	4.95e14	96.11	NW Kagoshima pref	287	89	19	196	71	179	0.4805	-0.8005	-0.3022	-0.5388	-0.0974	0.0583	TKD		
24	1998/02/21,00:55	37.3	138.8	11	5.0	3.15e16	81.72	mid Niigata pref	38	49	94	213	41	86	-0.3376	0.4672	0.1138	-0.6555	-0.0747	0.9931	SBT	SGN	YMZ
25	1998/02/24,09:42	36.4	141.0	35	4.2	2.17e15	90.89	E off Ibaraki pref	190	88	-82	294	8	-166	0.0748	0.1509	0.2006	0.0540	-0.9676	-0.1288	KZK	SGN	YMZ
26	1998/02/25,17:32	35.6	141.2	41	4.9	2.75e16	81.08	near Choshi city	91	46	74	294	46	106	-0.9397	-0.2059	0.0473	-0.0334	-0.2037	0.9731	KZK	SGN	YMZ
27	1998/02/26,01:44	35.7	141.2	26	4.2	2.62e15	81.07	near Choshi city	203	85	7	112	83	174	-0.6171	0.6974	0.0610	0.7702	0.1874	-0.1531	KZK	SGN	YMZ
28	1998/02/26,06:56	35.4	140.4	35	3.8	6.11e14	79.92	Kujukuri coast Boso pen	68	75	106	199	22	43	-0.2338	0.3928	0.7934	-0.2079	-0.2701	0.4417	JIZ	SGN	YMZ
29	1998/02/28,17:39	33.5	138.5	119	5.5	2.00e17	53.46	far S off Tokai District	134	74	34	34	58	161	0.6391	-0.2176	0.3606	-1.0273	0.2186	0.3882	FUJ	JIZ	TYM
30	1998/03/02,23:30	31.8	130.3	11	3.9	7.24e14	95.20	NW Kagoshima pref	103	87	-7	193	83	-177	0.3837	-0.8933	-0.1136	-0.4717	-0.0945	0.0879	TKD		
31	1998/03/03,07:39	31.9	130.3	8	4.0	9.67e14	96.75	NW Kagoshima pref	291	76	30	193	61	164	0.3861	-0.6850	-0.5322	-0.5605	0.0910	0.1744	TKD		
32	1998/03/08,04:46	36.1	139.8	53	4.5	6.15e15	91.61	SW Ibaraki pref	52	71	83	253	20	110	-0.4828	0.2630	0.6020	-0.1148	-0.5167	0.5977	KZK	SGN	YMZ
33	1998/03/11,19:27	37.7	142.3	41	5.0	3.39e16	77.47	SE off Miyagi pref	59	75	140	162	52	19	0.4224	0.4750	0.6194	-0.7199	-0.0697	0.2976	GJM	SBT	YMZ
34	1998/03/16,23:03	37.0	141.3	38	4.5	6.50e15	82.04	E off Fukushima pref	40	80	92	209	10	80	-0.1037	0.1770	0.6010	-0.2378	-0.7186	0.3415	KZK	SBT	YMZ
35	1998/03/17,07:52	36.0	141.1	14	3.9	7.61e14	65.20	E off Ibaraki pref	354	69	59	234	37	144	0.0401	0.4049	-0.2990	-0.6169	-0.6283	0.5768	KZK	SGN	YMZ
36	1998/03/23,09:37	36.4	141.2	35	5.4	1.28e17	83.07	E off Ibaraki pref	5	87	75	263	16	167	0.1466	0.3038	0.1594	-0.1719	-0.9459	0.0253	KZK	SGN	YMZ
37	1998/03/27,06:30	31.9	130.4	17	4.4	4.20e15	62.45	NW Kagoshima pref	259	84	-9	349	81	-174	-0.4343	-0.9061	0.1991	0.3051	0.0957	0.1292	TKA	TKD	
38	1998/03/28,14:50	36.7	140.9	53	3.9	9.30e14	79.47	E off Ibaraki pref	6	74	81	217	19	119	-0.0898	0.1993	0.0338	-0.4668	-0.8323	0.5565	KZK	SGN	YMZ
39	1998/03/29,15:36	36.4	141.1	41	3.8	5.69e14	88.94	E off Ibaraki pref	279	79	-108	157	21	-34	0.2653	0.3351	0.8773	0.1115	0.0731	-0.3768	SGN	YMZ	
40	1998/04/03,16:40	37.5	138.4	20	4.6	7.90e15	78.43	off S Niigata pref	34	57	94	207	34	85	-0.2159	0.4308	0.2467	-0.6819	-0.3099	0.8978	SBT	SGN	YMZ
41	1998/04/05,01:54	35.4	138.3	8	4.4	4.50e15	95.20	Akaishi mountains reg	249	89	-154	159	64	-1	0.6719	0.6566	0.4397	-0.5506	-0.0863	-0.1213	JIZ	NAA	SGN
42	1998/04/08,17:44	37.0	140.9	92	4.8	1.73e16	73.70	eastern Fukushima pref	185	50	-110	34	44	-68	0.2016	-0.2592	-0.2705	0.8011	-0.1956	-1.0027	KZK	SBT	YMZ
43	1998/04/09,05:29	42.8	145.0	44	4.9	2.80e16	80.21	off Nemuro peninsula	141	73	-51	251	43	-154	0.7782	0.3669	-0.2791	-0.3349	-0.5774	-0.4433	HSS	NMR	
44	1998/04/09,08:45	36.9	141.0	89	5.5	1.79e17	85.84	E off Fukushima pref	239	63	-125	117	43	-41	0.9618	-0.0588	0.2823	-0.3080	-0.4411	-0.6538	KZK	SBT	YMZ
45	1998/04/11,10:07	36.5	140.7	32	4.4	4.82e15	79.73	northern Ibaraki pref	347	82	72	235	20	157	0.3185	0.1665	-0.1393	-0.4795	-0.9053	0.1610	SGN	TYM	YMZ
46	1998/04/12,15:05	35.6	140.1	92	4.0	1.26e15	92.80	central Chiba pref	355	86	93	134	5	49	0.0437	-0.0749	-0.0849	-0.1493	-0.9882	0.1055	JIZ	SGN	
47	1998/04/16,08:41	35.9	140.6	47	3.6	3.21e14	79.22	southern Ibaraki pref	204	85	-52	300	38	-172	-0.3203	0.4624	0.5901	0.4388	-0.6050	-0.1185	KZK	YMZ	
48	1998/04/17,06:41	36.5	141.0	56	3.8	5.80e14	57.62	E off Ibaraki pref	274	62	142	24	58	34	-0.5947	0.6382	-0.3212	0.0954	-0.4283	0.4993	SBT	SGN	YMZ
49	1998/04/17,16:21	31.8	130.3	8	3.9	7.63e14	75.89	NW Kagoshima pref	284	87	21	193	69	177	0.4804	-0.8246	-0.3839	-0.3798	0.0405	-0.1006	TKA	TKD	
50	1998/04/19,09:40	39.8	138.6	11	4.5	6.44e15	88.90	W off Akita pref	196	46	86	23	45	94	-0.0724	0.3367	0.0420	-0.9019	0.0307	0.9743	GJM	KZK	SBT
51	1998/04/20,01:49	32.0	130.5	5	4.3	3.26e15	90.57	NW Kagoshima pref	269	78	-31	6	60	-166	0.3515	-0.8971	0.3783	0.0676	-0.0612	-0.4191	TKA	TKD	
52	1998/04/21,01:55	35.0	139.1	8	3.4	1.57e14	71.94	E off Izu peninsula	334	89	-31	65	59	-179	0.6867	0.5597	0.2634	-0.6143	0.4487	-0.0724	FUJ	SGN	
53	1998/04/21,04:58	37.4	141.2	68	4.5	6.35e15	80.62	E off Fukushima pref	180	55	119	316	44	55	0.0061	-0.4005	-0.2711	-0.8261	0.2982	0.8199	SBT	SGN	
54	1998/04/21,05:11	35.0	139.1	8	3.7	4.17e14	88.69	E off Izu peninsula	157	89	26	66	64	179	0.7149	0.6373	0.3313	-0.5403	0.3463	-0.1746	FUJ	SGN	
55	1998/04/21,10:27	34.9	139.2	5	4.4	4.30e15	89.06	E off Izu peninsula	329	78	-27	65	64	-167	0.8520	0.5202	0.0884	-0.6008	0.3957	-0.2512	FUJ	SGN	TYM
56	1998/04/21,11:45	34.9	139.2	5	3.8	6.64e14	68.01	E off Izu peninsula	334	70	-34	77	58	-156	0.7244	0.6658	-0.0003	-0.3016	0.4211	-0.4228	FUJ	SGN	TYM
57	1998/04/21,19:41	34.9	139.2	5	4.3	3.17e15	86.28	E off Izu peninsula	352	81	-26	87	64	-170	0.2797	0.8932	0.0168	-0.0225	0.3904	-0.2571	FUJ	SGN	TYM
58	1998/04/22,01:41	35.0	139.1	5	4.2	2.31e15	86.79	E off Izu peninsula	324	84	-35	58	56	-173	0.8087	0.2977	0.2447	-0.7180	0.5152	-0.0907	FUJ	SGN	TYM
59	1998/04/22,08:50	35.0	139.1	5	4.2	2.59e15	87.35	E off Izu peninsula	328	79	-31	65	59	-167	0.7593	0.4257	0.0518	-0.6481	0.5714	-0.1111	FUJ	SGN	TYM
60	1998/04/22,11:32	35.2	136.6	8	5.1	5.49e16	88.57	Shiga Gifu border region	12	55	103	170	37	72	0.0987	0.0278	0.1827	-0.9836	-0.2958	0.8849	ABU	KIS	NAA
61	1998/04/22,14:46	35.2	136.6	5	3.2	8.18e13	63.57	Shiga Gifu border region	19	68	115	146	33	43	0.2908	-0.0991	0.2786	-0.8686	-0.5861	0.5778	ABU	KIS	
62	1998/04/22,20:34	35.2	136.6	20	3.3	8.84e13	64.14	Shiga Gifu border region	54	81	120	160	31	18	0.2821	0.3721	0.6501	-0.5429	-0.4848	0.2607	ABU	NAA	
63	1998/04/23,02:26	35.2	136.5	5	3.5	2.32e14	73.80	Shiga Gifu border region	168	48	73	13	45	108	0.0278	0.0142	0.2197	-0.9877	0.0449	0.9598	ABU	KIS	NAA
64	1998/04/23,15:00	38.0	139.0	11	3.5	1.74e14	56.83	off N Niigata pref	4	48	94	178	42	86	-0.0773	0.0139	0.0607	-0.9526	-0.1075	1.0300	GJM	KZK	YMZ
65	1998/04/24,16:51	34.9	139.1	5	3.7	4.21e14	93.28	central Izu peninsula	346	79	-29	82	62	-168	0.4237	0.8206	-0.0048	-0.1909	0.4438	-0.2328	FUJ	SGN	
66	1998/04/24,18:44	35.1	137.3	17	3.5	1.95e14	79.06	central Aichi pref	347	71	-97	187	20	-71	-0.1957	0.0831	0.1793	0.7029	0.7676	-0.5072	FUJ	JIZ	SGN
67	1998/04/24,22:40	34.9	139.2	14	3.4	1.26e14	74.03	E off Izu peninsula	88	89	-173	357	83	-1	0.2569	0.9899	-0.1155	0.0793	-0.0375	-0.3362	FUJ	SGN	
68	1998/04/24,23:36	35.0	139.2	5	3.2	7.72e13	77.80	E off Izu peninsula	316	75	-38	57	53	-161	0.9644	0.2117	0.2826	-0.6021	0.4246	-0.3623	FUJ	SGN	
69	1998/04/25,09:34	35.0	139.1	5	4.2	2.61e15	83.30	E off Izu peninsula	353	73	-29	92	62	-161	0.1809	0.8209	-0.2697	0.0332	0.4725	-0.2141	FUJ	SGN	TYM
70	1998/04/25,22:37	35.0	139.1	5	5.0	3.42e16	87.33	E off Izu peninsula	346	85	-33	79	57	-174	0.3963	0.7592	0.0714	-0.2987	0.5407	-0.0976	FUJ	SGN	TYM

Table 5 Estimated moment tensors (continued).

No.	Origion Time(UT)	Lat(N)	Lon(E)	D(km)	Mw	Mo(Nm)	VarRed	Region name	Str1	Dip1	Rak1	Str2	Dip2	Rak2	Mxx	Mxy	Mxz	Myy	Myz	Mzz	used Stations		
71	1998/04/25,23:57	35.0	139.1	5	3.5	2.23e14	85.28	E off Izu peninsula	332	73	-34	73	57	-160	0.7487	0.5887	0.0432	-0.4053	0.4844	-0.3434	FUJ	SGN	
72	1998/04/26,01:27	34.3	139.2	8	3.6	3.07e14	72.30	near Niijima island	129	86	-166	38	76	-4	-0.8740	0.2257	-0.1935	1.0178	-0.1207	-0.1437	FUJ	JIZ	SGN
73	1998/04/26,03:21	34.6	140.3	89	4.9	2.32e16	80.66	SE off Boso peninsula	137	58	-105	344	35	-68	0.1753	0.4340	-0.3807	0.6870	-0.2161	-0.8623	JIZ	SGN	TYM
74	1998/04/26,06:03	35.0	139.2	5	4.6	9.04e15	85.03	E off Izu peninsula	84	77	-163	351	73	-13	0.3421	0.9107	-0.2246	-0.1493	0.1956	-0.1928	FUJ	SGN	TYM
75	1998/04/26,06:48	33.4	140.7	5	3.4	1.51e14	56.13	E off Hachijojima island	174	54	83	5	37	99	0.2182	-0.0138	0.0683	-1.0574	0.2967	0.8393	FUJ	SGN	
76	1998/04/26,08:31	35.0	139.2	5	3.9	7.39e14	78.28	E off Izu peninsula	356	71	-21	94	70	-159	0.1889	0.9287	-0.1856	0.1960	0.1892	-0.3849	FUJ	SGN	TYM
77	1998/04/26,09:01	34.9	139.2	5	4.5	5.97e15	87.49	E off Izu peninsula	15	81	-15	107	75	-171	-0.4744	0.8108	-0.2189	0.5314	0.2024	-0.0571	FUJ	SGN	TYM
78	1998/04/26,09:18	35.0	139.1	14	3.7	3.66e14	52.90	E off Izu peninsula	114	84	19	21	71	173	0.6177	-0.6696	0.3222	-0.7115	0.0433	0.0938	FUJ	SGN	TYM
79	1998/04/26,09:23	35.0	139.1	5	3.3	8.47e13	56.90	E off Izu peninsula	156	80	-34	253	56	-167	0.6821	0.6959	-0.2279	-0.3440	-0.4179	-0.3380	FUJ	SGN	
80	1998/04/26,10:46	35.0	139.2	5	3.6	2.42e14	70.79	E off Izu peninsula	336	58	-45	94	53	-139	0.5711	0.7137	-0.1419	0.0700	0.3438	-0.6411	FUJ	SGN	TYM
81	1998/04/26,13:03	34.9	139.2	5	4.2	1.90e15	88.13	E off Izu peninsula	343	74	-31	82	61	-161	0.5051	0.7638	-0.0834	-0.2107	0.4613	-0.2944	FUJ	SGN	TYM
82	1998/04/26,13:07	34.9	139.2	5	3.5	1.80e14	88.52	E off Izu peninsula	341	77	-15	75	75	-167	0.7021	0.8020	-0.0513	-0.3726	0.1919	-0.3295	FUJ	SGN	
83	1998/04/26,21:09	35.0	139.1	5	4.8	1.62e16	83.40	E off Izu peninsula	349	69	-31	91	61	-156	0.3111	0.8037	-0.2267	0.0418	0.4304	-0.3529	FUJ	SGN	TYM
84	1998/04/26,22:06	36.1	139.8	32	3.9	9.09e14	56.74	SW Ibaraki pref	218	87	-82	332	8	-156	-0.0968	-0.0471	0.6078	0.2018	-0.7730	-0.1050	SGN	TYM	YMZ
85	1998/04/26,22:33	34.9	139.2	5	3.6	3.22e14	80.37	E off Izu peninsula	348	73	-35	90	56	-160	0.3319	0.8111	-0.0647	0.0330	0.4752	-0.3649	FUJ	SGN	TYM
86	1998/04/27,11:39	34.9	139.2	5	3.9	8.31e14	88.76	E off Izu peninsula	103	75	-161	8	71	-15	-0.2480	0.8564	-0.3475	0.3885	0.1771	-0.1405	FUJ	SGN	TYM
87	1998/04/28,02:09	34.9	139.2	17	3.6	2.47e14	75.36	E off Izu peninsula	82	81	-170	350	80	-10	0.3509	0.9266	-0.1374	-0.2499	0.1702	-0.1009	SGN	TYM	
88	1998/04/28,02:39	34.8	137.1	20	3.2	6.19e13	50.86	Mikawa bay region	24	88	-134	292	44	-3	0.4987	-0.5397	-0.3900	-0.4039	0.6076	-0.0950	ABU	NAA	
89	1998/04/29,06:15	36.2	140.1	77	3.9	9.03e14	50.44	SW Ibaraki pref	106	58	66	326	39	123	-0.5996	-0.5776	0.4203	-0.1796	-0.0411	0.7791	KZK	NAA	
90	1998/04/29,07:43	35.0	139.1	5	3.8	5.20e14	75.76	E off Izu peninsula	124	75	50	17	42	157	0.3042	-0.4667	0.5739	-0.7071	0.2928	0.4029	FUJ	SGN	TYM
91	1998/04/29,20:13	34.9	139.2	8	3.7	4.50e14	86.74	E off Izu peninsula	174	86	12	84	78	176	0.2875	0.9519	0.1582	-0.1068	0.2109	-0.1808	FUJ	SGN	TYM
92	1998/04/30,06:19	34.9	139.2	5	3.8	5.18e14	74.36	E off Izu peninsula	334	90	-15	64	75	-180	0.8764	0.5960	0.1851	-0.6521	0.1867	-0.2242	FUJ	SGN	TYM
93	1998/04/30,20:59	36.4	141.1	35	4.0	9.45e14	85.45	E off Ibaraki pref	9	78	76	240	18	140	-0.0555	0.2904	0.0940	-0.3157	-0.8868	0.3712	KZK	SGN	YMZ
94	1998/05/01,12:35	35.0	139.1	5	3.5	1.69e14	68.57	E off Izu peninsula	109	59	-115	332	39	-54	0.4902	0.5591	-0.4684	0.2905	0.0509	-0.7807	FUJ	TYM	
95	1998/05/03,01:59	35.0	139.2	5	4.4	3.90e15	81.80	E off Izu peninsula	88	74	-158	352	69	-17	0.3304	0.9067	-0.2462	-0.0149	0.1861	-0.3154	FUJ	SGN	TYM
96	1998/05/03,02:09	35.0	139.1	5	5.5	2.35e17	87.96	E off Izu peninsula	165	85	8	74	82	175	0.5815	0.8450	0.1717	-0.4246	0.1273	-0.1569	KZK	NAA	YMZ
97	1998/05/03,21:44	35.0	139.2	5	4.2	2.40e15	84.53	E off Izu peninsula	352	70	-22	90	70	-158	0.3084	0.9002	-0.2034	0.0429	0.2399	-0.3512	FUJ	SGN	TYM
98	1998/05/03,22:06	34.9	139.2	5	4.1	1.56e15	85.62	E off Izu peninsula	355	80	-27	90	63	-169	0.1710	0.8865	-0.0555	0.0450	0.4215	-0.2160	FUJ	SGN	TYM
99	1998/05/03,23:16	34.9	139.2	8	3.7	3.58e14	86.25	E off Izu peninsula	358	88	-18	88	72	-178	0.1427	0.9496	0.0644	0.0451	0.3036	-0.1878	FUJ	KZK	SGN
100	1998/05/05,08:25	34.9	139.2	8	4.2	2.25e15	87.24	E off Izu peninsula	355	80	-17	88	73	-170	0.2268	0.9502	-0.0730	0.0070	0.2426	-0.2338	FUJ	SGN	TYM
101	1998/05/05,09:26	34.9	139.2	5	3.8	6.47e14	87.91	E off Izu peninsula	99	83	-156	6	67	-7	-0.3077	0.8551	-0.4655	0.2004	0.1902	0.1072	FUJ	SGN	TYM
102	1998/05/05,14:02	34.9	139.2	5	4.0	9.85e14	87.88	E off Izu peninsula	100	84	-159	8	69	-7	-0.3293	0.8669	-0.4110	0.2580	0.1300	0.0713	FUJ	SGN	TYM
103	1998/05/05,19:49	34.9	139.2	8	3.5	2.02e14	86.21	E off Izu peninsula	155	90	15	65	75	180	0.7932	0.6318	0.1597	-0.6654	0.2057	-0.1277	FUJ	SGN	TYM
104	1998/05/05,22:58	33.3	135.8	20	4.3	3.71e15	85.43	S off Kii peninsula	23	77	66	265	27	150	-0.2502	0.5199	0.3188	-0.1044	-0.7450	0.3546	ABU	ISI	KIS
105	1998/05/06,11:19	34.2	135.3	5	3.6	2.91e14	90.63	NW Wakayama pref	166	45	83	356	45	97	0.0966	-0.1873	0.0721	-1.0285	-0.0058	0.9319	ABU	ISI	KIS
106	1998/05/07,03:28	34.8	138.2	35	3.7	3.83e14	58.23	SW Shizuoka pref	314	83	132	52	42	11	-0.7486	-0.0442	-0.4443	0.5664	-0.5869	0.1821	KIS	KZK	YMZ
107	1998/05/09,05:53	33.6	139.4	8	3.7	4.72e14	65.68	near Miyakejima island	175	66	-89	352	24	-93	-0.2022	0.1170	-0.0544	0.8473	-0.6545	-0.6452	FUJ	JIZ	KIS
108	1998/05/09,15:29	35.2	136.5	5	3.6	2.58e14	66.18	Shiga Gifu border region	2	51	91	181	39	89	0.0265	0.0299	0.0153	-0.9869	-0.2231	0.9604	ABU	KIS	NAA
109	1998/05/12,12:23	35.4	140.3	26	3.5	2.34e14	71.26	Kujukuri coast Boso pen	72	71	87	262	19	99	-0.6038	0.1556	0.7510	0.0186	-0.2508	0.5852	SGN	YMZ	
110	1998/05/14,18:56	40.2	143.6	20	5.9	7.19e17	72.04	far E off Sanriku	37	79	103	165	17	39	0.1739	0.2276	0.5338	-0.4462	-0.7320	0.2723	GJM	TMR	
111	1998/05/15,18:45	35.0	139.9	65	4.7	1.42e16	96.94	southern Boso peninsula	208	71	29	108	63	158	-0.7928	0.5954	0.0401	0.4462	0.4181	0.3466	FUJ	JIZ	SGN
112	1998/05/16,02:26	34.9	139.9	68	3.7	4.59e14	70.11	southern Boso peninsula	211	76	33	112	58	163	-0.7832	0.5097	-0.0709	0.5204	0.5071	0.2628	FUJ	JIZ	SGN
113	1998/05/17,03:59	35.2	136.6	5	3.6	3.18e14	82.56	Shiga Gifu border region	1	65	108	144	30	57	0.1138	-0.2746	0.0996	-0.8011	-0.5988	0.6873	ABU	KIS	NAA
114	1998/05/17,07:06	36.4	140.7	50	3.8	5.42e14	78.81	northern Ibaraki pref	17	77	100	161	16	54	0.0685	-0.0042	0.2974	-0.5022	-0.8304	0.4337	KZK	SGN	YMZ
115	1998/05/18,02:40	34.9	139.2	8	3.5	1.87e14	75.46	E off Izu peninsula	295	72	-154	196	66	-20	-0.4696	0.6184	0.5180	0.6457	-0.1597	-0.1761	NAA	YMZ	
116	1998/05/18,16:27	35.2	141.0	23	4.1	1.76e15	66.81	E off Boso peninsula	162	58	-62	297	41	-127	0.2512	0.6346	0.0536	0.5010	-0.4084	-0.7522	JIZ	SGN	YMZ
117	1998/05/18,18:16	35.0	139.9	62	3.8	6.45e14	74.10	southern Boso peninsula	204	72	30	104	61	160	-0.6223	0.6383	0.1208	0.3866	0.5393	0.2358	FUJ	SGN	
118	1998/05/20,17:43	32.7	140.4	86	4.0	9.73e14	71.56	E off Hachijojima island	262	50	111	52	45	67	-0.9646	0.5769	-0.1216	0.2022	-0.0594	0.7624	FUJ	JIZ	TYM
119	1998/05/20,21:54	38.5	142.1	77	4.9	2.60e16	90.63	E off Miyagi pref	218	67	-88	33	23	-95	0.2172	-0.3827	0.4424	0.4664	-0.5428	-0.6836	GJM	SBT	YMZ
120	1998/05/22,19:49	33.7	131.9	80	5.5	1.88e17	85.49	Iyonada Setonaikai	24	75	54	274	39	155	-0.5294	0.4365	0.0288	0.1198	-0.7807	0.4096	ABU	ISI	TKA
121	1998/05/28,01:41	34.1	139.1	5	4.0	1.18e15	74.31	near Niijima island	177	73	-100	29	20	-60	-0.0613	-0.1373	-0.0848	0.5822	-0.8145	-0.5209	FUJ	SGN	
122	1998/05/29,06:33	34.8	137.7	23	3.4	1.50e14	72.39	Hamanako lake region	31	71	32	289	60	158	-0.7839	0.5271	-0.0273	0.4630	-0.5070	0.3209	FUJ	KIS	SGN
123	1998/05/30,06:29	35.5	141.2	35	4.7	1.06e16	76.72	near Choshi city	264	67	114	35	33	46	-0.6506	0.5074	-0.6237	0.0513	0.0177	0.5993	KZK	SGN	YMZ
124	1998/06/02,21:00	35.3	138.5	14	3.5	2.18e14	77.56	Mt. Fuji region	276	53	122	50	48	55	-0.9031	0.3398	-0.1913	0.0924	-0.3342	0.8107	JIZ	NAA	SGN
125	1998/06/04,10:11	34.3	139.2	17	3.7	3.93e14	64.87	near Niijima island	302	74	162	37	72	17	-0.9746	0.3314	-0.0791	0.7502	-0.3287	0.2244	FUJ	JIZ	TYM
126	1998/06/05,07:55	36.5	141.1	44	3.7	4.00e14	78.64	E off Ibaraki pref	21	70	80	229	22	117	-0.1268	0.3784	0.2352	-0.4535	-0.7270	0.5804	SBT	SGN	YMZ
127	1998/06/06,12:38	35.4	140.5	62	4.1	1.74e15	86.52	Kujukuri coast Boso pen	182	88	-103	82	13	-10	0.4079	-0.2033	-0.1201	-0.1495	-0.9758	-0.2584	JIZ	SGN	TYM
128	1998/06/07,23:02	36.1	139.9	53	4.0	1.23e15	92.88	SW Ibaraki pref	50	70	89	232	20	92	-0.3957	0.2947	0.5720	-0.2761	-0.4912	0.6719	KZK	SGN	YMZ
129	1998/06/08,07:48	37.0	141.1	50	4.1	1.80e15	86.61	E off Fukushima pref	181	78	90	3	12	92	0.1567	0.0141	-0.0090	-0.4742	0.9193	0.3175	KZK	SBT	YMZ
130	1998/06/10,07:17	33.9	135.4	59	4.4	3.88e15	84.97	central Wakayama pref	318	72	-82	114	20	-113	0.3691	0.3820	0.5063	0.1786	0.6078	-0.5476	ABU	ISI	KIS
131	1998/06/11,02:01	36.8	139.5	8	3.8	6.54e14	67.17	northern Tochigi pref	56	80	138	155	49	14	0.5089	0.3967	0.5738	-0.7576	-0.2578	0.2487	KZK	SBT	YMZ
132	1998/06/11,02:03	36.8	139.5	5	4.0	9.53e14	74.92	northern Tochigi pref	56	80	124	160	36	18	0.3233	0.3130	0.7152	-0.6139	-0.3308	0.2906	KZK	SBT	YMZ
133	1998/06/12,12:12	33.4	141.1	44	4.2	2.43e15	87.08	E off Hachijojima island	210	52	109	1	42	67	0.0742	0.3206	-0.2483	-0.9453	0.1093	0.8712	JIZ	SGN	TYM
134	1998/06/12,17:02	37.8	138.5	8	3.8	4.91e14	85.09	Sadogashima is reg	242	65	130	358	46	35	0.0290	0.5281	-0.6098	-0.6060	-0.0503	0.5770	KZK	SBT	YMZ
135	1998/06/13,04:15	36.0	140.1	65	3.6	3.13e14	71.13	southern Ibaraki pref	28	78	94	188	13	71	0.2112	0.3359	0.3993	-0.4560	-0.8122	0.2448	SGN	YMZ	
136	1998/06/14,13:17	35.4	140.8	26	5.7	3.58e17	80.27	E off Boso peninsula	218	60	-83	24	31	-102	0.2079	-0.4122	0.3517	0.6363	-0.3588	-0.8442	JIZ	SGN	YMZ
137	1998/06/16,03:11	33.9	138.8	8	4.0	1.21e15	84.80	near Niijima island	52	89	-1	142	89	-179	-0.8608	-0.2300	-0.0179	1.0874	0.0068	-0.2266	FUJ	JIZ	NAA
138	1998/06/16,20:10	34.7	139.7	125	4.6	8.90e15	95.99	Sagaminada	25	90	95	118	5	2	0.0388	-0.0648	0.4297	-0.0601	-0.8990	0.0213	FUJ	JIZ	SGN
139	1998/06/19,17:35	34.4	136.1	5	3.3	9.17e13	62.98	southern Mie pref	127	83	58	27	32	167	0.3799	-0.1756	0.7421	-0.5871	0.4002	0.2073	ABU	KIS	NAA
140	1998/06/21,21:23	36.4	141.1	29	4.1	1.73e15	88.96	E off Ibaraki pref	1	82	69	251	22	158	0.0915	0.3678	0.0394	-0.3115	-0.8948	0.2200	KZK	SGN	YMZ

Table 5 Estimated moment tensors (continued).

No.	Origion Time(UT)	Lat(N)	Lon(E)	D(km)	Mw	Mo(Nm)	VarRed	Region name	Str1	Dip1	Rak1	Str2	Dip2	Rak2	Mxx	Mxy	Mxz	Myy	Myz	Mzz	used Stations		
141	1998/06/22,07:07	28.2	129.5	41	5.4	1.50e17	85.67	near Amami-Oshima island	252	89	-52	343	38	-178	-0.3014	-0.5327	0.7237	0.3412	-0.3065	-0.0398	TKA		
142	1998/06/23,13:54	34.6	136.1	38	4.4	5.13e15	92.83	northern Mie pref	38	68	-73	179	28	-126	0.0198	-0.2145	-0.5307	0.6677	0.4630	-0.6876	ABU	KIS	NAA
143	1998/06/23,16:12	33.3	141.1	53	4.6	8.87e15	86.72	E off Hachijojima island	336	52	54	206	50	128	0.2733	0.0188	-0.3643	-1.0386	-0.0421	0.7653	JIZ	SGN	TYM
144	1998/06/23,18:37	34.6	136.1	41	3.7	4.60e14	87.61	northern Mie pref	40	62	-69	182	34	-123	0.0540	-0.2934	-0.4868	0.7476	0.2755	-0.8016	ABU	KIS	NAA
145	1998/06/24,14:52	36.2	140.1	71	4.8	1.92e16	94.39	SW Ibaraki pref	5	68	97	167	23	73	0.0545	-0.0486	0.1023	-0.7140	-0.7209	0.6596	KZK	SGN	YMZ
146	1998/06/24,21:30	34.3	139.2	23	4.7	1.09e16	66.88	near Niijima island	271	62	135	26	51	37	-0.6658	0.6757	-0.3354	0.0638	-0.2121	0.6020	KIS	NAA	YMZ
147	1998/06/29,14:46	34.8	140.1	74	4.2	1.89e15	92.77	SE off Boso peninsula	9	89	25	278	65	178	-0.2403	0.8601	-0.0290	0.3107	-0.4391	-0.0705	FUJ	JIZ	SGN
148	1998/06/30,17:22	36.6	138.0	8	5.0	3.71e16	93.28	northern Nagano pref	354	71	45	245	48	154	0.1616	0.6075	-0.2462	-0.6152	-0.5174	0.4536	FUJ	KZK	SGN
149	1998/06/30,18:03	36.6	141.2	41	3.9	6.90e14	73.27	E off Ibaraki pref	157	87	-69	254	21	-172	0.3499	0.2122	-0.2941	-0.2191	-0.8869	-0.1307	SBT	SGN	YMZ
150	1998/07/03,12:27	35.7	140.7	50	3.8	5.27e14	85.30	near Choshi city	338	84	70	232	21	163	0.1934	0.1872	-0.3924	-0.3982	-0.8325	0.2048	FUJ	JIZ	SGN
151	1998/07/05,14:10	36.3	140.8	56	3.6	3.05e14	79.97	E off Ibaraki pref	173	88	-27	264	63	-178	0.1859	0.8640	0.0533	-0.2424	-0.4603	0.0565	KZK	SGN	YMZ
152	1998/07/06,01:54	36.1	139.9	56	3.6	2.73e14	69.16	SW Ibaraki pref	55	66	88	241	24	96	-0.5300	0.2949	0.5286	-0.2454	-0.4029	0.7754	KZK	SGN	YMZ
153	1998/07/07,14:32	32.7	140.4	140	5.1	4.53e16	84.42	E off Hachijojima island	122	75	-112	360	27	-36	0.0038	0.4356	-0.6917	0.4327	-0.3880	-0.4365	JIZ	SGN	TYM
154	1998/07/13,09:42	35.1	139.9	92	3.8	5.12e14	85.91	southern Boso peninsula	172	83	83	37	10	135	-0.0523	0.1001	0.1605	-0.2331	0.9480	0.2854	FUJ	JIZ	SGN
155	1998/07/14,22:09	36.1	139.9	44	4.6	9.13e15	90.31	SW Ibaraki pref	45	69	85	239	21	103	-0.4246	0.2740	0.4998	-0.2704	-0.5574	0.6950	JIZ	KZK	YMZ
156	1998/07/18,16:18	35.7	140.7	56	4.9	2.61e16	89.72	near Choshi city	358	70	95	163	21	76	-0.0697	-0.1046	0.0149	-0.6083	-0.7582	0.6780	KZK	SGN	TYM
157	1998/07/21,03:14	37.0	140.4	95	4.1	1.83e15	91.05	mid Fukushima pref	216	74	81	67	18	120	-0.3020	0.3352	-0.4623	-0.1892	0.6998	0.4912	KZK	SBT	SGN
158	1998/07/23,15:18	32.6	140.4	95	3.9	8.43e14	55.03	E off Hachijojima island	345	87	72	246	19	171	0.1084	0.2651	-0.2863	-0.2241	-0.9015	0.1157	FUJ	JIZ	TYM
159	1998/07/29,22:32	34.3	139.3	17	3.8	6.07e14	59.85	near Niijima island	130	66	150	233	63	27	-1.0094	-0.0494	0.0232	0.6314	0.4644	0.3779	FUJ	SGN	NAA
160	1998/07/31,01:12	35.5	140.2	62	4.0	1.30e15	87.62	central Chiba pref	162	81	-28	257	63	-170	0.4694	0.7222	0.1070	-0.4653	-0.5379	-0.0042	SGN	JIZ	YMZ
161	1998/07/31,19:12	34.6	136.1	44	3.5	2.16e14	55.50	northern Mie pref	25	58	-85	196	33	-98	0.0853	-0.3153	-0.2179	0.8022	0.3680	-0.8875	ABU	KIS	NAA
162	1998/08/02,02:55	34.5	139.2	5	3.8	4.83e14	90.59	near Niijima island	120	83	-135	23	46	-10	-0.4773	0.4225	-0.6365	0.6586	-0.2621	-0.1812	FUJ	SGN	NAA
163	1998/08/03,11:09	37.2	140.0	5	5.1	4.99e16	86.37	mid Fukushima pref	167	67	81	8	25	109	0.0729	-0.0517	0.2055	-0.7676	0.6462	0.6948	SBT	KZK	SGN
164	1998/08/07,05:47	36.2	137.7	5	4.1	1.73e15	91.66	Hida mountains region	175	74	18	80	73	163	0.1494	0.8914	0.2947	-0.2997	0.2388	0.1503	NAA	FUJ	SGN
165	1998/08/07,06:55	36.2	137.7	5	3.9	9.38e14	89.66	Hida mountains region	80	83	157	173	68	8	0.2387	0.8733	0.3937	-0.3111	0.0604	0.0725	NAA	FUJ	SGN
166	1998/08/07,07:52	42.9	145.2	47	4.1	1.74e15	66.17	off Nemuro peninsula	33	71	74	254	24	128	-0.3422	0.4899	0.3833	-0.1817	-0.6462	0.5239	HSS	TMR	
167	1998/08/07,12:02	36.2	137.6	5	4.1	1.58e15	94.07	Hida mountains region	272	88	-159	181	69	-2	-0.0580	0.9278	0.3633	0.0412	-0.0524	0.0168	NAA	FUJ	SGN
168	1998/08/07,13:02	36.2	137.7	5	4.3	2.96e15	95.24	Hida mountains region	273	88	-153	182	63	-2	-0.0959	0.8843	0.4579	0.0955	-0.0265	0.0005	NAA	FUJ	SGN
169	1998/08/08,10:52	36.2	137.6	8	4.2	2.47e15	87.65	Hida mountains region	79	80	163	172	73	11	0.2086	0.9010	0.2561	-0.4284	0.0613	0.2199	NAA	FUJ	SGN
170	1998/08/09,03:45	36.2	137.7	5	4.5	6.02e15	93.66	Hida mountains region	273	79	-158	179	69	-12	-0.0514	0.8933	0.4073	0.0333	-0.2566	0.0181	NAA	FUJ	SGN
171	1998/08/11,01:09	33.2	131.5	98	4.6	8.24e15	73.77	northern Oita pref	85	50	-104	287	42	-73	0.9763	0.1034	-0.1671	-0.0232	0.1731	-0.9531	ISI		
172	1998/08/12,00:40	36.2	137.7	5	4.5	6.60e15	91.12	Hida mountains region	86	84	149	179	59	7	0.0975	0.8359	0.5354	-0.1038	0.1613	0.0063	NAA	FUJ	SGN
173	1998/08/12,06:13	36.2	137.7	8	4.9	2.15e16	92.14	Hida mountains region	266	88	-159	175	69	-2	0.0104	0.9149	0.3628	-0.2367	-0.2227	0.2263	NAA	FUJ	SGN
174	1998/08/14,05:06	36.2	137.6	5	4.2	2.35e15	60.57	Hida mountains region	82	84	169	174	79	6	0.1715	0.9501	0.1753	-0.3034	0.0584	0.1319	NAA	FUJ	SGN
175	1998/08/14,10:36	36.3	137.6	8	4.8	1.50e16	86.70	Hida mountains region	87	80	167	180	77	10	-0.0587	0.9653	0.1862	-0.1548	0.1114	0.2135	NAA	KZK	FUJ
176	1998/08/14,12:32	36.3	137.6	8	4.1	1.52e15	86.50	Hida mountains region	187	86	12	96	78	176	-0.2777	0.9490	0.0115	0.1748	0.2023	0.1029	NAA	KZK	FUJ
177	1998/08/14,14:48	36.3	137.6	8	3.7	4.12e14	82.87	Hida mountains region	277	85	-168	186	78	-5	-0.2462	0.9485	0.2234	0.1977	-0.0766	0.0485	NAA	KZK	FUJ
178	1998/08/14,14:52	36.3	137.6	8	3.9	7.57e14	84.34	Hida mountains region	274	83	-167	183	77	-7	-0.1576	0.9550	0.2539	0.0771	-0.1439	0.0805	NAA	KZK	FUJ
179	1998/08/14,16:31	36.3	137.6	5	4.0	1.26e15	73.16	Hida mountains region	178	82	14	86	76	172	0.0813	0.9536	0.1476	-0.1489	0.2296	0.0676	NAA	KZK	FUJ
180	1998/08/15,18:31	36.3	137.6	5	5.3	1.17e17	86.17	Hida mountains region	94	89	177	184	87	1	-0.1756	0.9867	0.0419	0.1249	0.0161	0.0507	NAA	KZK	FUJ
181	1998/08/16,14:05	37.2	141.8	41	5.2	8.38e16	92.34	E off Fukushima pref	22	63	87	208	27	95	-0.0498	0.3798	0.2066	-0.6994	-0.5458	0.7493	SBT	KZK	SGN
182	1998/08/17,01:15	36.3	137.6	8	4.8	2.00e16	86.15	Hida mountains region	185	89	-17	276	73	-178	-0.1656	0.9405	0.0355	0.2148	-0.2830	-0.0493	NAA	KZK	FUJ
183	1998/08/21,09:21	37.1	141.8	32	3.5	2.17e14	85.78	E off Fukushima pref	7	85	73	261	18	163	-0.2720	0.2579	-0.0065	0.0146	-0.9496	0.2575	YMZ	SBT	KZK
184	1998/08/21,18:44	36.2	137.7	5	4.2	2.44e15	89.46	Hida mountains region	82	86	152	174	62	4	0.2330	0.8475	0.4857	-0.2152	0.0687	-0.0178	NAA	FUJ	SGN
185	1998/08/21,18:55	36.2	137.6	5	4.6	9.42e15	83.56	Hida mountains region	75	89	171	165	81	1	0.4724	0.8599	0.1605	-0.4926	-0.0321	0.0202	NAA	FUJ	SGN
186	1998/08/21,19:48	36.2	137.7	5	4.0	1.27e15	90.18	Hida mountains region	83	77	153	180	64	15	0.0722	0.8412	0.4812	-0.1778	0.2406	0.1056	NAA	FUJ	SGN
187	1998/08/24,00:57	34.3	139.2	17	4.1	1.38e15	65.87	near Niijima island	233	57	40	118	57	140	-0.9933	0.1133	0.0375	0.4071	0.4832	0.5862	JIZ	TYM	FUJ
188	1998/08/24,02:18	34.3	139.2	17	4.3	3.18e15	82.48	near Niijima island	229	78	16	136	74	167	-1.0493	-0.0755	-0.0616	0.8453	0.2665	0.2040	JIZ	TYM	FUJ
189	1998/08/24,14:20	37.7	141.8	62	4.3	2.86e15	86.85	E off Fukushima pref	190	52	116	331	45	60	0.2397	-0.2156	-0.2176	-1.0485	0.1697	0.8088	YMZ	SBT	GJM
190	1998/08/25,23:44	28.6	128.6	125	5.0	3.38e16	64.77	near Tokara Islands	137	77	-150	40	61	-15	-0.7522	0.0399	-0.4945	0.9267	-0.1690	-0.1745	TKA		
191	1998/08/26,13:46	36.2	140.8	41	3.7	3.51e14	54.21	E off Ibaraki pref	327	63	69	187	34	125	0.1734	-0.2928	-0.3650	-0.8764	-0.3959	0.7029	YMZ	TYM	SGN
192	1998/08/26,16:24	36.3	137.6	11	3.7	4.09e14	82.96	Hida mountains region	265	88	-154	174	64	-2	0.0758	0.8818	0.4275	-0.2186	-0.2112	0.1428	NAA	KZK	FUJ
193	1998/08/26,20:07	36.3	137.6	8	3.8	5.90e14	86.86	Hida mountains region	81	84	152	174	63	7	0.1166	0.8674	0.4315	-0.3080	-0.0634	0.1914	NAA	KZK	FUJ
194	1998/08/26,20:13	35.0	139.2	5	3.4	1.32e14	71.46	E off Izu peninsula	130	78	31	33	60	166	0.7177	-0.2485	0.5139	-0.8862	0.1435	0.1686	TYM	SGN	FUJ
195	1998/08/28,05:13	36.3	137.6	11	4.0	1.11e15	87.58	Hida mountains region	82	87	149	173	59	3	0.1534	0.8392	0.4938	-0.2573	-0.0946	0.1038	NAA	KZK	FUJ
196	1998/08/28,23:46	35.6	140.0	56	5.3	9.80e16	91.94	central Chiba pref	213	66	-151	111	64	-27	0.8519	-0.4906	-0.1072	-0.4799	-0.4495	-0.3720	SGN	YMZ	KZK
197	1998/08/29,11:52	34.3	139.2	14	4.0	1.20e15	69.93	near Niijima island	308	63	121	75	40	44	-0.9220	-0.2955	-0.2872	0.2556	-0.4158	0.6664	JIZ	FUJ	SGN
198	1998/08/30,10:33	33.8	135.4	47	3.6	3.01e14	61.25	central Wakayama pref	110	89	128	201	38	2	-0.4450	0.4443	0.7556	0.4084	0.2339	0.0365	ISI	ABU	NAA
199	1998/08/30,17:47	38.7	142.2	47	3.9	8.99e14	79.67	E off Miyagi pref	19	59	90	198	31	90	-0.0673	0.2743	0.1491	-0.8071	-0.4388	0.8744	SBT	YMZ	TMR
200	1998/08/31,14:30	36.2	137.7	8	3.6	3.23e14	86.20	Hida mountains region	270	89	-135	179	45	-2	0.0219	0.7021	0.7111	0.0063	-0.0154	-0.0282	NAA	FUJ	SGN
201	1998/09/01,01:21	34.4	140.3	65	4.1	1.61e15	85.36	far S off Boso peninsula	228	77	98	15	15	57	-0.0936	0.2342	-0.6887	-0.3176	0.5727	0.4112	TYM	JIZ	SGN
202	1998/09/03,07:58	39.8	141.0	5	5.9	7.53e17	76.65	northern Iwate pref	360	52	65	217	44	118	-0.0371	0.3103	-0.2800	-0.8610	-0.2288	0.8982	GJM	TMR	SBT
203	1998/09/03,12:25	39.8	141.0	5	3.7	4.42e14	77.31	northern Iwate pref	354	51	77	194	41	105	-0.1330	0.0592	-0.1963	-0.9010	-0.1753	1.0339	GJM	TMR	SBT
204	1998/09/03,23:02	32.0	131.9	23	4.7	1.42e16	87.83	Hyuganada region	188	79	-83	336	13	-121	-0.0555	0.0532	0.1444	0.4111	-0.9092	-0.3556	TKD	TKA	ISI
205	1998/09/04,08:15	35.2	136.5	5	3.6	2.50e14	85.44	Shiga Gifu border region	12	54	110	161	41	65	0.0060	-0.0670	0.2831	-0.9309	-0.2364	0.9250	NAA	ABU	KIS
206	1998/09/05,01:08	36.4	137.6	8	4.8	1.76e16	91.42	Hida mountains region	354	82	15	261	75	172	0.1452	0.9277	-0.0926	-0.3718	-0.2108	0.2266	KZK	NAA	FUJ
207	1998/09/05,03:02	36.4	137.6	8	4.9	2.53e16	91.04	Hida mountains region	355	84	14	264	76	174	0.1087	0.9516	-0.0607	-0.2885	-0.2159	0.1797	KZK	NAA	FUJ
208	1998/09/05,18:30	39.5	138.5	14	4.4	4.51e15	87.28	W off Akita pref	320	75	18	226	72	164	0.8015	0.0969	-0.2864	-1.0616	-0.0587	0.2601	GJM	SBT	KZK
209	1998/09/05,23:03	43.4	146.0	74	4.1	1.36e15	84.49	near Kunashiri island	231	80	65	120	27	157	-0.6021	0.1095	-0.6328	0.3079	0.5659	0.2943	TNK	HSS	
210	1998/09/06,20:49	43.1	145.7	53	4.5	5.47e15	88.53	off Nemuro peninsula	231	81	168	323	78	9	0.8980	0.2281	-0.2533	-0.9776	0.0085	0.0796	HSS		

Table 5 Estimated moment tensors (continued).

No.	Origion Time(UT)	Lat(N)	Lon(E)	D(km)	Mw	Mo(Nm)	VarRed	Region name	Str1	Dip1	Rak1	Str2	Dip2	Rak2	Mxx	Mxy	Mxz	Myy	Myz	Mzz	used Stations		
211	1998/09/07,06:38	34.6	136.1	38	3.7	4.60e14	85.67	northern Mie pref	17	67	-79	170	25	-114	0.0583	-0.0164	-0.2963	0.6911	0.6317	-0.7494	ABU	KIS	FUJ
212	1998/09/07,07:53	36.2	137.7	11	4.1	1.44e15	89.36	Hida mountains region	86	82	142	182	53	10	-0.1684	0.8244	0.5439	-0.1091	-0.1135	0.2775	NAA	FUJ	SGN
213	1998/09/07,23:40	35.9	140.8	41	4.6	8.63e15	77.67	near Choshi city	13	70	90	192	20	89	-0.0431	0.1274	0.1681	-0.6084	-0.7461	0.6514	TYM	SGN	KZK
214	1998/09/09,18:58	40.3	142.3	38	3.8	5.73e14	73.29	NE off Iwate pref	298	77	-118	184	31	-27	-0.0499	0.4924	0.7053	0.4265	0.3263	-0.3766	TMR	GJM	HSS
215	1998/09/14,10:50	35.8	140.1	35	3.7	3.85e14	69.85	northern Chiba pref	86	78	102	219	17	44	-0.3319	0.2254	0.9004	-0.0754	-0.0118	0.4073	TYM	SGN	YMZ
216	1998/09/14,11:11	35.8	140.1	35	3.9	7.24e14	82.15	northern Chiba pref	83	76	100	228	17	56	-0.4619	0.2364	0.8623	0.0320	-0.0807	0.4299	TYM	SGN	YMZ
217	1998/09/14,23:16	32.6	132.2	38	4.4	4.30e15	80.67	Hyuganada region	346	48	-87	162	42	-93	0.2691	0.1826	-0.0173	0.8323	0.1155	-1.1014	TKD	TKA	ISI
218	1998/09/15,05:10	34.2	139.1	11	3.7	4.07e14	66.11	near Niijima island	213	88	26	122	64	177	-0.8091	0.3578	-0.1708	0.8333	0.4189	-0.0243	JIZ	TYM	FUJ
219	1998/09/15,07:24	38.3	140.8	8	5.0	3.19e16	91.91	southern Miyagi pref	37	54	99	203	37	78	-0.2164	0.4254	0.2587	-0.7122	-0.2023	0.9287	SBT	YMZ	GJM
220	1998/09/17,04:02	29.5	130.6	26	4.9	2.55e16	65.17	near Amami-Oshima island	29	51	88	212	39	93	-0.1209	0.5755	0.0901	-0.7448	-0.1879	0.8657	TKA	TKD	
221	1998/09/18,08:16	36.3	137.7	5	4.7	1.12e16	62.02	Hida mountains region	266	83	-166	174	76	-7	0.1878	0.9456	0.2264	-0.1240	-0.1359	-0.0638	NAA	KZK	FUJ
222	1998/09/18,21:19	36.3	137.7	8	3.8	6.63e14	83.95	Hida mountains region	291	82	-167	199	77	-8	-0.4668	0.7480	0.1605	0.7976	0.0196	-0.3308	NAA	KZK	FUJ
223	1998/09/19,08:43	37.5	138.1	11	3.6	2.96e14	72.25	off S Niigata pref	58	66	100	215	26	69	-0.3924	0.3701	0.5961	-0.3658	-0.2772	0.7582	SBT	YMZ	SGN
224	1998/09/19,21:53	36.4	137.6	8	4.5	5.75e15	95.78	Hida mountains region	180	83	-13	271	77	-173	-0.0244	0.9644	0.1418	-0.0089	-0.2347	0.0333	NAA	FUJ	SGN
225	1998/09/24,08:03	33.4	134.6	29	4.2	1.91e15	94.97	SE off Shikoku	308	75	162	43	72	16	-0.9852	0.1501	-0.0605	0.8277	-0.3692	0.1575	ISI	ABU	
226	1998/09/24,21:59	37.5	141.3	86	4.8	1.52e16	84.93	E off Fukushima pref	242	52	-95	71	38	-83	0.8194	-0.3552	0.1929	0.1444	-0.1643	-0.9638	YMZ	SBT	KZK
227	1998/09/26,23:43	31.8	132.0	29	4.3	3.58e15	56.15	Hyuganada region	41	66	107	184	30	57	-0.0447	0.3224	0.5053	-0.6748	-0.3941	0.7195	TKA	TKD	ISI
228	1998/09/27,11:34	29.4	130.7	95	5.4	1.39e17	64.17	near Amami-Oshima island	29	80	-149	293	59	-11	0.7437	-0.5196	-0.0961	-0.5854	0.5125	-0.1582	TKA	TKD	
229	1998/09/27,17:50	32.0	131.9	62	4.5	5.75e15	68.19	Hyuganada region	320	64	141	69	56	31	-0.7555	-0.2595	0.1009	0.3590	-0.7693	0.3965	TKA	TKD	
230	1998/09/27,21:45	35.7	140.7	26	3.7	4.09e14	84.76	near Choshi city	199	78	-115	86	28	-27	0.3482	-0.4021	0.1414	0.0429	-0.8281	-0.3911	YMZ	SGN	FUJ
231	1998/10/01,19:27	36.7	141.3	32	3.9	7.84e14	74.12	E off Ibaraki pref	209	73	-76	349	22	-128	0.0040	-0.0522	0.4826	0.5882	-0.6520	-0.5921	YMZ	SBT	SGN
232	1998/10/03,17:01	36.7	141.5	35	4.4	4.93e15	80.45	E off Ibaraki pref	204	79	-105	79	18	-37	0.0763	-0.4483	0.4148	0.1632	-0.7987	-0.2394	SBT	SGN	KZK
233	1998/10/04,17:40	35.1	138.2	23	3.3	1.07e14	88.21	central Shizuoka pref	183	81	-100	50	13	-44	-0.0940	-0.1964	0.0537	0.3476	-0.9376	-0.2535	JIZ	NAA	SGN
234	1998/10/06,23:09	41.7	142.0	53	3.7	3.38e14	56.86	E off Aomori pref	95	58	-122	324	44	-50	0.6467	0.4547	-0.4195	0.1380	0.3158	-0.7846	TMR	HSS	GJM
235	1998/10/13,03:36	43.0	145.4	50	3.9	9.24e14	74.67	off Nemuro peninsula	21	63	68	241	34	125	-0.2705	0.5430	0.0603	-0.4626	-0.5426	0.7331	HSS	TMR	
236	1998/10/13,20:41	40.0	143.6	26	5.5	1.76e17	77.77	far E off Sanriku	23	56	91	202	34	89	-0.1267	0.3408	0.1586	-0.7870	-0.3534	0.9138	TMR	GJM	HSS
237	1998/10/16,18:05	36.2	137.6	8	3.6	2.46e14	67.26	Hida mountains region	107	51	-76	266	41	-106	0.9817	0.1240	-0.1342	-0.0382	-0.1945	-0.9435	NAA	FUJ	SGN
238	1998/10/18,23:17	35.7	139.3	107	4.2	2.04e15	66.98	Tokyo pref	115	50	-73	270	43	-109	0.8133	0.1169	-0.0481	0.2599	-0.3396	-1.0731	JIZ	FUJ	YMZ
239	1998/10/18,23:35	42.3	143.0	50	3.9	7.42e14	79.14	Hidaka mountains region	49	59	94	220	31	83	-0.4546	0.3637	0.3811	-0.4815	-0.2700	0.9361	HSS	TMR	
240	1998/10/21,07:36	38.0	139.3	5	3.6	3.21e14	85.96	NE Niigata pref	21	55	106	174	38	68	0.0542	0.1357	0.2574	-0.9509	-0.2390	0.8967	KZK	YMZ	
241	1998/10/27,10:23	34.7	140.5	32	3.7	4.05e14	86.62	SE off Boso peninsula	139	74	-51	248	42	-155	0.7726	0.2585	-0.2834	-0.3568	-0.6381	-0.4158	TYM	JIZ	SGN
242	1998/10/31,18:01	36.4	140.6	50	4.0	1.05e15	69.43	northern Ibaraki pref	19	67	93	191	24	83	0.0564	0.2415	0.2375	-0.7268	-0.6412	0.6705	YMZ	TYM	SGN
243	1998/10/31,21:21	35.2	139.8	89	4.0	1.13e15	92.69	Tokyo bay region	191	72	70	60	27	136	-0.1999	0.3702	-0.0025	-0.3844	0.7754	0.5843	SGN	YMZ	NAA
244	1998/11/01,09:02	37.6	137.3	11	3.5	2.34e14	76.11	off Noto peninsula	244	56	121	18	45	53	-0.3227	0.5672	-0.4121	-0.4841	-0.1339	0.8069	KZK	SBT	
245	1998/11/01,10:45	35.4	140.4	23	3.8	5.85e14	76.47	Kujukuri coast Boso pen	71	74	85	270	17	108	-0.5348	0.0979	0.7936	0.0194	-0.2932	0.5154	SGN	YMZ	FUJ
246	1998/11/01,19:13	41.9	141.5	107	4.3	3.00e15	87.50	S off Tomakomai	212	77	125	320	37	21	0.4816	0.0033	-0.3691	-0.8222	0.6219	0.3406	TMR	HSS	GJM
247	1998/11/03,07:48	37.9	141.7	86	4.1	1.53e15	76.60	SE off Miyagi pref	192	58	-110	47	37	-61	0.2126	-0.3932	-0.1247	0.6607	-0.4619	-0.8732	YMZ	SBT	GJM
248	1998/11/04,21:44	36.5	140.6	59	3.9	7.22e14	74.79	northern Ibaraki pref	54	52	128	182	51	51	-0.1058	0.4315	0.4787	-0.6840	0.2339	0.7899	SGN	SBT	FUJ
249	1998/11/05,22:26	35.0	139.2	8	3.9	8.56e14	93.36	E off Izu peninsula	77	84	156	170	66	7	0.3316	0.8324	0.4245	-0.3765	0.0404	0.0448	SGN	FUJ	NAA
250	1998/11/07,06:49	34.8	137.5	38	3.5	2.06e14	55.00	Hamanako lake region	286	69	157	25	68	23	-0.6677	0.6472	-0.2117	0.4471	-0.4413	0.2205	FUJ	JIZ	SGN
251	1998/11/07,11:13	28.3	129.3	20	4.6	1.01e16	68.29	near Amami-Oshima island	243	76	138	346	49	19	0.3123	0.5672	-0.5913	-0.6459	0.1249	0.3336	TKA		
252	1998/11/08,12:40	35.6	140.0	71	4.7	1.36e16	91.26	central Chiba pref	10	62	100	170	30	73	0.0964	0.0092	0.1554	-0.8840	-0.5206	0.7876	YMZ	KZK	NAA
253	1998/11/09,00:12	34.8	137.1	32	3.8	5.01e14	72.33	Mikawa bay region	130	86	162	221	72	4	-0.9472	0.1485	0.1816	0.9278	0.2556	0.0194	NAA	FUJ	ABU
254	1998/11/10,02:21	33.2	132.8	35	4.2	2.15e15	84.72	SW Kochi pref	187	52	-75	344	41	-108	-0.2660	0.0991	0.1088	1.1002	-0.1991	-0.8342	TKD	ISI	KIS
255	1998/11/11,06:47	34.7	140.7	47	4.1	1.57e15	89.97	SE off Boso peninsula	147	74	-42	251	50	-159	0.7333	0.3912	-0.0690	-0.4161	-0.6686	-0.3172	TYM	JIZ	SGN
256	1998/11/11,07:17	34.7	140.6	29	3.6	3.20e14	82.90	SE off Boso peninsula	29	75	104	164	20	47	0.3159	0.2579	0.3536	-0.6500	-0.7602	0.3341	TYM	JIZ	SGN
257	1998/11/13,05:31	37.0	141.3	59	3.8	5.61e14	82.81	E off Fukushima pref	23	68	94	192	22	80	-0.0503	0.1999	0.3039	-0.6301	-0.6612	0.6805	YMZ	KZK	SGN
258	1998/11/15,21:23	35.6	140.1	74	3.8	5.32e14	89.28	central Chiba pref	6	72	99	160	20	65	0.0178	-0.0770	0.1329	-0.6016	-0.7914	0.5839	TYM	SGN	JIZ
259	1998/11/15,23:08	37.7	137.4	5	4.7	1.45e16	89.63	off Noto peninsula	74	79	143	172	53	14	0.2645	0.6810	0.6390	-0.4319	0.0811	0.1674	SBT	YMZ	NAA
260	1998/11/16,08:25	36.4	141.4	20	4.1	1.73e15	88.95	E off Ibaraki pref	4	71	61	243	35	144	-0.0777	0.4937	-0.1177	-0.4742	-0.6917	0.5519	YMZ	SGN	SBT
261	1998/11/18,14:02	33.4	133.2	32	3.8	5.29e14	78.16	SW Kochi pref	298	66	-144	192	57	-29	-0.2771	0.6156	0.4527	0.7379	-0.0637	-0.4608	ISI	KIS	
262	1998/11/20,16:40	36.5	141.1	35	4.4	5.24e15	75.98	E off Ibaraki pref	6	86	76	259	14	163	0.1867	0.2896	0.1675	-0.2179	-0.9476	0.0312	SBT	SGN	KZK
263	1998/11/23,19:48	38.0	141.6	74	5.1	5.73e16	86.06	SE off Miyagi pref	165	59	-91	347	31	-89	0.1967	0.1508	-0.1297	0.7641	-0.4564	-0.9608	YMZ	SBT	GJM
264	1998/11/24,08:42	35.6	140.2	56	4.1	1.54e15	83.12	central Chiba pref	42	49	118	183	49	62	0.0093	0.4351	0.2664	-0.8577	0.1105	0.8484	TYM	SGN	JIZ
265	1998/11/24,17:36	37.1	141.6	35	4.7	1.08e16	90.64	E off Fukushima pref	25	76	90	204	14	89	0.0008	0.2301	0.3735	-0.4042	-0.8093	0.4034	YMZ	SBT	KZK
266	1998/11/25,01:47	35.9	136.7	8	4.0	1.21e15	89.25	Fukui Gifu border region	350	61	86	178	29	97	-0.0385	-0.0839	-0.1248	-0.8269	-0.5071	0.8655	NAA	ABU	FUJ
267	1998/11/27,15:23	35.6	140.1	44	4.3	3.29e15	90.90	central Chiba pref	202	69	-132	90	46	-30	0.4966	-0.6134	-0.0147	-0.0055	-0.6144	-0.4911	SGN	JIZ	YMZ
268	1998/11/29,12:52	37.2	141.2	74	4.2	2.13e15	89.15	E off Fukushima pref	166	62	-100	7	29	-71	0.0274	0.0407	-0.2300	0.8082	-0.5188	-0.8356	YMZ	SBT	KZK
269	1998/11/30,13:52	38.3	141.9	47	3.9	9.28e14	79.77	E off Miyagi pref	37	66	107	181	29	57	-0.0309	0.2486	0.4926	-0.7054	-0.4196	0.7363	YMZ	GJM	
270	1998/12/02,02:02	35.1	136.6	41	3.6	2.65e14	80.86	northern Mie pref	180	65	-68	316	33	-129	0.1128	0.3098	0.2319	0.6415	-0.6078	-0.7543	NAA	ABU	KIS
271	1998/12/02,20:15	35.6	140.1	65	4.4	3.87e15	92.41	central Chiba pref	217	69	-142	111	54	-26	0.8458	-0.4001	0.0512	-0.4362	-0.5473	-0.4096	SGN	YMZ	KZK
272	1998/12/04,16:15	36.1	140.0	47	3.9	8.54e14	79.09	SW Ibaraki pref	50	73	75	271	23	129	-0.5615	0.1809	0.5497	-0.0206	-0.5839	0.5821	YMZ	SGN	FUJ
273	1998/12/04,16:38	33.5	135.1	35	4.1	1.50e15	93.30	S Part of Kii channel	324	77	-97	171	15	-63	0.0185	0.2126	0.5390	0.3980	0.7073	-0.4165	KIS	ISI	ABU
274	1998/12/07,09:01	29.3	130.4	41	5.3	9.55e16	50.01	near Amami-Oshima island	202	47	80	37	44	101	-0.1452	0.5136	0.0700	-0.7753	0.0914	0.9206	TKA		
275	1998/12/09,15:56	42.3	143.1	56	4.9	2.18e16	91.99	Hidaka mountains region	40	65	85	231	25	100	-0.3853	0.3866	0.3928	-0.3663	-0.5191	0.7516	HSS	TMR	NMR
276	1998/12/12,17:21	32.8	130.1	11	3.5	2.18e14	69.03	near Unzendake	135	83	-32	229	58	-172	0.9018	0.0662	-0.2908	-0.7810	-0.4394	-0.1209	TKD		
277	1998/12/12,19:11	35.6	140.1	62	3.5	2.11e14	56.08	central Chiba pref	15	66	101	169	26	66	-0.0393	0.0073	0.2707	-0.7186	-0.6200	0.7579	TYM	SGN	JIZ
278	1998/12/16,00:18	31.3	131.4	20	5.8	6.52e17	74.34	SE off Osumi pen	35	84	91	205	6	80	-0.0465	0.1040	0.5638	-0.1606	-0.7977	0.2071	TKA	TKD	
279	1998/12/17,12:49	36.1	141.4	26	5.1	4.37e16	78.25	far E off Ibaraki pref	8	85	67	267	24	168	0.0686	0.4508	0.2257	-0.1512	-0.8787	0.0825	SGN	SBT	KZK
280	1998/12/18,01:27	36.4	141.0	41	4.0	1.30e15	84.13	E off Ibaraki pref	10	80	84	221	12	121	0.1826	0.2263	0.1774	-0.4133	-0.9158	0.2307	YMZ	SGN	SBT

Table 5 Estimated moment tensors (continued).

No.	Origion Time(UT)	Lat(N)	Lon(E)	D(km)	Mw	Mo(Nm)	VarRed	Region name	Str1	Dip1	Rak1	Str2	Dip2	Rak2	Mxx	Mxy	Mxz	Myy	Myz	Mzz	used Stations		
281	1998/12/19,02:09	35.5	139.0	23	3.7	3.78e14	73.83	eastern Yamanashi pref	228	48	87	53	42	93	-0.5894	0.5194	-0.0465	-0.3861	0.0840	0.9755	FUJ	JIZ	TYM
282	1998/12/22,10:23	36.1	140.6	50	4.3	2.70e15	77.27	southern Ibaraki pref	330	63	-41	81	54	-146	0.7075	0.5496	-0.1085	-0.1871	0.5295	-0.5204	YMZ	TYM	SGN
283	1998/12/24,19:08	32.0	131.9	65	4.3	2.95e15	70.72	Hyuganada region	49	75	65	290	29	147	-0.6862	0.2329	0.5469	0.2494	-0.5395	0.4368	TKD	ISI	
284	1998/12/25,10:39	37.4	139.4	5	3.8	6.38e14	87.61	western Fukushima pref	65	87	153	157	63	4	0.5958	0.6066	0.4077	-0.7083	-0.1919	0.1125	SBT	KZK	YMZ

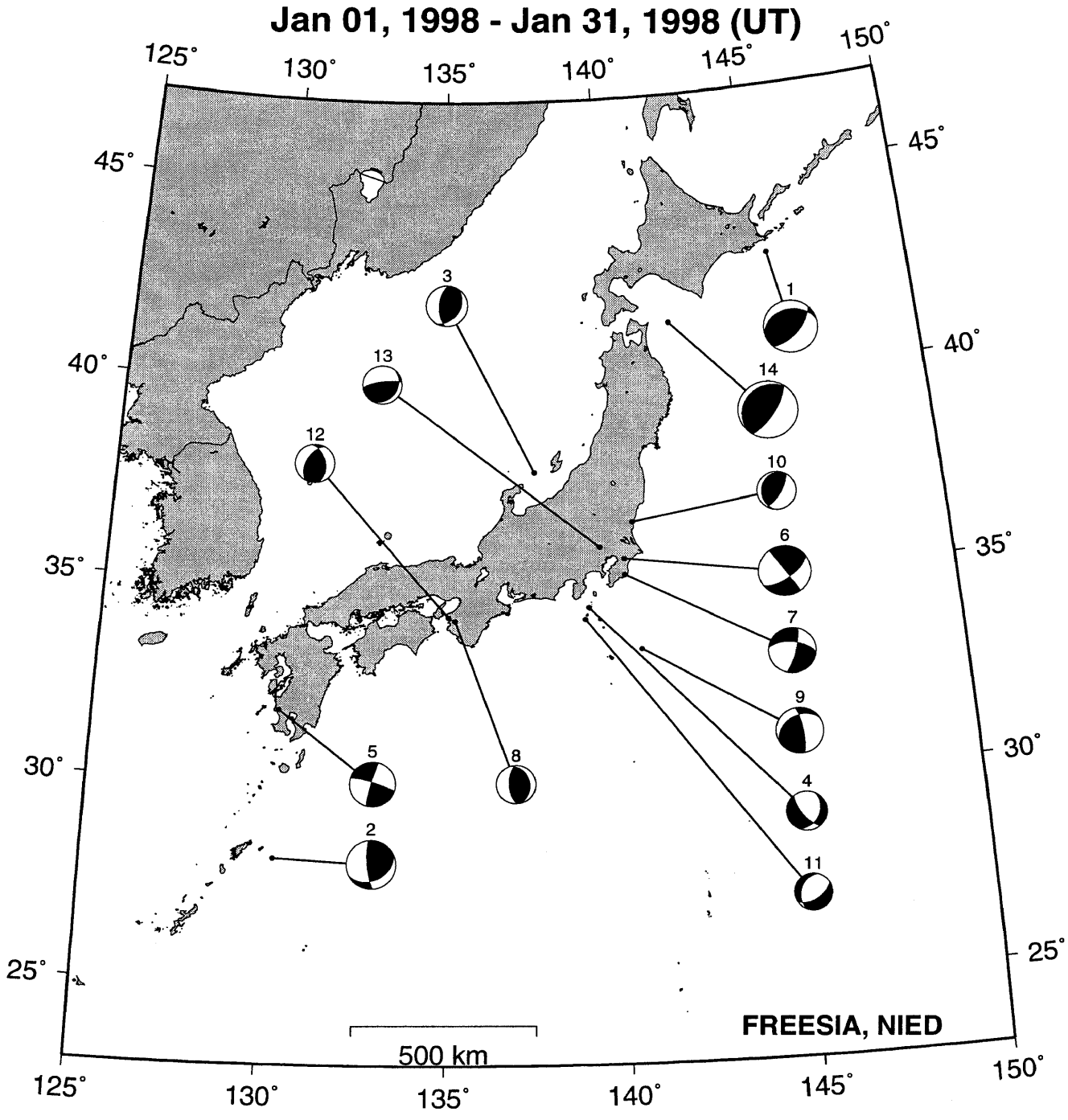

Fig. 2 Estimated focal mechanisms plotted with epicentral locations.

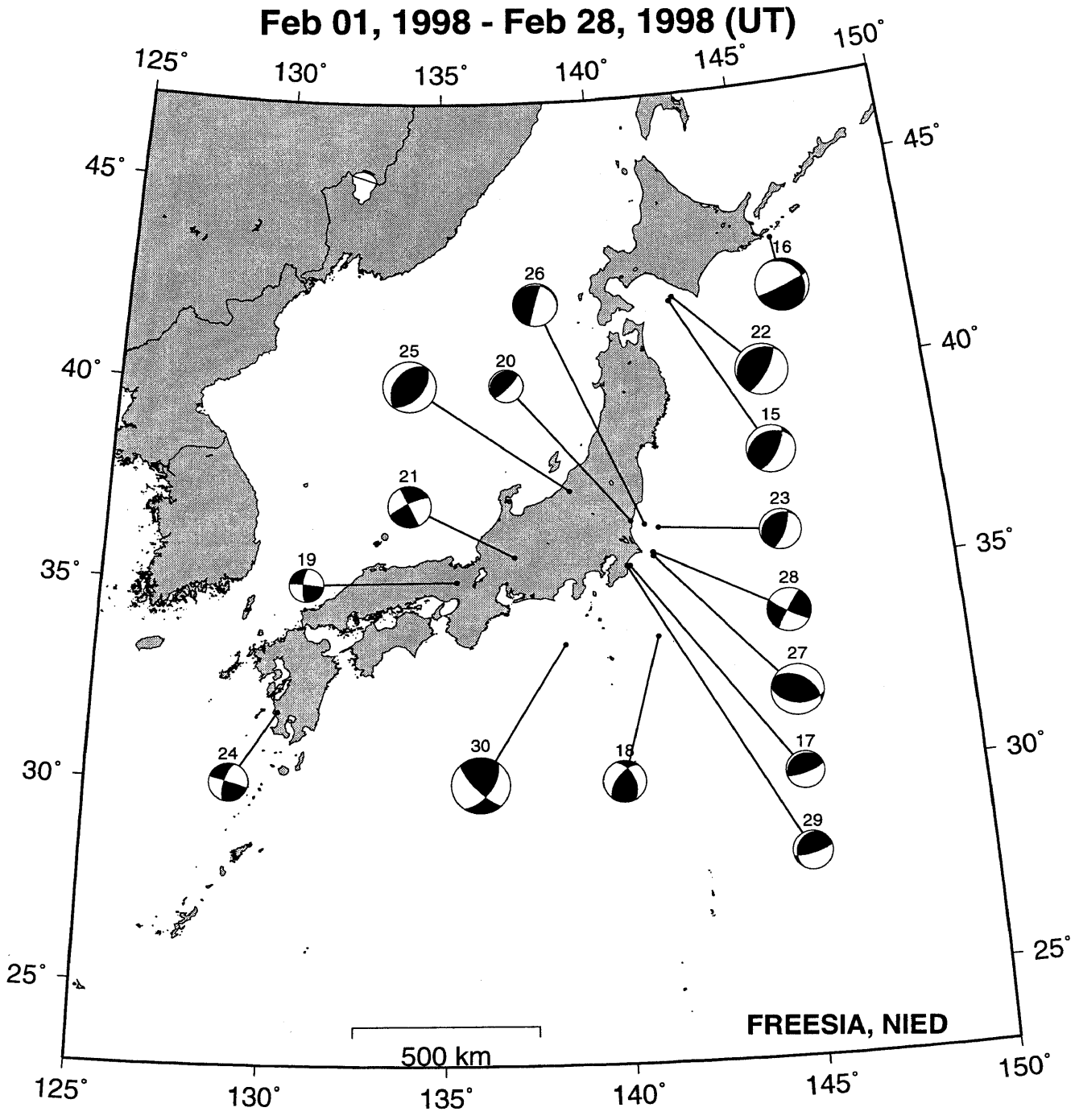

Fig. 2 Estimated focal mechanisms plotted with epicentral locations (continued).

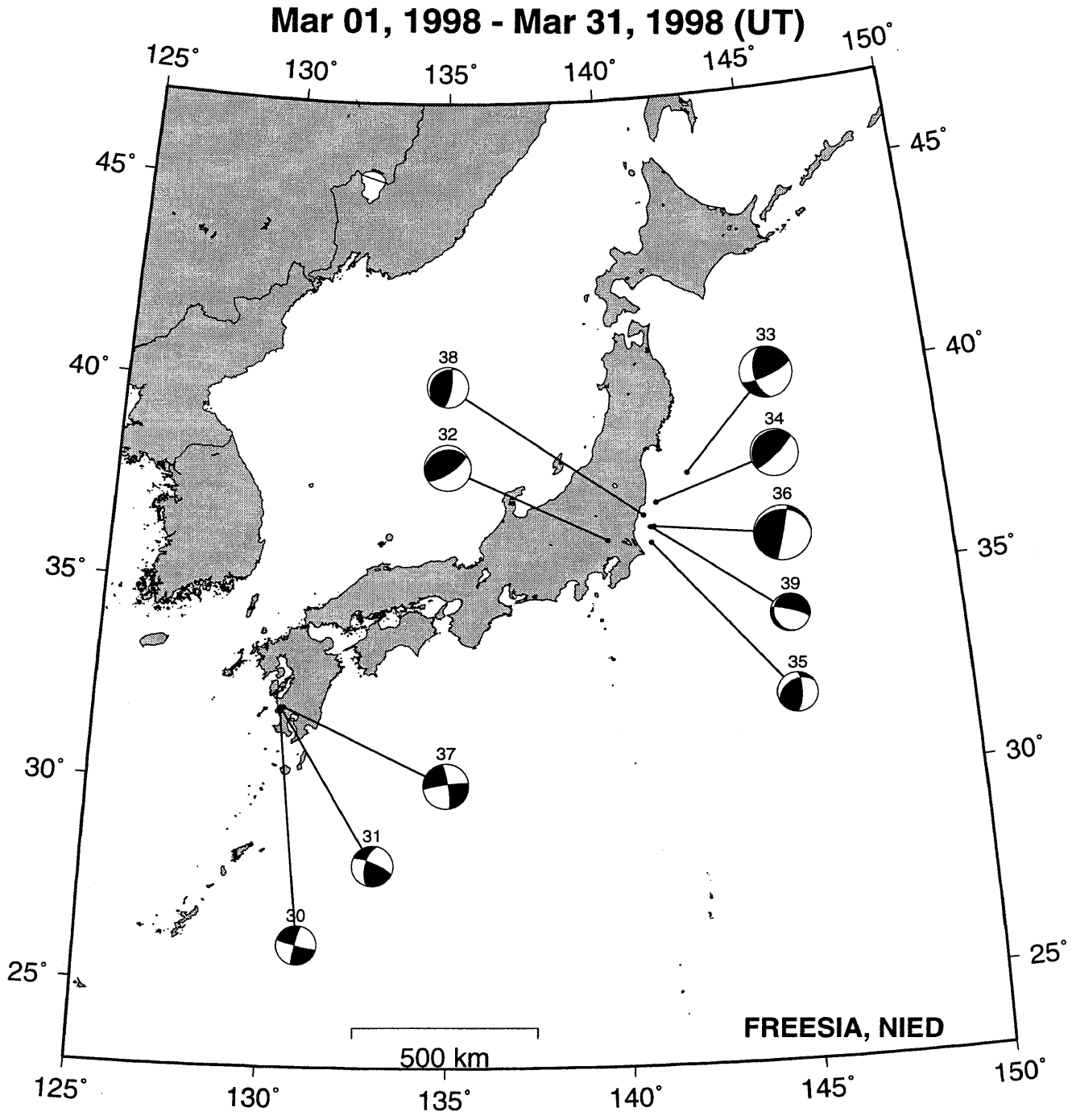

Fig. 2 Estimated focal mechanisms plotted with epicentral locations (continued).

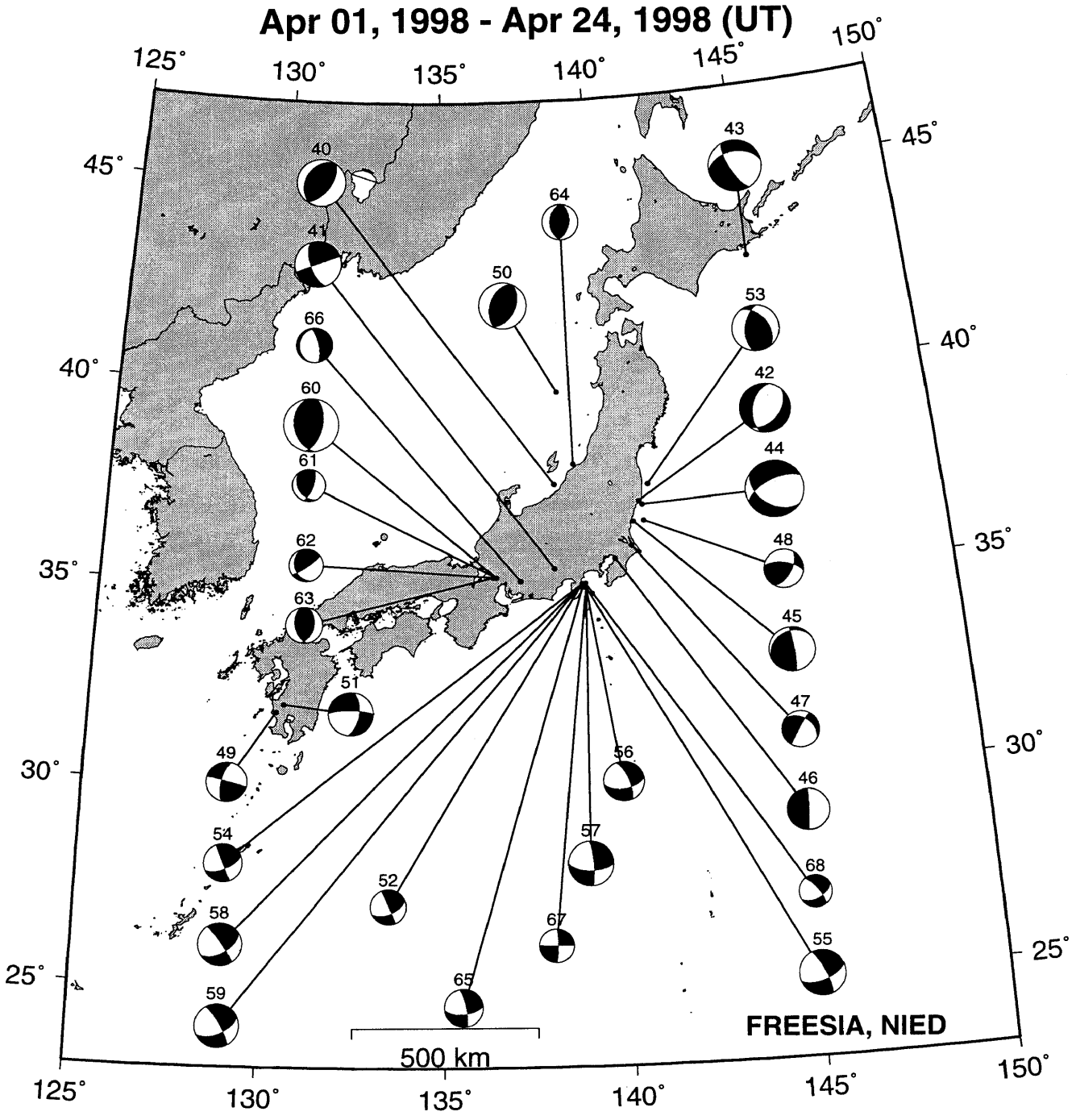

Fig. 2 Estimated focal mechanisms plotted with epicentral locations (continued).

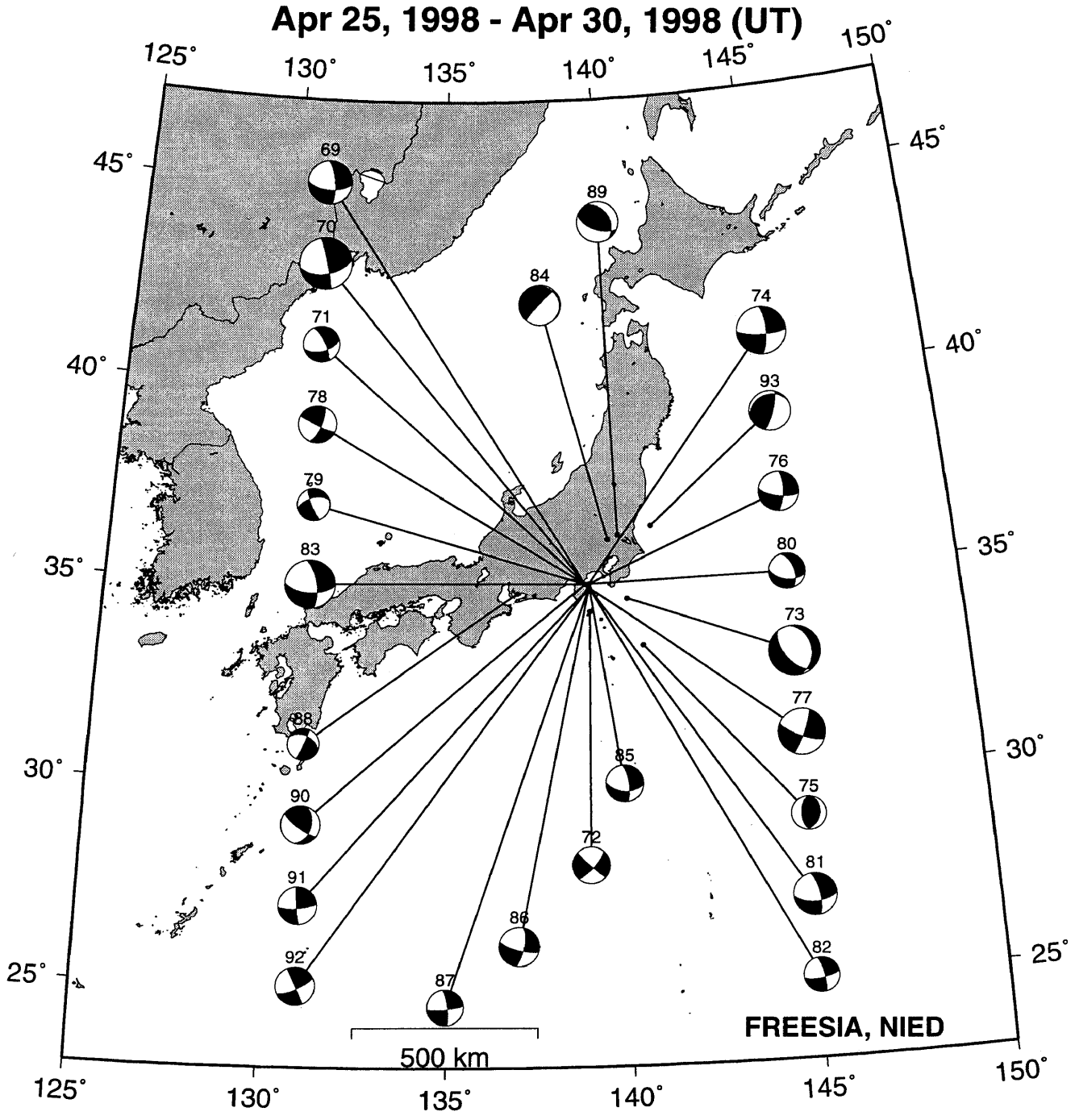

Fig. 2 Estimated focal mechanisms plotted with epicentral locations (continued).

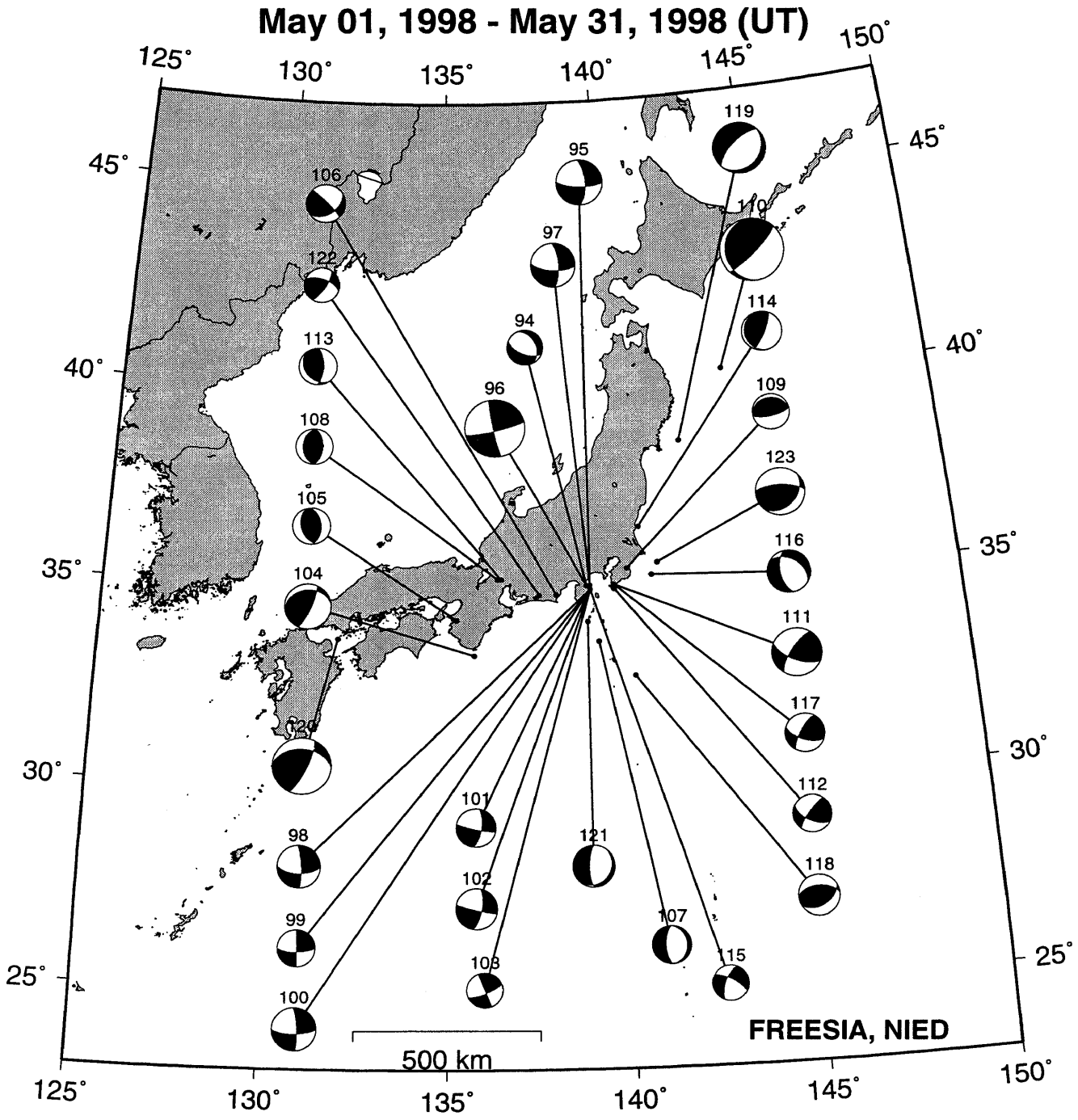

Fig. 2 Estimated focal mechanisms plotted with epicentral locations (continued).

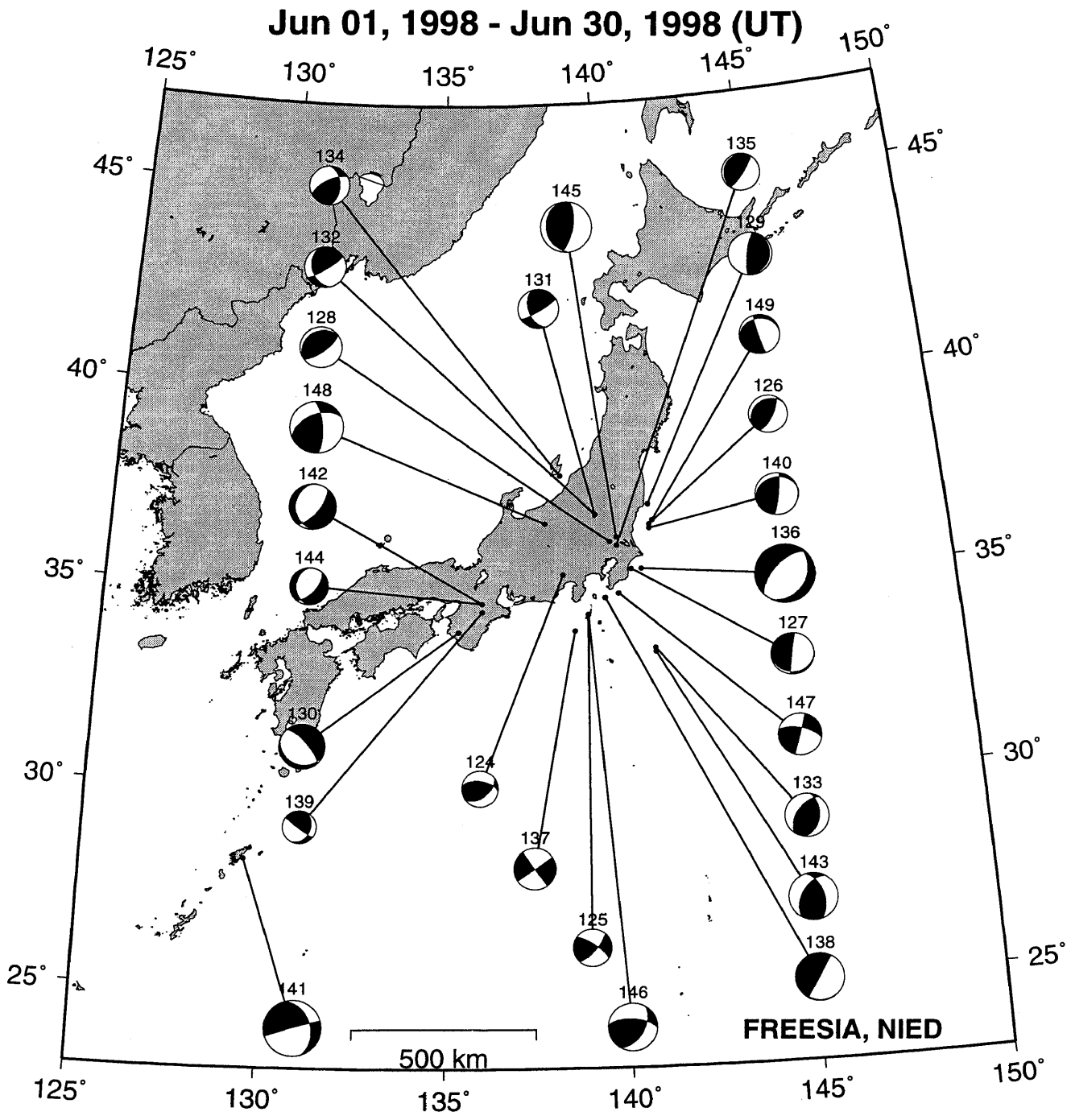

Fig. 2 Estimated focal mechanisms plotted with epicentral locations (continued).

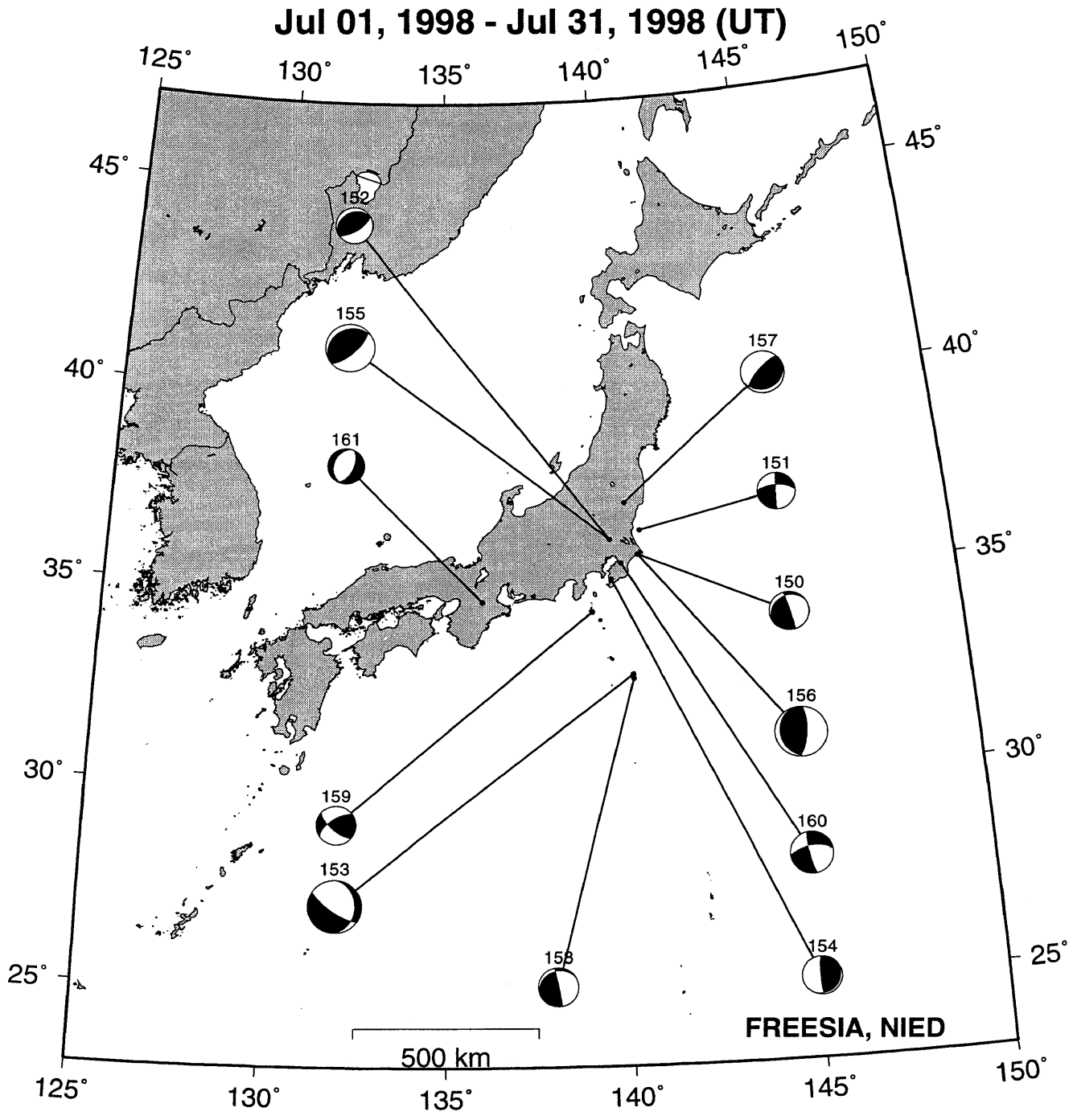

Fig. 2 Estimated focal mechanisms plotted with epicentral locations (continued).

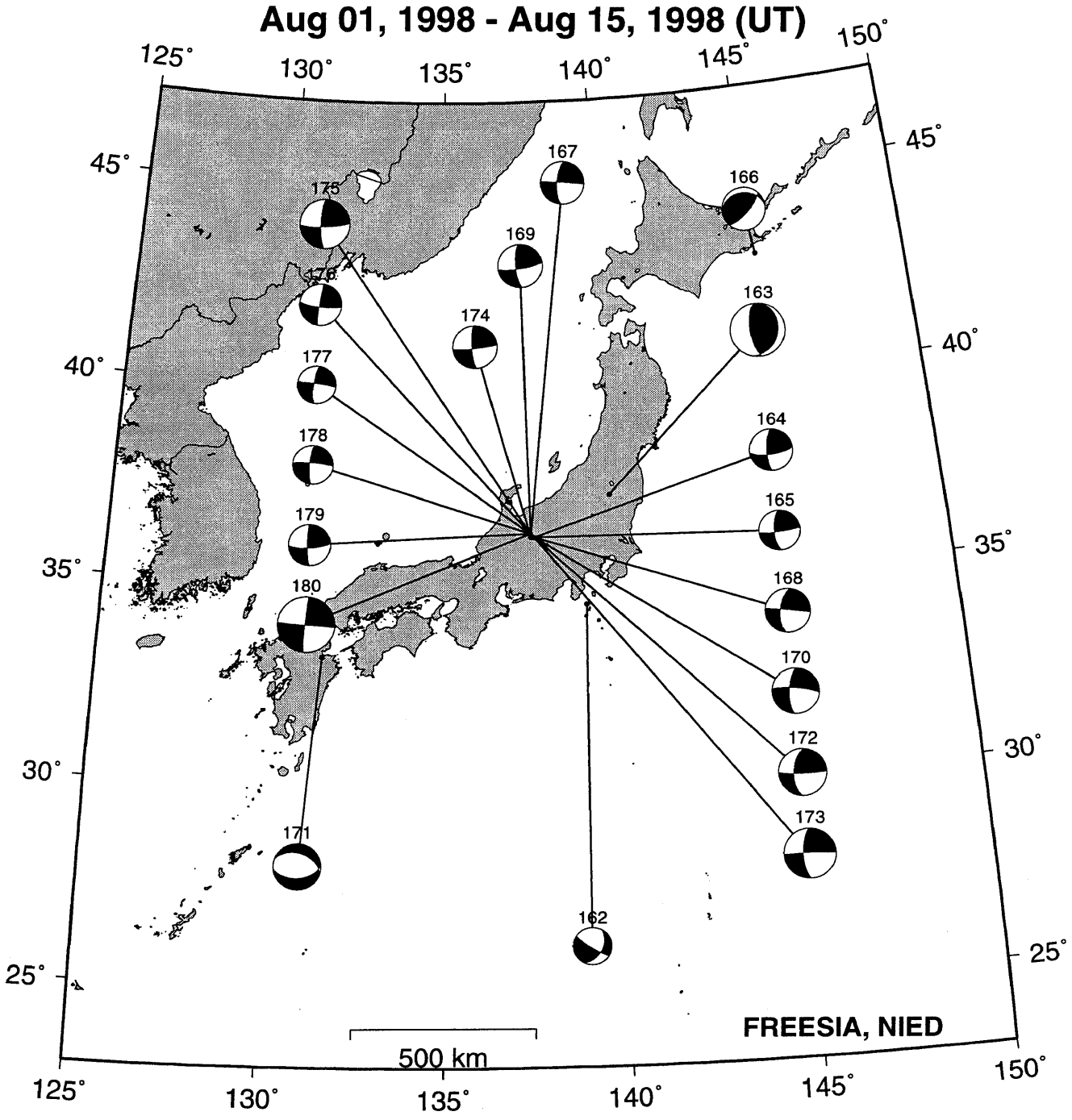

Fig. 2 Estimated focal mechanisms plotted with epicentral locations (continued).

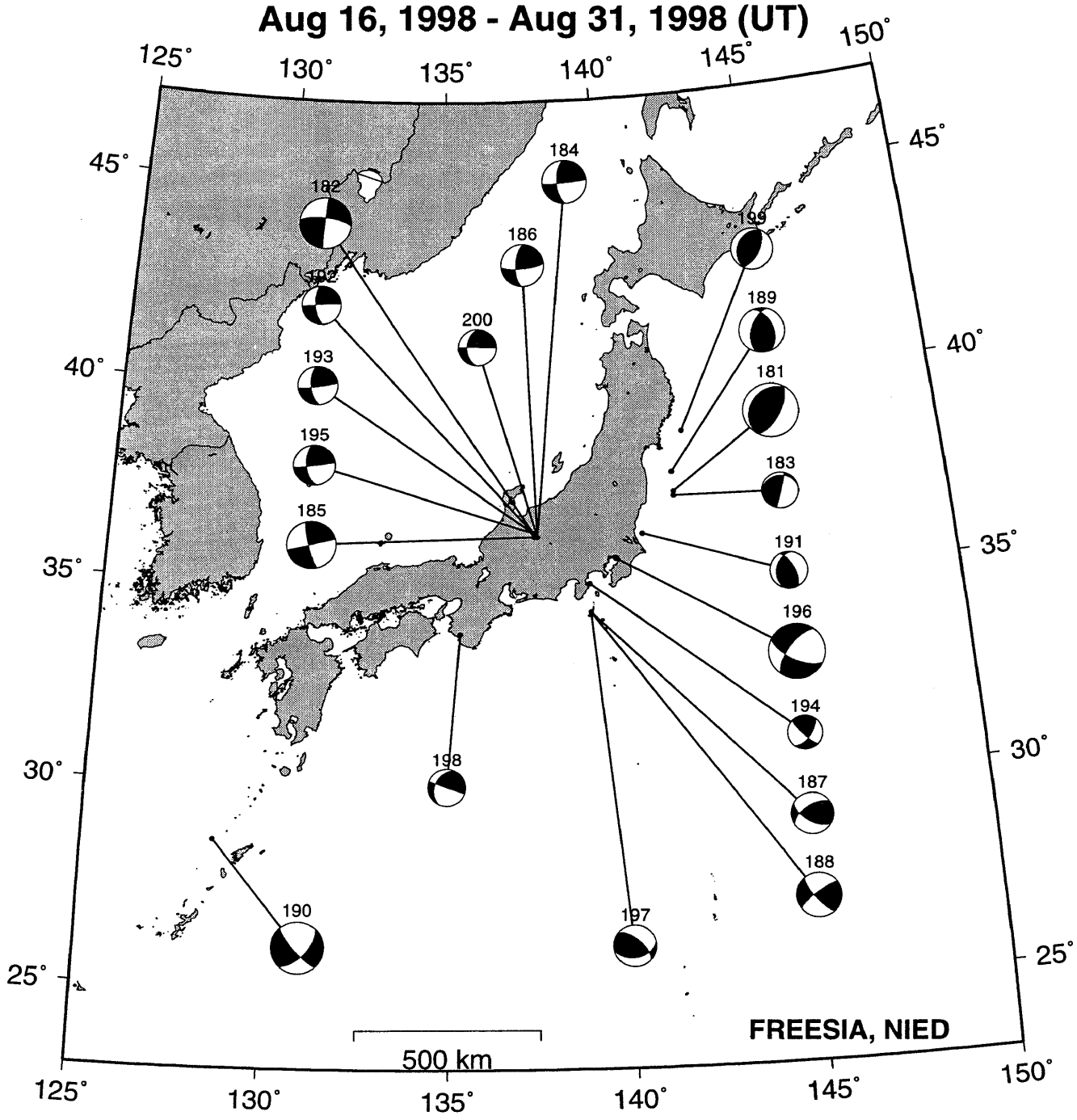

Fig. 2 Estimated focal mechanisms plotted with epicentral locations (continued).

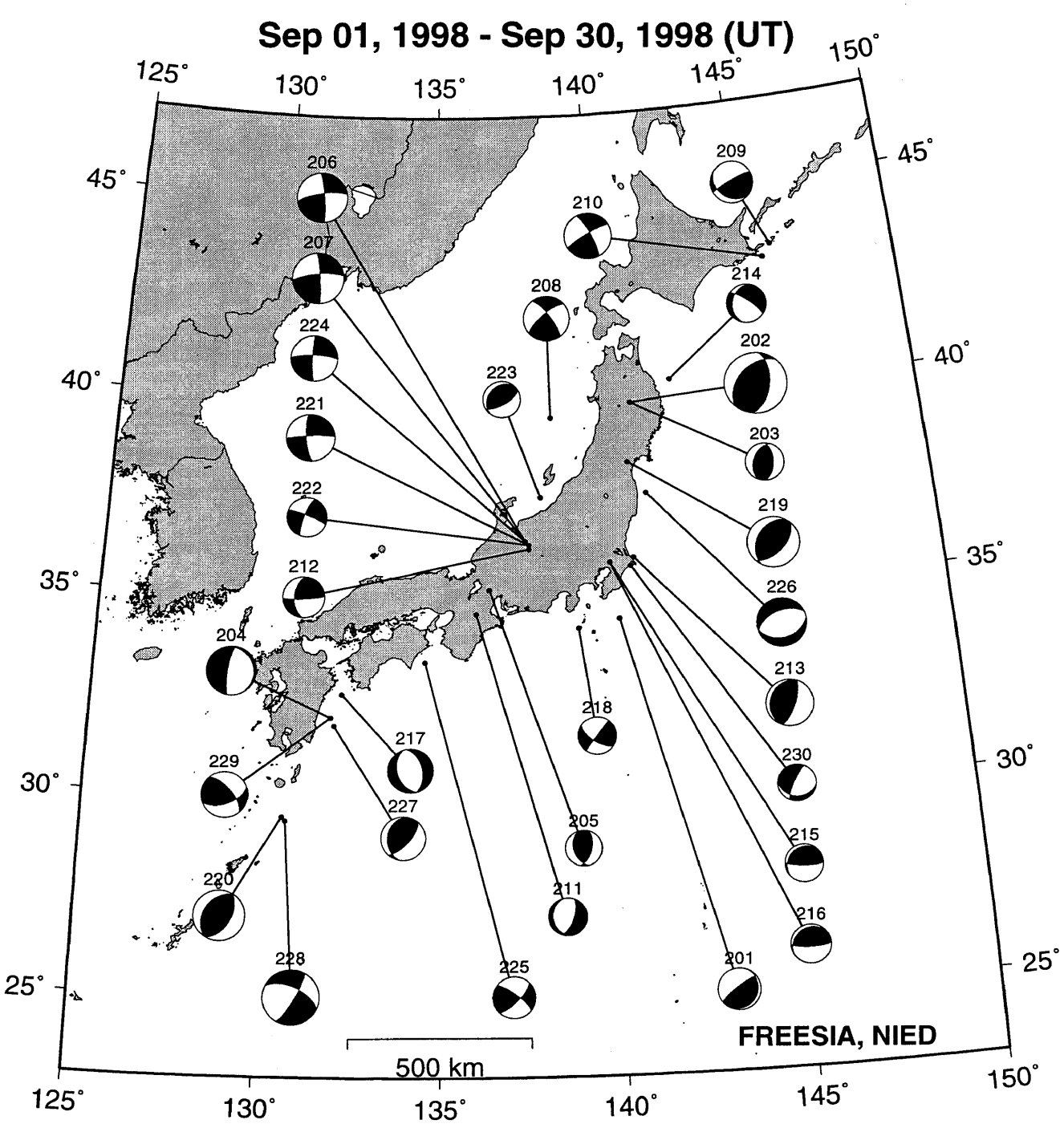

Fig. 2 Estimated focal mechanisms plotted with epicentral locations (continued).

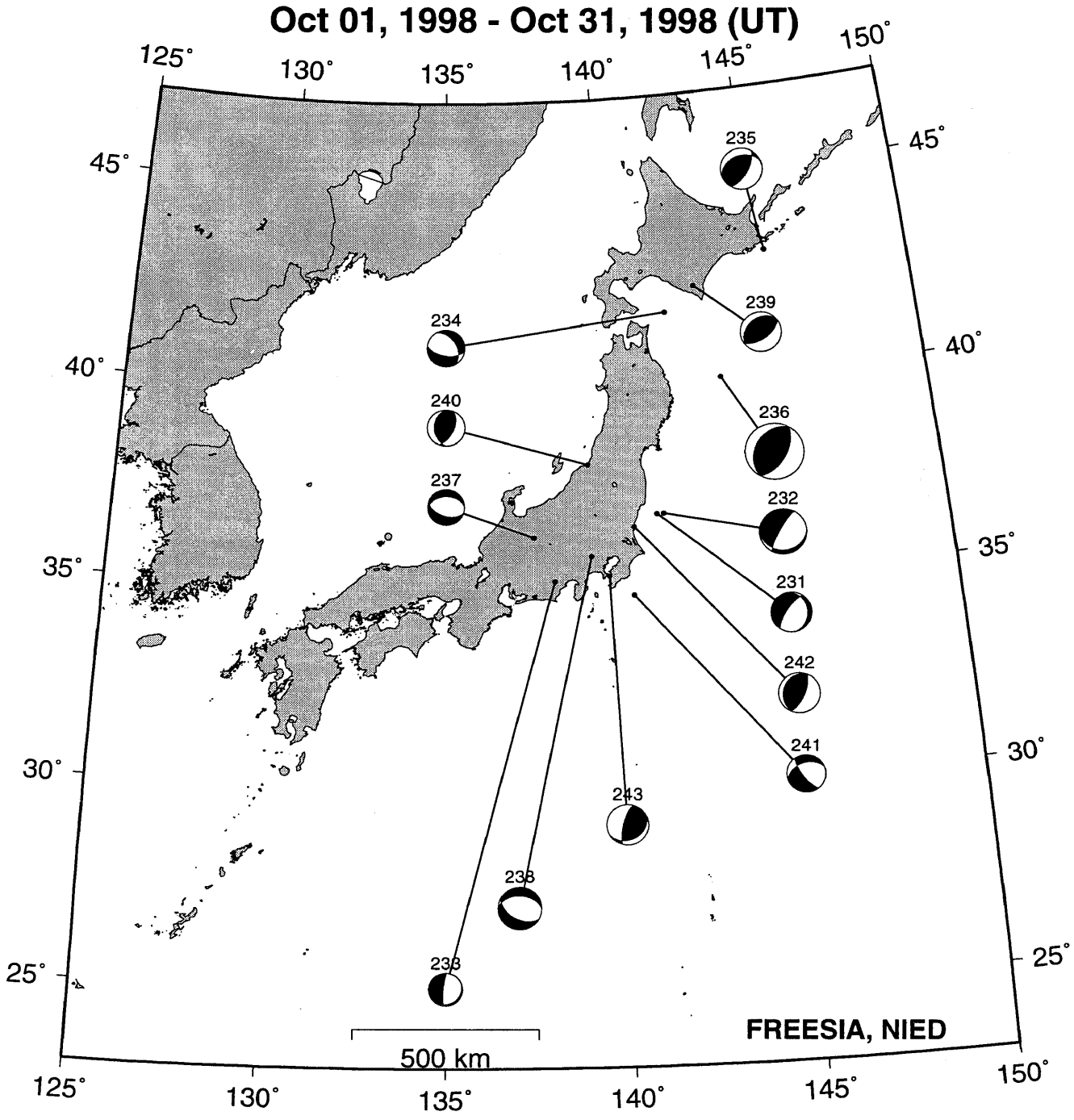

Fig. 2 Estimated focal mechanisms plotted with epicentral locations (continued).

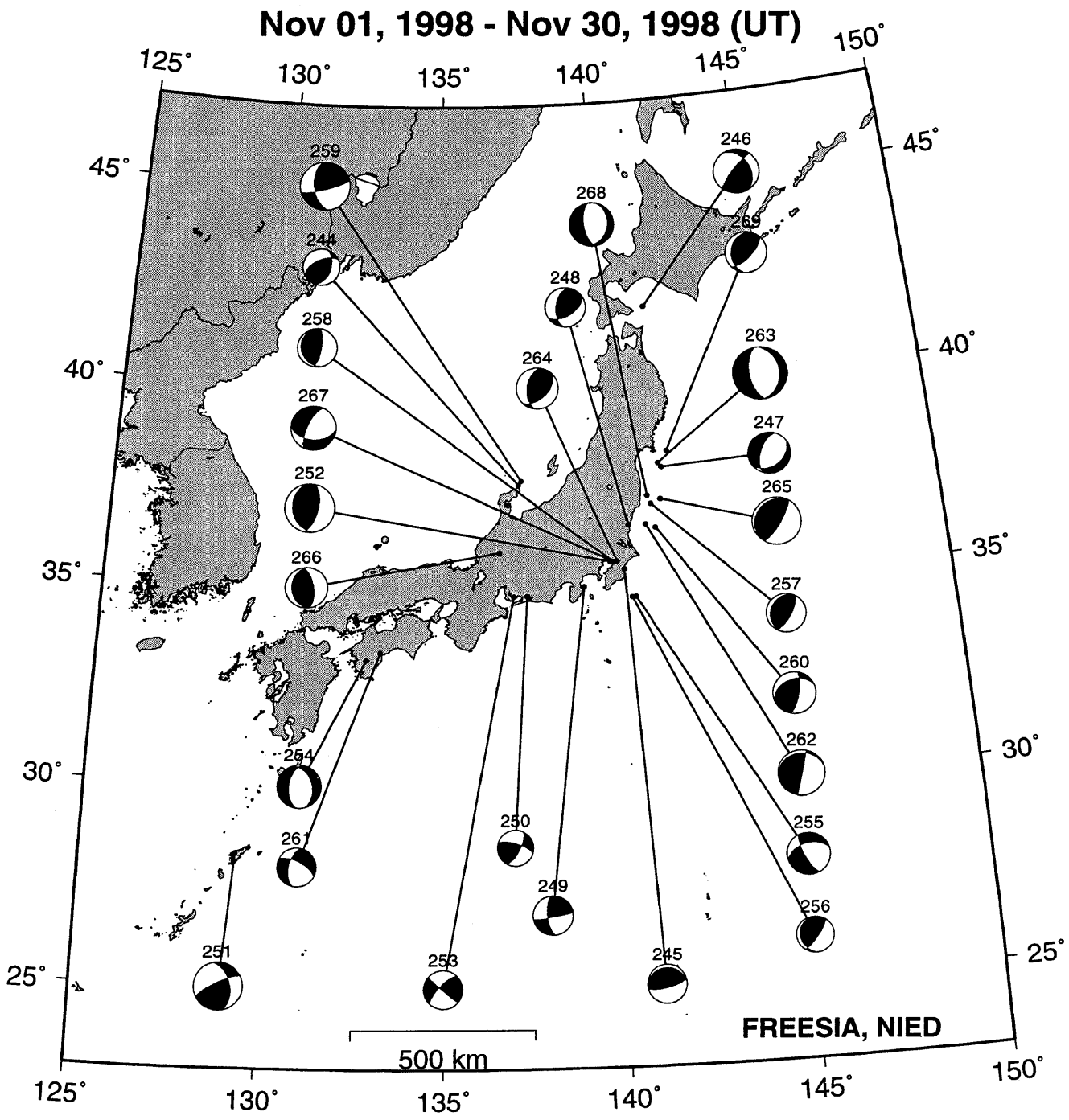

Fig. 2 Estimated focal mechanisms plotted with epicentral locations (continued).

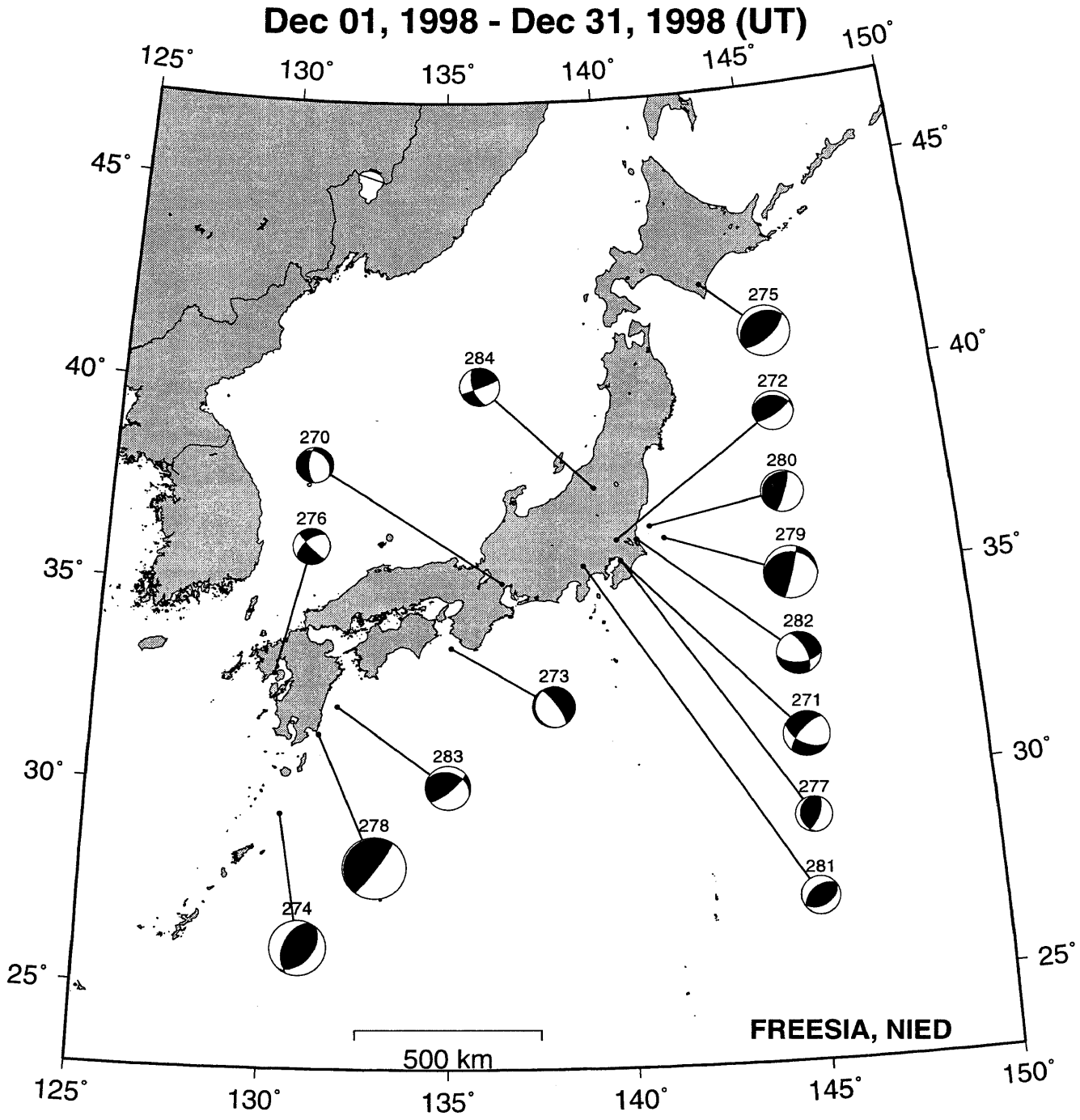

Fig. 2 Estimated focal mechanisms plotted with epicentral locations (continued).

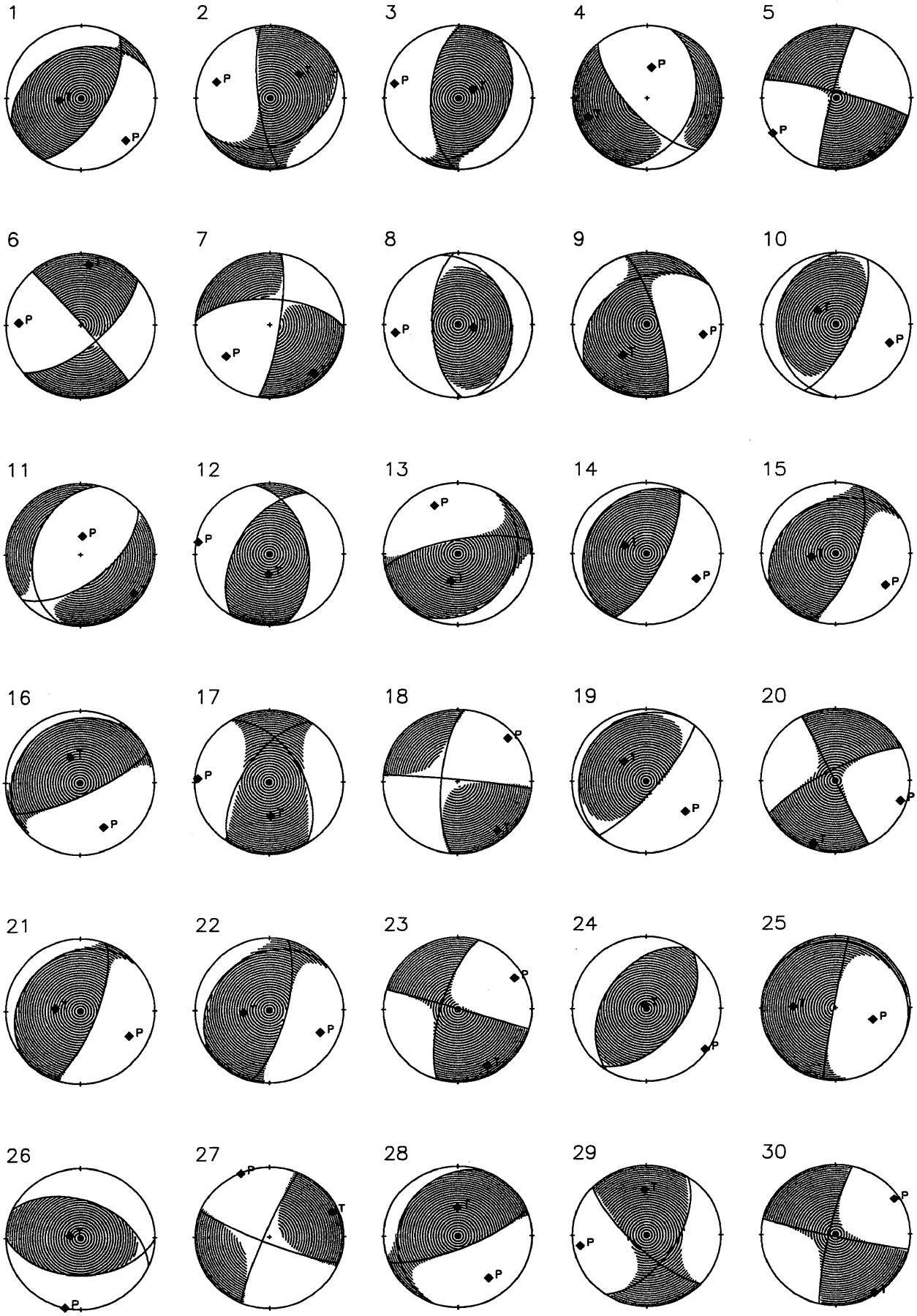

Fig. 3 Estimated moment tensors plotted to the lower hemisphere. P- and T-axes are also plotted.

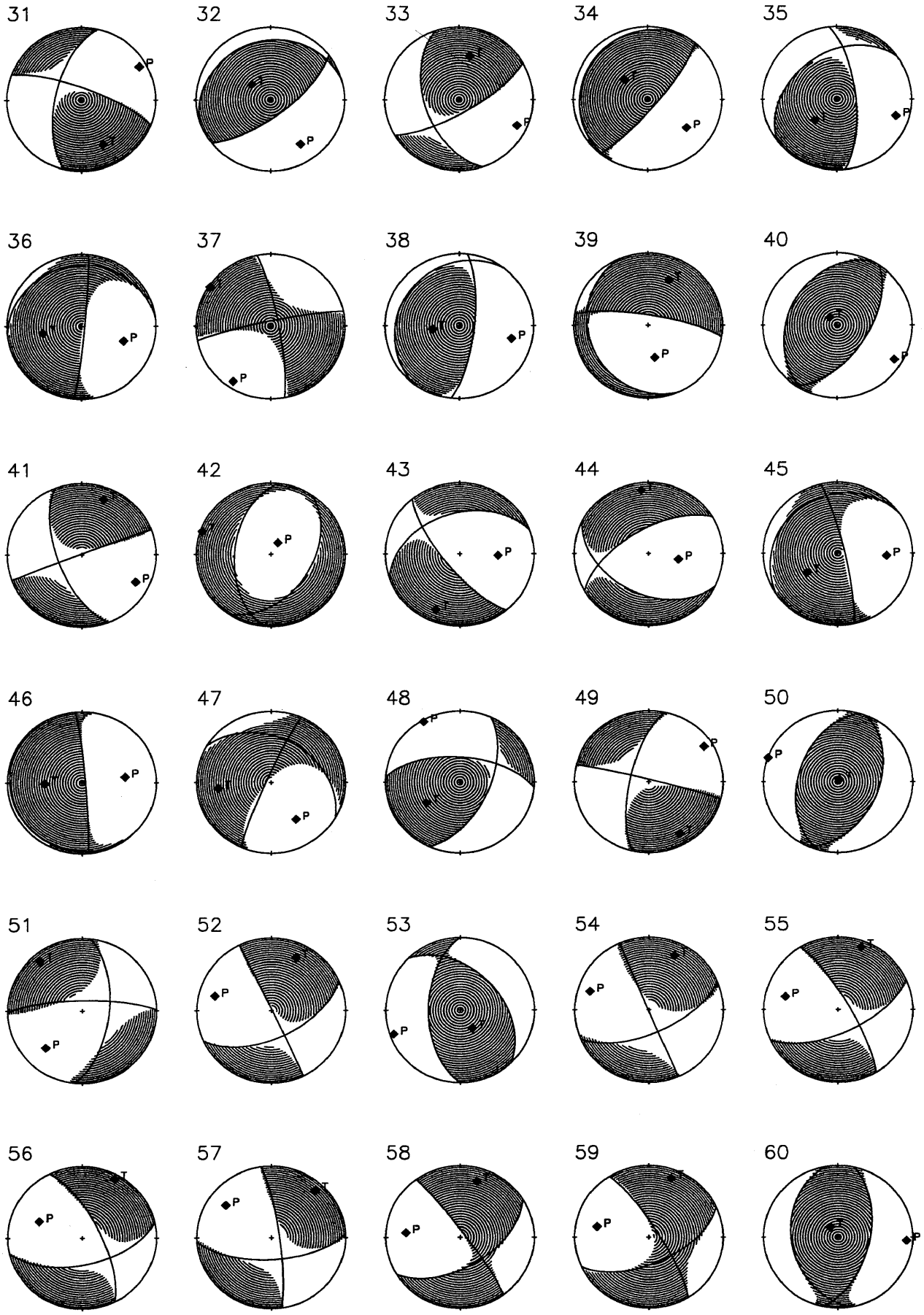

Fig. 3 Estimated moment tensors plotted to the lower hemisphere (continued).

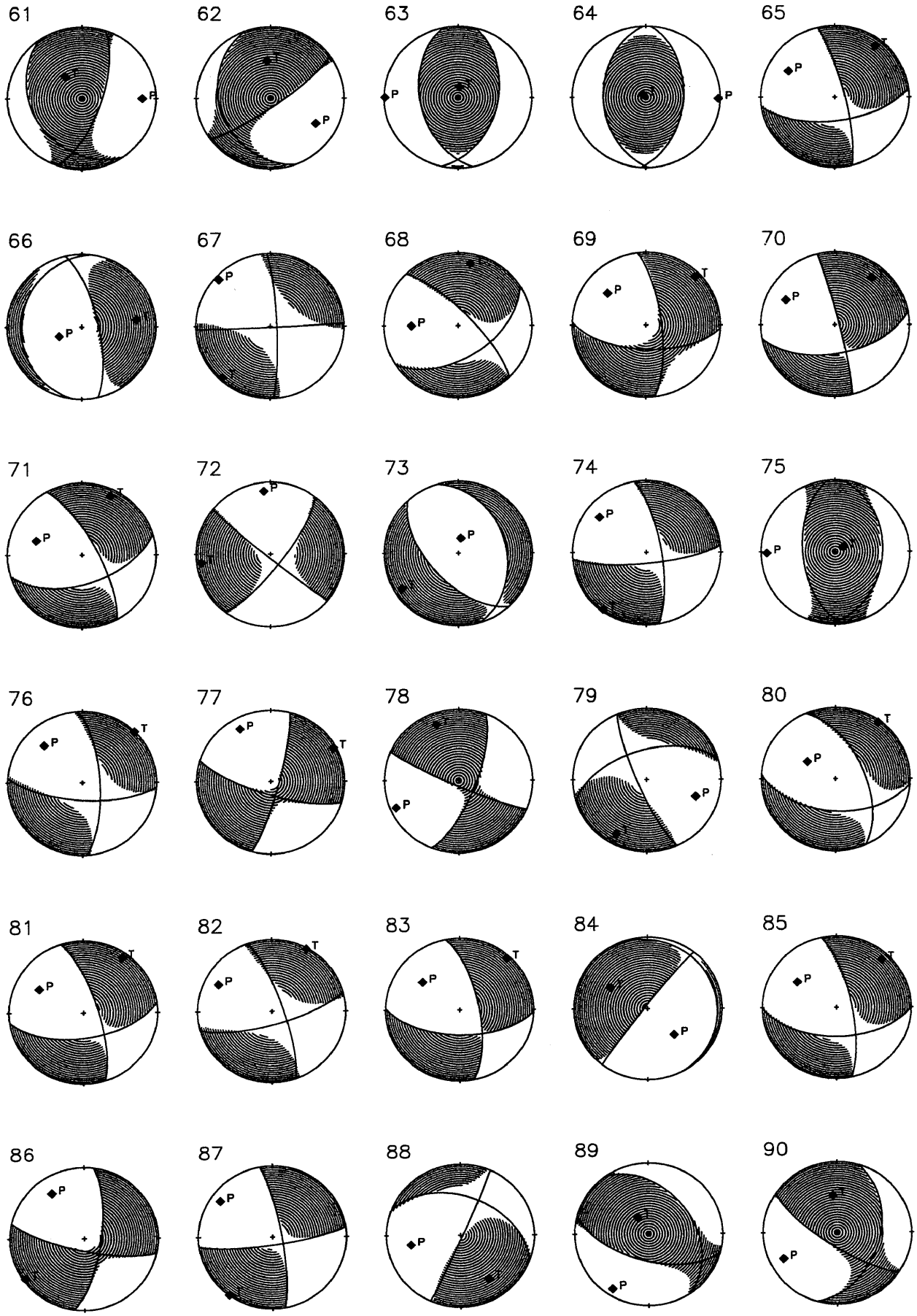

Fig. 3 Estimated moment tensors plotted to the lower hemisphere (continued).

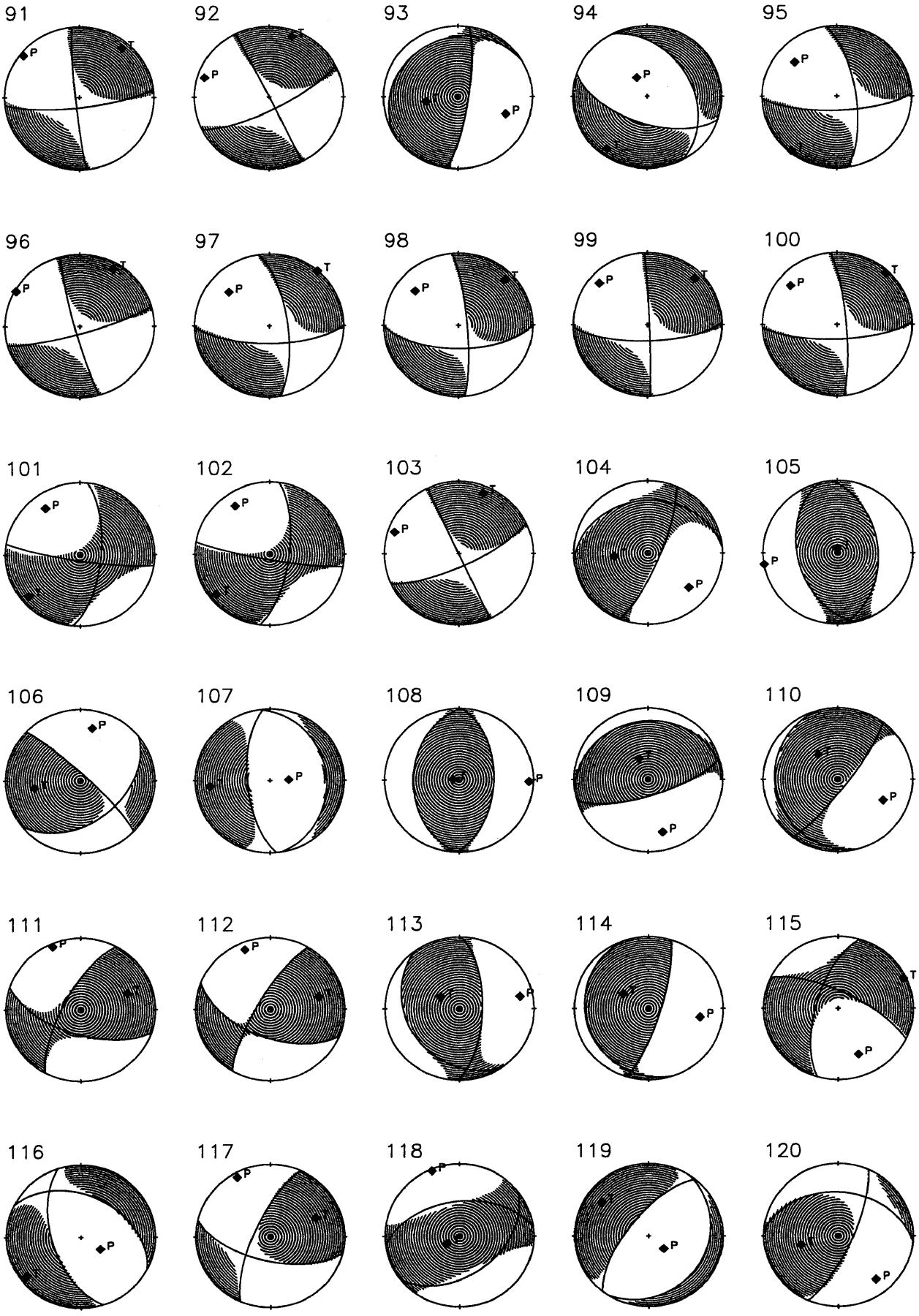

Fig. 3 Estimated moment tensors plotted to the lower hemisphere (continued).

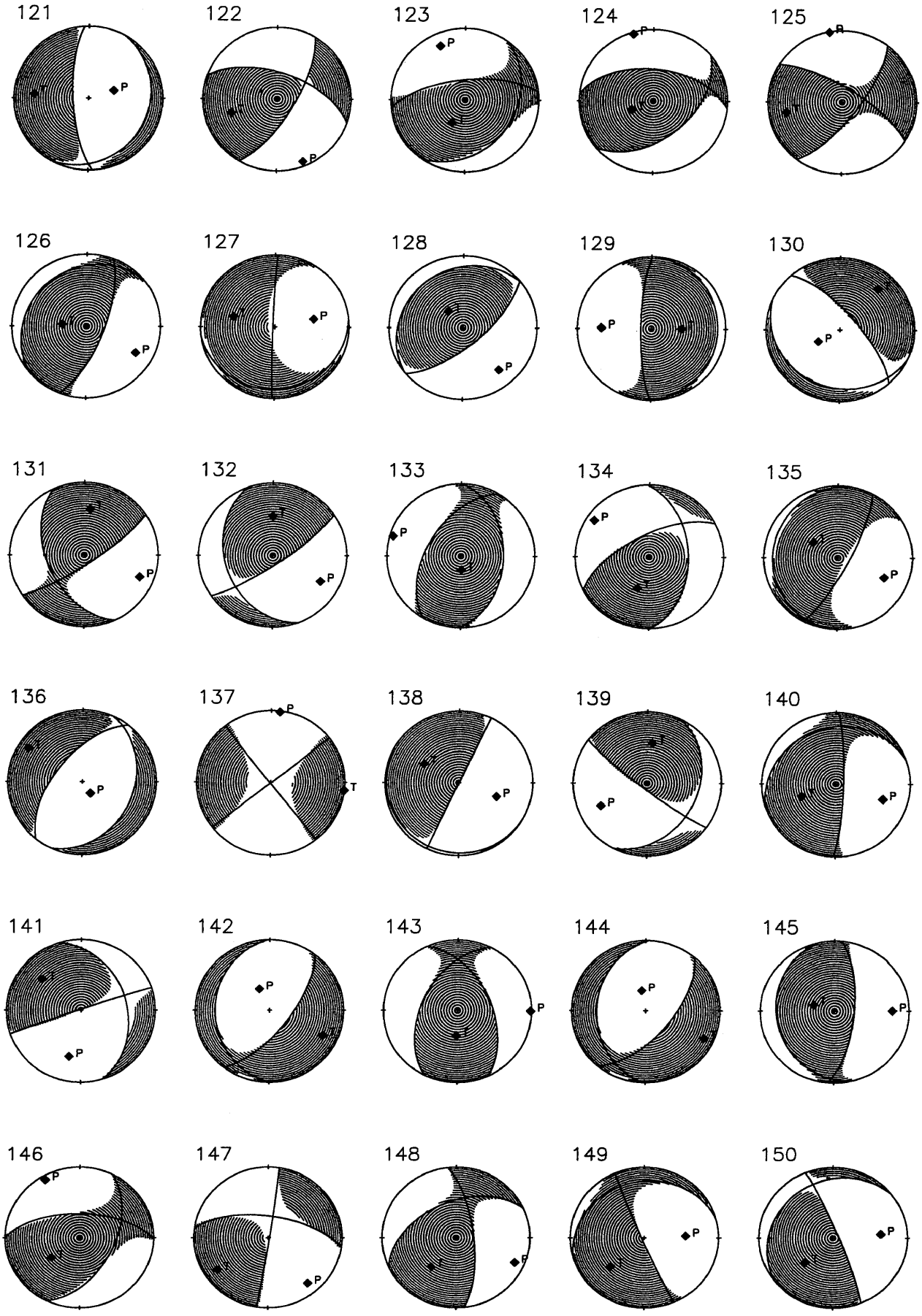

Fig. 3 Estimated moment tensors plotted to the lower hemisphere (continued).

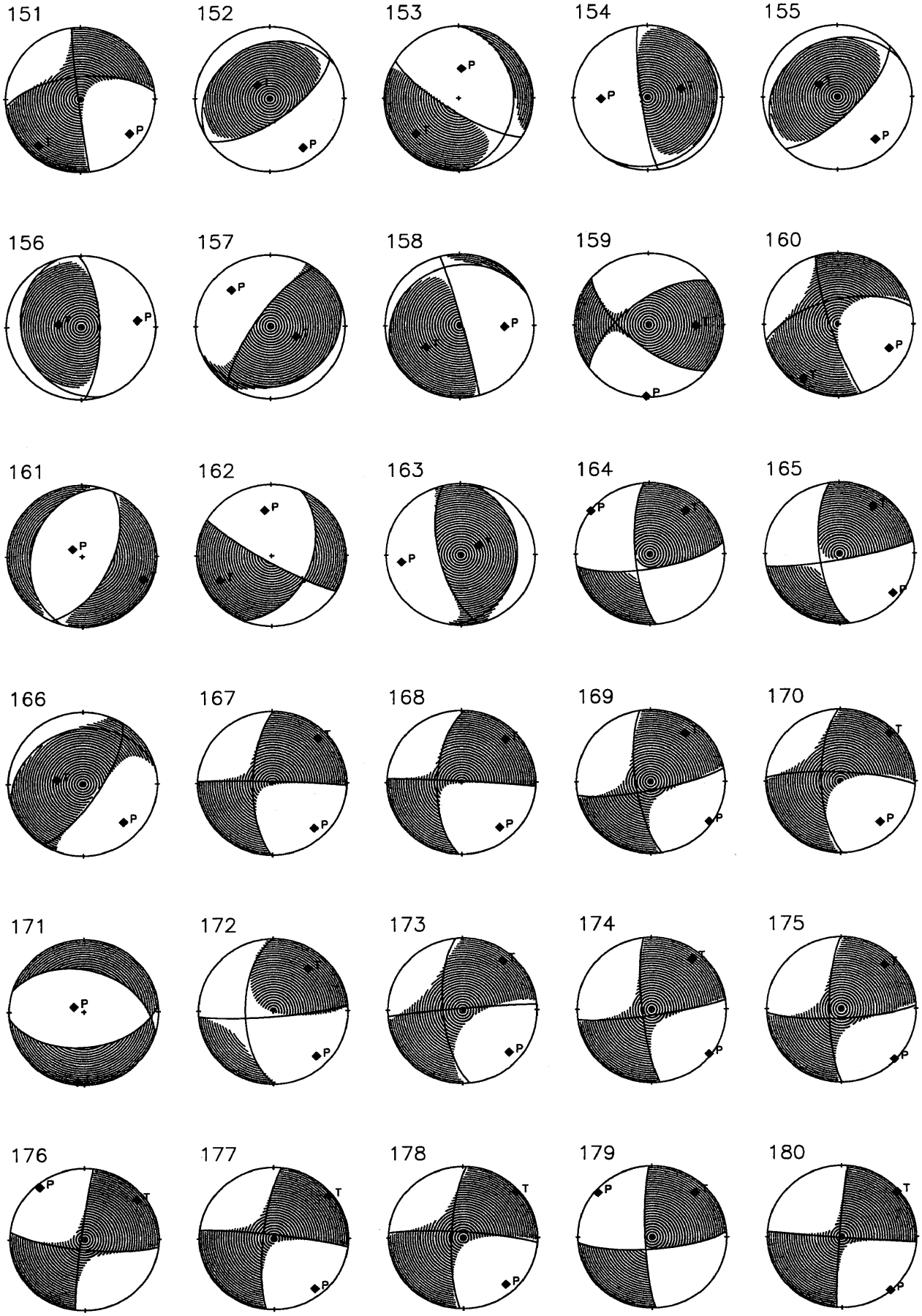

Fig. 3 Estimated moment tensors plotted to the lower hemisphere (continued).

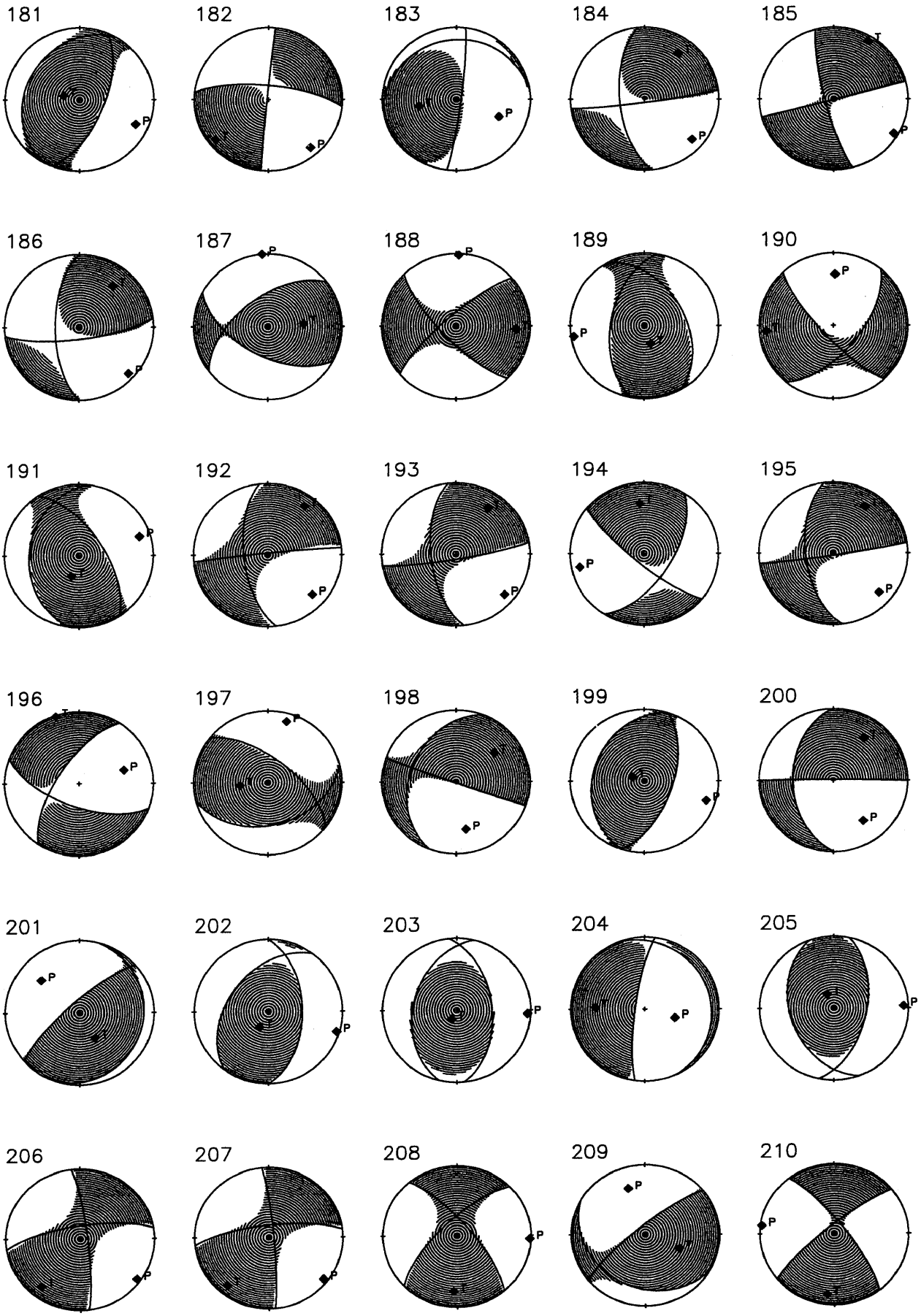

Fig. 3 Estimated moment tensors plotted to the lower hemisphere (continued).

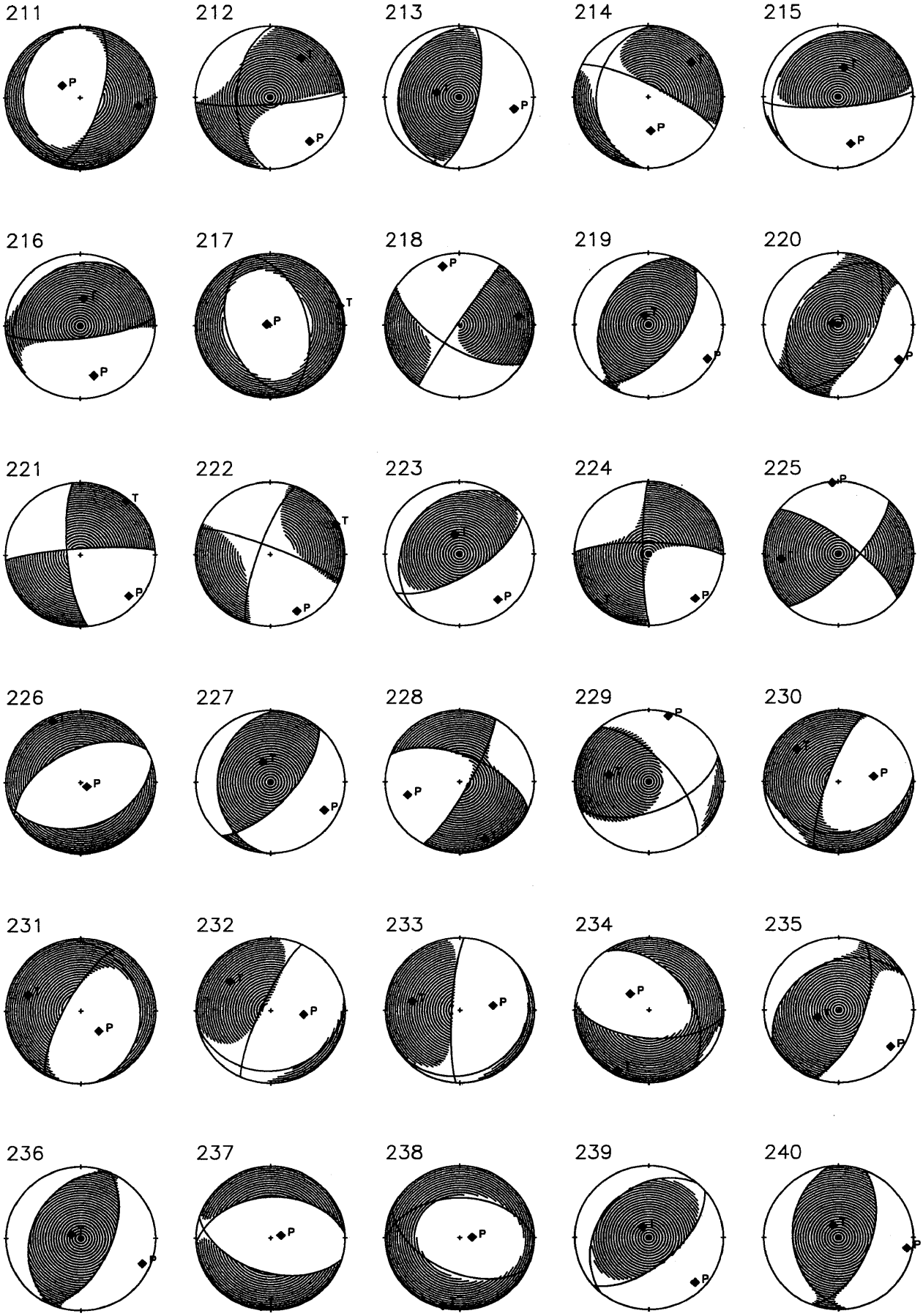

Fig. 3 Estimated moment tensors plotted to the lower hemisphere (continued).

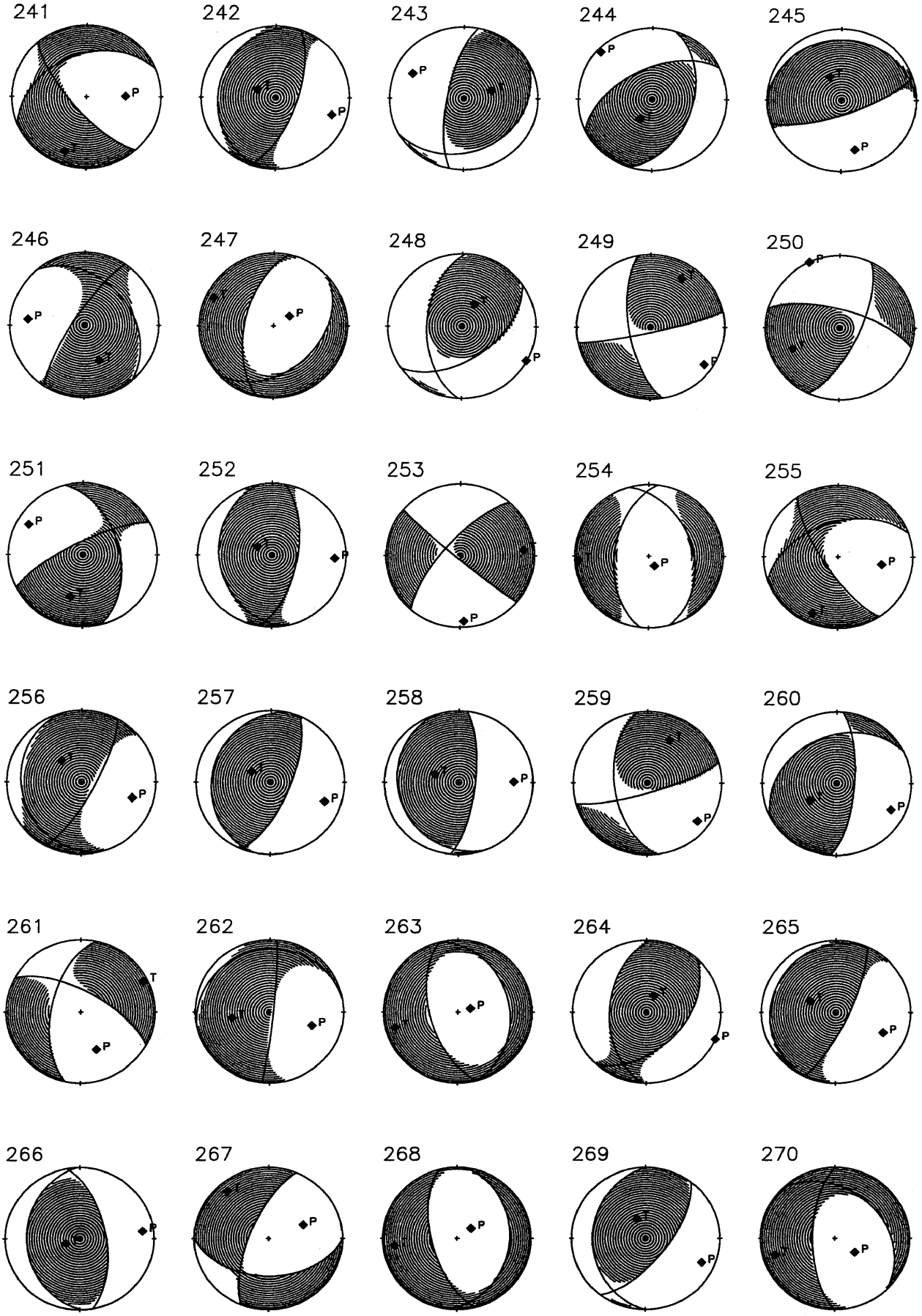

Fig. 3 Estimated moment tensors plotted to the lower hemisphere (continued).

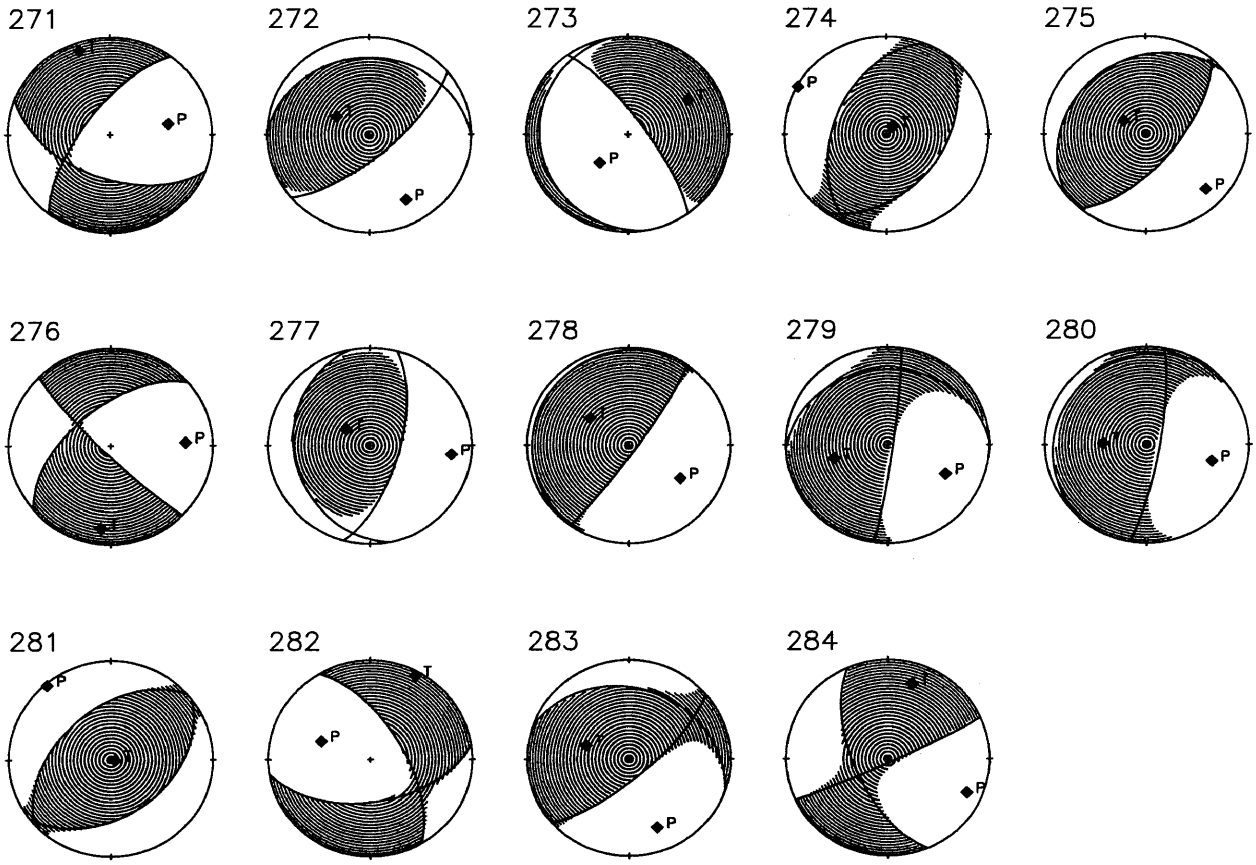

Fig. 3 Estimated moment tensors plotted to the lower hemisphere (continued).