J. Earth Planet. Sci. Nagoya Univ., Vol. 44, 29 to 59, 1997

Himi fault revealed by gravity survey in the west of the Toyama Plain, central Japan

Naoko HAGITA, Mamoru ADACHI and Ryuichi SHICHI

Department of Earth and Planetary Sciences, Graduate School of Science, Nagoya University, Nagoya 464-01, Japan
(Received September 11, 1997 / Accepted October 28, 1997)

ABSTRACT

Six hundred and sixty-two gravity data have been newly obtained from a dense gravity survey in and around the Toyama Plain. The Bouguer anomaly map, drawn from a total of 931 gravity data including the 662 new data, has revealed some prominent underground structures of the Himi and Isurugi faults. Both faults have the same NE direction, nearly the same length of 15—20 km, and a similar steep gravity gradient of about 15 mgal/2 km on the new Bouguer anomaly map. Unlike the Isurugi fault that characterizes the western boundary of the Toyama Plain, the Himi fault shows neither clear topographic lineaments nor large fault zones. Since the Himi fault is covered by Pliocene and Quaternary sediments, it is not an active fault but is likely to have finished its main activity before the Pliocene.

INTRODUCTION

In and around the Toyama Plain, there are several lineaments extending generally from northeast to southwest; for example, the east and west boundary lines between the Toyama Plain and the surrounding hills. These lineaments are regarded as active faults by the Research Group for Active Faults of Japan (1991). Naruse (1985) inferred that the Toyama Plain is a fault basin subsiding on the front of these active faults. Since most parts of the plain are buried under Quaternary sediments, local underground structures related to these faults have been very poorly understood. It is difficult to know the underground structures by geological methods alone, and we therefore carried out a dense gravity survey in a limited area (Lat. 36°35′—37°00′N, Long. 136°45′—137°05′E). In the surveyed area there is the Isurugi fault that forms a clear lineament as the west boundary line of the Toyama Plain (Figs. 1 and 2).

A gravity survey around Toyama Prefecture has been carried out by several researchers (e.g. Kono et al., 1982). Takeuchi and Kono (1992) considered that the Bouguer anomaly mapped by these gravity data shows patterns that correspond to the northeast-southwest faults. However, since the density of their gravity measurement stations is only 1 station in 9 km^2 on the average, it is insufficient to analyze local tectonic features in detail. Thus we carried out a much denser gravity survey with an average density of 1 station in 1 km^2.

The new Bouguer anomaly map from our data shows several remarkable features on the local underground structures of the study area. In this paper, we present the new Bouguer anomaly map and discuss the underground structures related to faults in and around the study area. Hagita et al. (1997) previously reported about part of the results of this gravity survey.

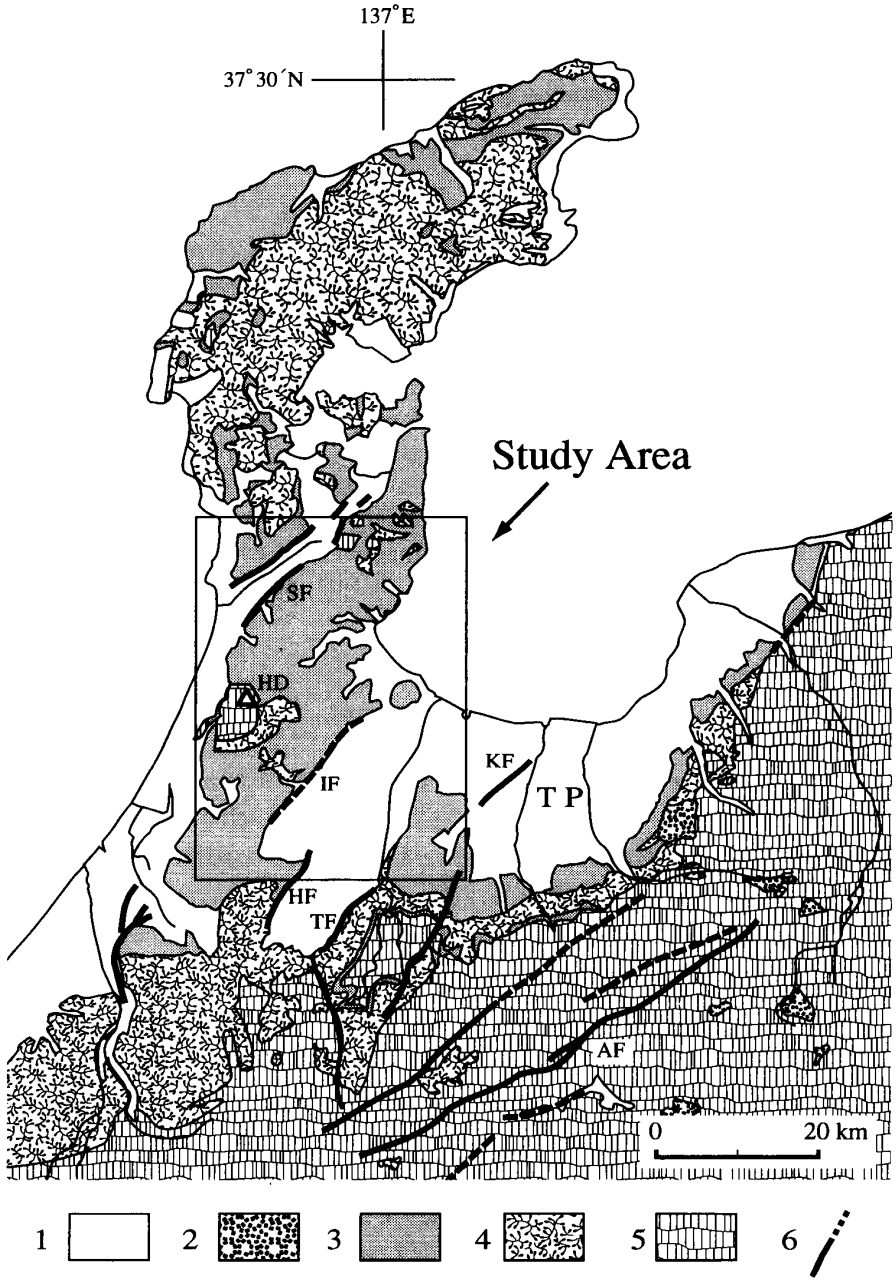


Fig. 1. Simplified geological map around the study area and the Toyama Plain (after Kato and Sugiyama, 1985). 1, Quaternary sediments; 2, Quaternary volcanic rocks; 3, Neogene sedimentary rocks; 4, Neogene volcanic rocks; 5, Pre-Neogene rocks (Permian Hida metamorphic complex, Jurassic Funatsu Granite, Jurassic-Cretaceous Tetori Group, Cretaceous rhyolite and so on); 6, Active faults; SF, Sekidosan fault; IF, Isurugi fault; KF, Kurehayama fault; HF, Horinji fault; TF, Takashozu fault; AF, Atotsugawa fault; TP, Toyama Plain; HD, Mt. Hodatsu-san.

GEOLOGICAL SETTING

The Toyama Plain is situated to the north of the Japan Alps, one of the highest mountainous districts in the Japanese Islands. Alluvial fan deposits from the steep mountains extensively cover the Toyama Plain. The simplified geological map of the study area and surroundings is shown in Fig. 1. Figure 2 is the Landsat imagery that shows the general topographic features of the study area and surroundings. The study area is underlain by topographically low plains of Quaternary sediments and 200—500 m high hills of Neogene sediments. Mt. Hodatsu-san, in the west of the study area, is composed of the Permian Hida metamorphic complex, the oldest basement rocks of this region.

There are many northeast-southwest faults that form lineaments in and around the study area: the Isurugi fault, the Kurehayama fault, the Sekidosan fault, the Horinji fault and the Takashozu fault (Figs. 1 and 2). The Research

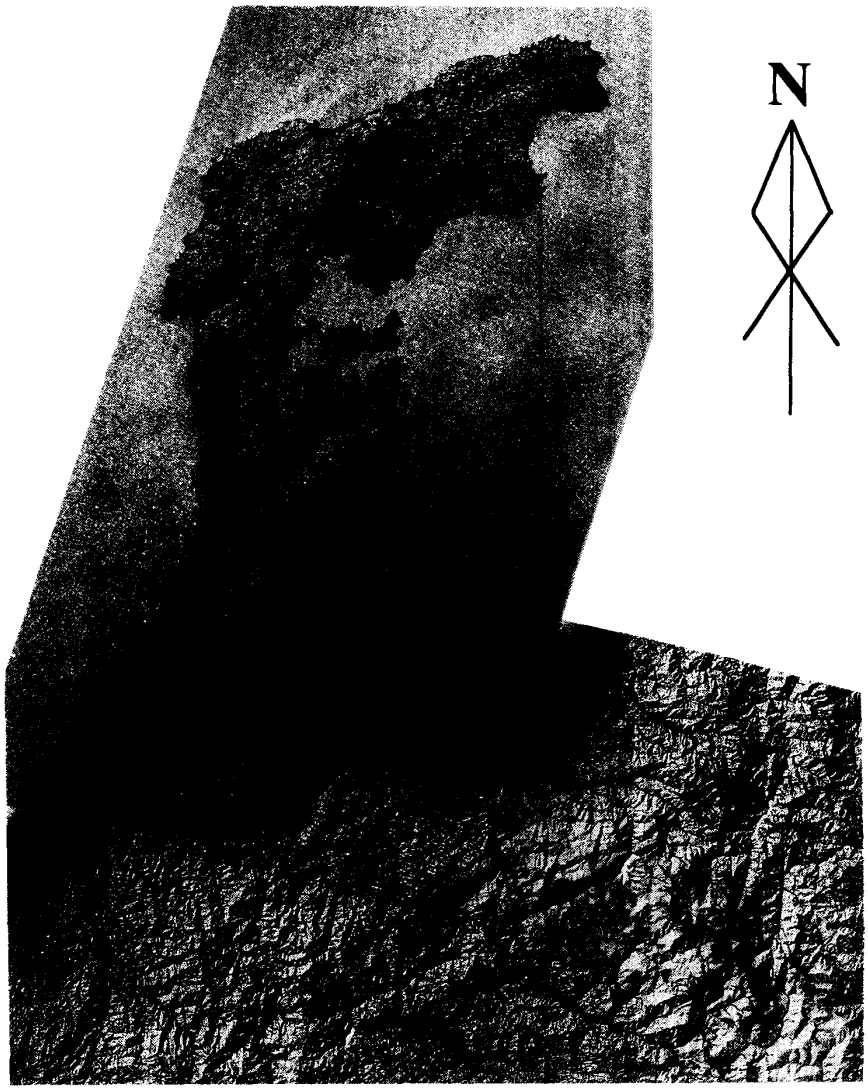


Fig. 2. Landsat imagery around the Toyama Plain (center); the Toyama Plain is clearly bounded by NE-SW lineaments.

Group for Active Faults of Japan (1991) regarded these faults as active faults. The main structures of the Toyama Plain were formed through the activity of these faults, beginning approximately 0.5 Ma ago, in the so-called "Isurugi movement" (Kaseno et al., 1972).

The Isurugi fault, exhibiting a clear lineament as the western boundary line of the Toyama Plain, forms the boundary between Pliocene and Quaternary sediments (Plate 1, Figs. 5 and 6). The fault is generally considered to be about 20 km long (Takemura, 1983), and its vertical displacement is estimated to be over 120 m (Research Group for Active Faults of Japan, 1991).

GRAVITY MEASUREMENT AND DATA PROCESSING

Gravity measurements were done with two LaCoste & Romberg gravimeters, G-783 and G-947, in October and November in 1996 and May in 1997. In total, 662 new gravity stations were established over an area that ranges 36°35′—37°00′N in latitude and 136°45′—137°05′E in longitude. Five of the new measurements were made on the bench marks and the triangulation stations installed by the Geographical Survey Institute (GSI). Five hundred and ninety-two measurements were made at spot heights on 1 : 25,000 scale topographic maps of GSI or 1 : 10,000 scale topographic maps of local city and town offices. The other 65 measurements were made at points where the elevation heights were estimated from the contours with a 10 m interval on topographic maps of GSI. The geographical latitude and longitude of each station were read on a map with a precision of 0.01′ (~ 20 m) by an X-Y reader.

In addition to our new 662 stations, the study area contains 269 stations established by the other institutions (56 by GSI and 213 by the Geological Survey of Japan, GSJ).

The gravity survey was carried out by a "closed loop method". The first and final measurements during a day were made at the same station. If the two measurements agreed within a certain allowance, the loop was regarded as being closed. For the base station of the survey, we used the first order gravity station at Nagoya University ($\phi = 35°09.10'$N, $\lambda = 136°58.31'$E, $h = 46.2$ m, $g = 979{,}732.585$ mgal) in the Japan Gravity Standardization Net 1975 (JGSN 75) (GSI, 1976). This gravity value is a revised one derived from calibration of Nakagawa et al. (1983). Because the study area is far from this base station, we set up two sub-base stations in this area, each of which was linked directly to the base station. A closed loop was successively linked to the preceding one, the first and final loops being linked to the base station. The accuracy of measurement depends on wrong location of a given spot height, uncertainty involved in drift rate estimation, instrumental "tare" which causes a sudden change in spring length, and so on (Yamamoto et al., 1982). The measured gravity values are estimated to have an accuracy of ± 0.2 mgal.

The measured values were corrected for tidal variations and the drift rate of the gravimeters. The terrain and Bouguer correction were computed assuming an average crustal density of 2.67 g/cm^3. For these corrections we

applied the method of Yamamoto et al. (1982). The gravity values, terrain corrections and Bouguer anomalies obtained from this survey are listed in the Appendix.

RESULTS

A Bouguer anomaly map with a 0.5 mgal contour interval was obtained from a total of 931 gravity data (Figs. 3 and 4). Generally, the Bouguer anomaly in the southeastern part of the study area shows a low and gentle distribution, while that in the northwestern part is high and rugged. The southeastern low anomaly zone is explained by Quaternary sediments in the Toyama Plain. The northwestern high anomaly zone around Mt. Hodatsu-san is explained by the presence of the Hida metamorphic complex of late Paleozoic age (Fig. 5). Our Bouguer anomaly map shows much finer patterns than the previous maps (e.g. Kono, 1983) because of much denser measurement.

The most prominent features of the new Bouguer anomaly map are two parallel steep gradient belts extending from northeast to southwest in the middle of the study area. Both belts are about 15 km long and 2 km wide, and have a gravity gradient of about 7.5 mgal/km; Bouguer anomaly values change sharply along these belts. This suggests that a fault having a large vertical displacement exists under each belt. The southwestern steep gradient belt corresponds to the Isurugi fault. On the other hand, no faults corresponding to the northeastern belt have been reported. This Himi fault (Hagita et al., 1997) is expected to extend from the coastline to the southwestern mountainous areas of Himi City (Fig. 5). However, it is topographically unclear and appears to be much different from the Isurugi fault, as discussed below.

DISCUSSION AND CONCLUDING REMARKS

1. Comparison between the Himi fault and the Isurugi fault

As stated in the previous chapter, the Himi and Isurugi faults have nearly the same NE trend, length and steep gravity gradient. However, the Himi fault is different from the Isurugi fault in expression on the topography and geology. While the Isurugi fault forms a clear lineament, is considered to be an active fault, and corresponds to the boundary line between Pliocene and Quaternary sediments, the Himi fault is completely buried beneath hills composed mainly of Pliocene sediments; neither fault-related topography nor lineaments can be seen around it apart from the coastline in Himi City (Figs. 5, 6 and Plate 1). This strongly suggests that the Himi fault has not been active since the hills were formed.

Only a few small-scale normal faults (Plate 2) are seen in the Pliocene sediments around the Himi fault. These minor faults do not have a certain direction, their displacements are normally less than 50 cm, and their fault gouges or fault breccias, if any, are less than 30 cm wide. These minor faults are too

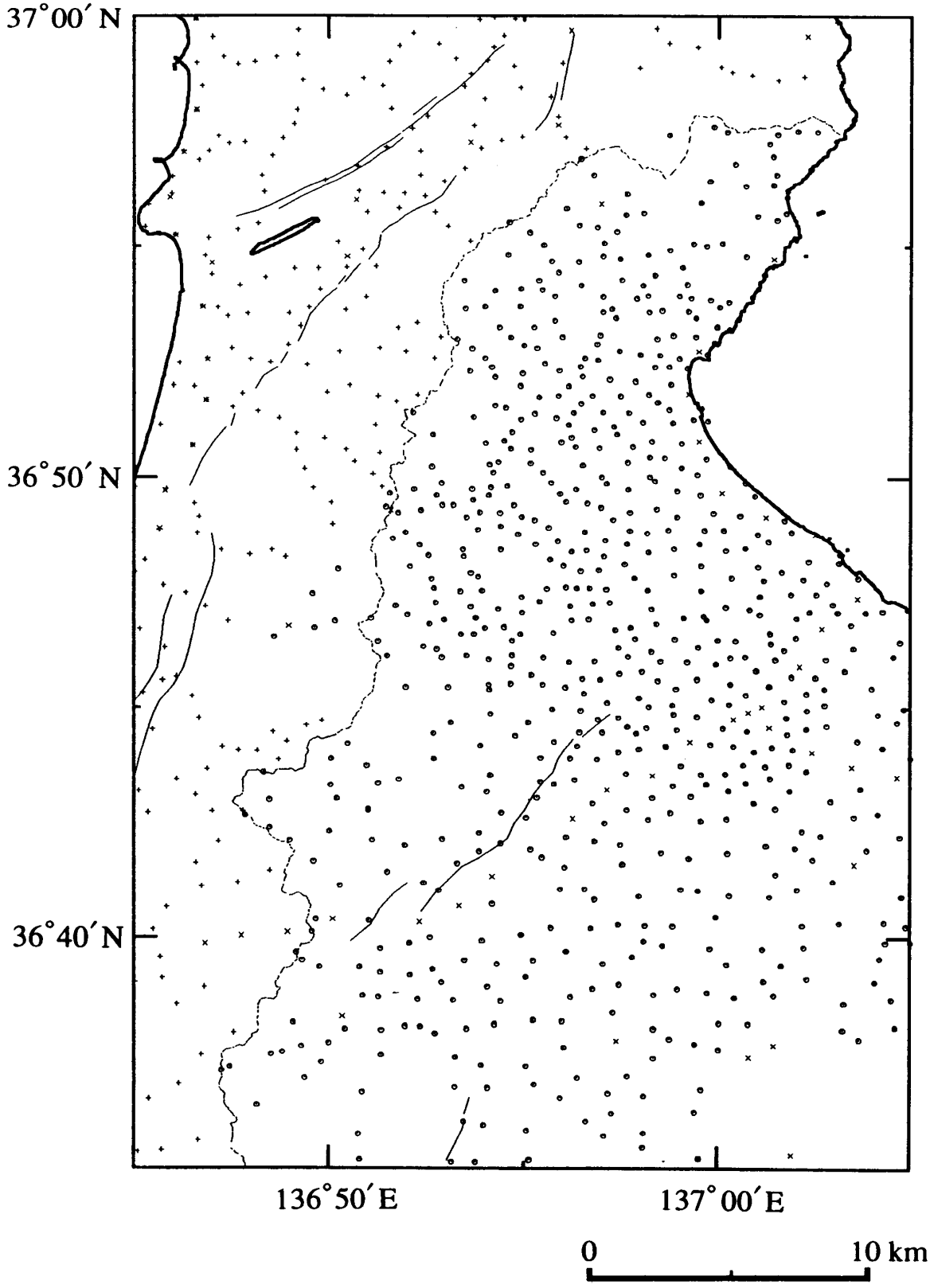


Fig. 3. Locations of gravity stations. Symbols are: ○=newly established stations; ×=stations of the Geographical Survey Institute (GSI); +=stations of the Geological Survey of Japan (GSJ).

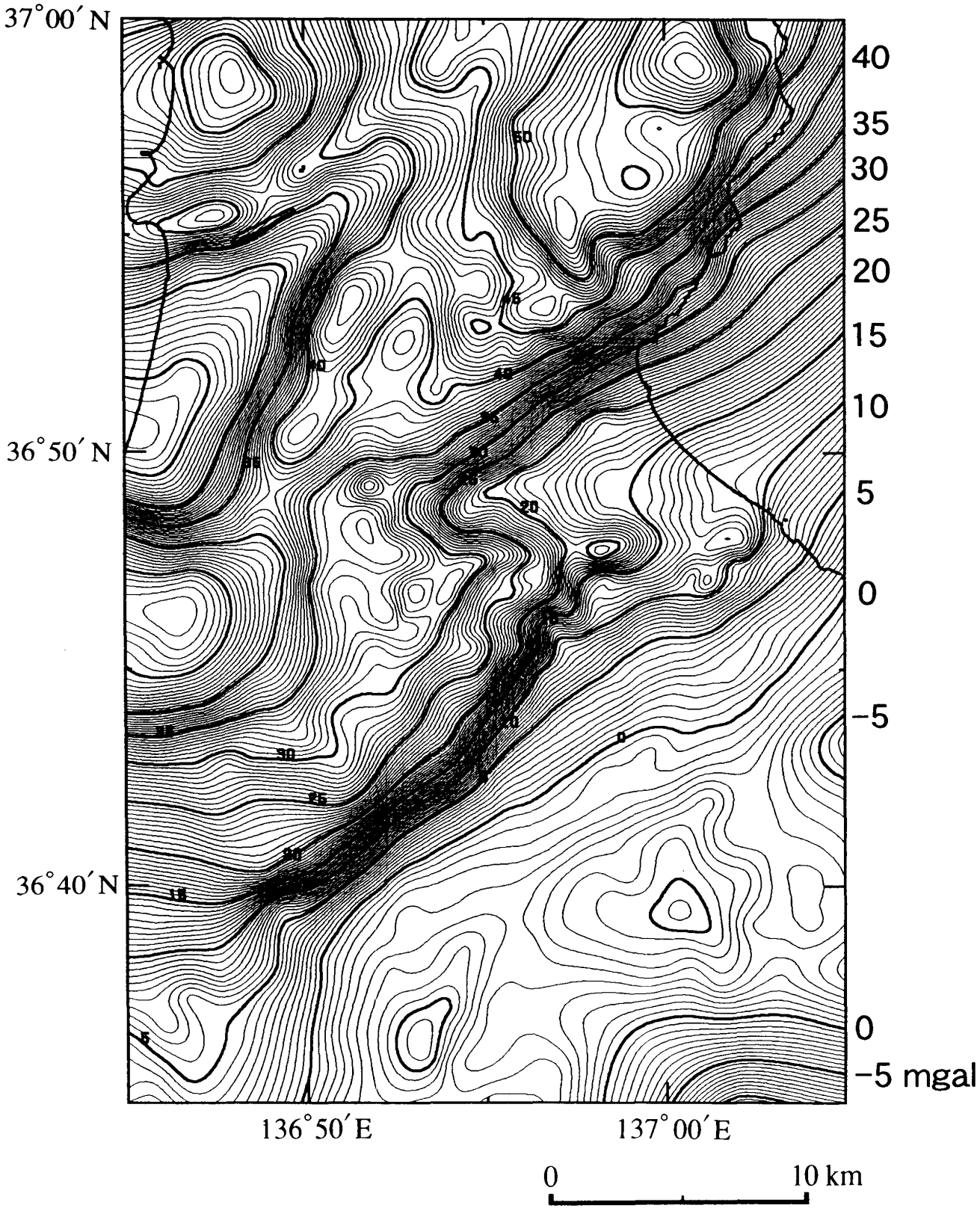


Fig. 4. A new Bouguer anomaly map with a 0.5 mgal contour interval obtained from this study. Thick contour lines are drawn at an interval of 5 mgal.

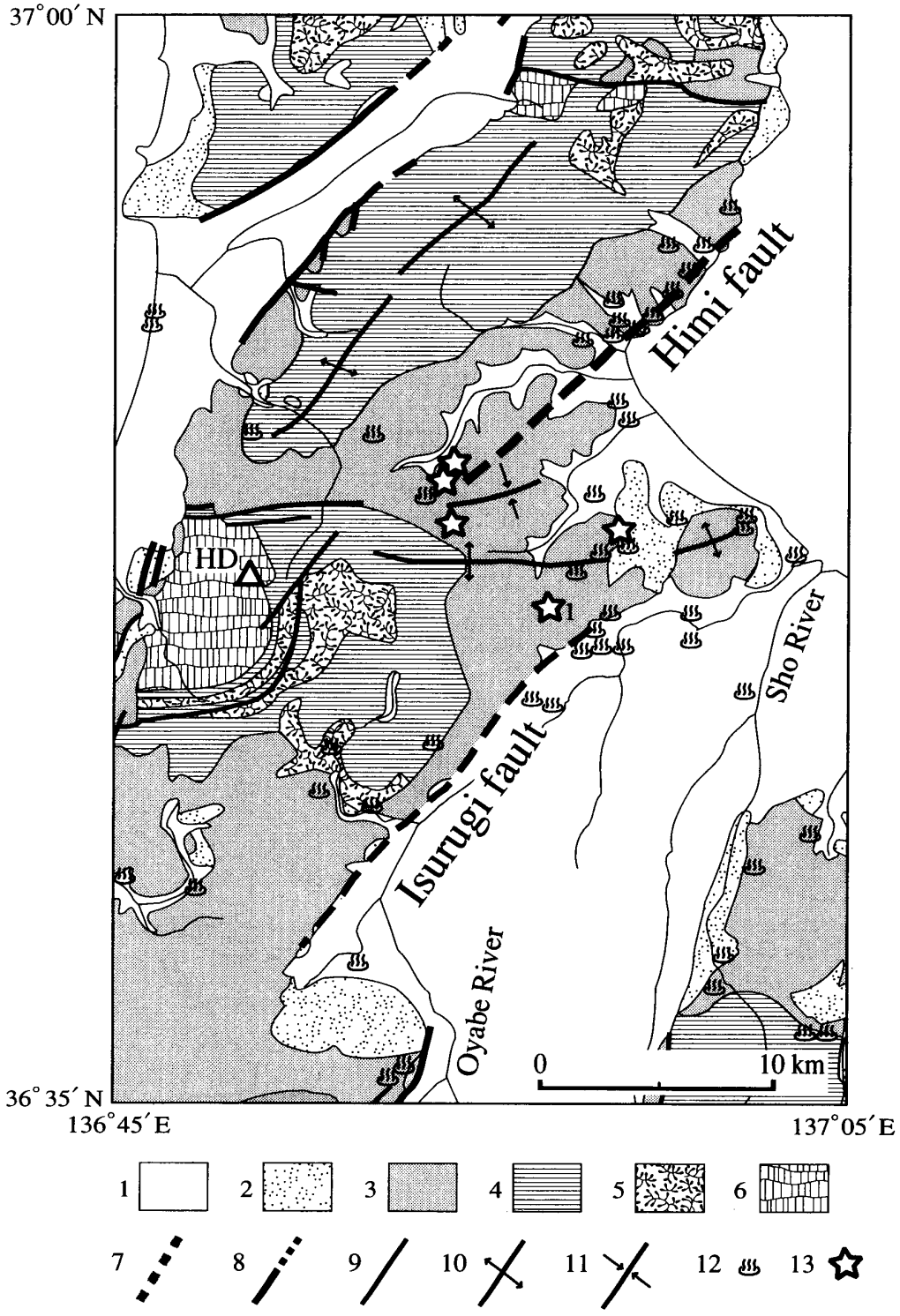


Fig. 5. Geological map of the study area modified from Kato and Sugiyama (1985). 1, Holocene; 2, Middle to Uppermost Pleistocene terrace deposits; 3, Upper Miocene to Lower Pleistocene sedimentary rocks; 4, Lower to Middle Miocene sedimentary rocks; 5, Lower to Middle Miocene volcanic rocks; 6, Hida metamorphic complex; 7, Himi fault; 8, Active fault (broken where inferred); 9, Fault in the Neogene and Lower Pleistocene (broken where concealed); 10, Anticlinal axis; 11, Synclinal axis; 12, Hot spring or mineral spring (data from Mizutani (1992) and 1 : 25,000 scale topographic maps of GSI); 13, Location of small-scale fault (fault outcrops at Location 1 are shown in Plate 2); HD, Mt. Hodatsu-san.

Fig. 6. Landsat imagery of the study area.

small to account for the steep gradient on the Bouguer anomaly map and are probably unrelated to the Himi fault.

There are several hot springs and mineral springs on and around the Himi fault (Fig. 5), suggesting that an aquifer related to this underground fault exists around it.

It is concluded that the Himi fault is not an active fault and had finished its main activity before the Pliocene sediments were laid down.

2. Tectonic relation of the Himi fault and the Isurugi fault

From the Bouguer anomaly map, we can infer that the Himi and Isurugi faults were once one continuous long fault over 40 km and were offset by an E-W or NW-SE fault. However, the timing of activity of the two faults is totally different. The Himi fault was active before the Pliocene and the Isurugi fault has been active in the Quaternary. Thus it is unlikely that the two faults were originally one big fault. Rather, we consider that these faults were two separate faults arranged en echelon from the beginning and experienced a different history.

Anyway, the Himi and Isurugi faults may have formed under the same stress field, and resulted in having nearly the same direction and size. Both these faults are important as to the late Tertiary-Quaternary tectonic evolution of the Toyama Plain and its surrounding areas in the circum-Japan Sea region.

ACKNOWLEDGEMENTS

We are deeply grateful to staffs and students of the Department of Earth and Planetary Sciences, Nagoya University, particularly to those of the Planetary Geology and Geophysics laboratories for helpful comments. We express our sincere thanks to GSI and GSJ for their approvals to utilize their unpublished data. Numerical calibrations were carried out by FACOM computation system at Nagoya University Computation Center (No. A40442B). We thank Himi, Takaoka, Shinminato, Oyabe and Tonami city offices for providing 1 : 10,000 scale topographic maps.

REFERENCES

Geographical Survey Institute (1976) Establishment of the Japan Gravity Standardization Net 1975. *J. Geod. Soc. Japan*, **22**, 65–76.

Hagita, N., Adachi, M. and Shichi, R. (1997) The Himi fault in northwestern Toyama Prefecture revealed by Bouguer anomaly. *Abst. 104th Ann. Meet. Geol. Soc. Japan*, 176.

Kaseno, Y., Miura, S. and Fujii, S. (1972) On the formation processes of the coastal plains of Hokuriku region, Japan. *Mem. Jour. Geol. Soc. Japan*, **7**, 91–100.

Kato, H. and Sugiyama, Y. (1985) Kanazawa. *Scale 1 : 500,000 Neotectonic map, Sheet 10*, Geological Survey of Japan.

Kono, Y. (1983) Gravity anomalies over the central Japan (2) —Comparison with topography, seismic activity, active faults and major tectonic lines—. *Zisin (J. Seismol. Soc. Japan), Ser. 2*, **36**, 247—253.

Kono, Y., Hibi, T., Kubo, M., Sunami, M., Michigami, O., Shibuya, K., Furuse, N. and Suzuki, K. (1982) Gravity anomaly over the central Japan (1). *Zisin (J. Seismol. Soc. Japan), Ser. 2*, **35**, 539—545.

Mizutani, Y. (1992) Chemical nature of hot springs. *In* Toyama Prefecture, *Explanation about the 1 : 100,000 scale geological map of Toyama Prefecture*, 104—111.

Nakagawa, I., Nakai, S., Shichi, R., Tajima, H., Izutuya, S., Kono, Y., Higashi, T., Fujimoto, H., Murakami, M., Tajima, K. and Funaki, M. (1983) *Precise calibration of scale values of LaCoste & Romberg gravimeters and international gravimetric connections along the circum-Pacific zone (Final report)*. 117pp.

Naruse, Y. (1985) The plain between high mountains and the deep sea — Toyama Plain. *In* Kaiduka, S., Naruse, Y. and Ota, Y., *Plains and coasts in Japan, Nature in Japan 4*. Iwanamishoten, Tokyo, 63—71.

Takemura, T. (1983) Active faults in Toyama Prefecture. *The Earth monthly*, **5**, 431—436.

Takeuchi, A. and Kono Y. (1992) Gravity. *In* Toyama Prefecture, *Explanation about the 1 : 100,000 scale geological map of Toyama Prefecture*, 144—149.

The Research Group for Active Faults of Japan (1991) *Active faults in Japan: Sheet maps and inventories (revised edition)*. University of Tokyo Press, Tokyo, 437pp.

Yamamoto, A., Nozaki, K., Fukao, Y., Furumoto, M., Shichi, R. and Ezaka, T. (1982) Gravity survey in the central ranges, Honshu, Japan. *J. Phys. Earth*, **30**, 201—243.

APPENDIX

The list of gravity values (G-value), terrain corrections (T. C.) and Bouguer anomalies (B. A.) is given. A density of 2.67 g/cm^3 is assumed. Stations are numbered in measuring order. They are classified into 4 types: blank, spot height; 1, bench mark of GSI; 2, contour; 3, triangulation station of GSI.

No.	Type	Latitude ° ′ N	Longitude ° ′ E	Altitude m	G-value mgal	T. C. mgal	B. A. mgal	Meter
1		36 38.66	136 52.27	32.9	979863.749	0.482	-2.385	G783
2		36 39.18	136 52.08	30.9	979865.250	0.471	-2.037	G783
3		36 39.88	136 52.06	31.6	979867.961	0.480	-0.190	G783
4		36 39.68	136 49.16	232	979834.863	2.253	8.042	G783
5		36 39.51	136 49.31	254	979827.538	2.805	5.828	G783
6		36 39.36	136 49.75	182.1	979842.937	1.284	5.826	G783
7		36 39.36	136 50.79	69	979861.087	0.661	1.192	G783
8		36 39.77	136 51.32	41.7	979867.147	0.602	1.254	G783
9		36 39.24	136 51.32	39.8	979865.023	0.517	-0.562	G783
10		36 38.74	136 50.87	49.8	979862.457	0.541	-0.424	G783
11		36 38.71	136 51.27	38.4	979863.567	0.516	-1.528	G783
12		36 38.09	136 52.33	34.4	979861.145	0.530	-3.825	G783
13		36 38.10	136 51.95	35.2	979861.834	0.536	-2.988	G783
14		36 38.02	136 51.34	39.5	979861.598	0.547	-2.255	G783
15		36 38.04	136 50.41	44.9	979862.729	0.604	-0.039	G783
16		36 37.75	136 49.99	49.4	979862.596	0.655	1.179	G783
17		36 38.17	136 49.08	74	979860.862	2.485	5.487	G783
18		36 37.68	136 49.29	64	979861.264	1.292	3.445	G783
19		36 37.55	136 48.80	95.5	979855.554	1.575	4.375	G783
20		36 37.50	136 48.51	108.7	979853.306	1.740	4.951	G783
21		36 37.13	136 47.24	211.7	979832.992	1.622	5.239	G783
22		36 37.21	136 47.45	172.4	979841.291	1.292	5.389	G783
23		36 36.96	136 49.37	56.9	979860.775	0.875	2.187	G783
24		36 36.38	136 48.15	78.1	979857.047	2.018	4.591	G783
25		36 37.32	136 49.80	52.6	979861.484	0.731	1.390	G783
26		36 37.48	136 51.34	54.3	979857.684	0.617	-2.422	G783
27		36 36.66	136 50.85	82.7	979850.742	1.130	-2.105	G783
28		36 35.74	136 50.75	107.4	979844.959	1.513	-1.339	G783
29	2	36 35.18	136 50.79	135	979838.191	1.283	-2.122	G783
30		36 39.51	136 53.47	31	979865.457	0.441	-2.317	G783
31		36 39.14	136 55.04	36.8	979862.837	0.466	-3.242	G783
32		36 38.71	136 56.19	43.1	979861.480	0.516	-2.699	G783
33		36 38.76	136 58.33	46.6	979859.332	0.570	-4.176	G783
34		36 38.89	136 58.94	47.1	979859.016	0.580	-4.571	G783
35		36 38.81	136 59.72	45.8	979859.199	0.619	-4.488	G783
36		36 37.73	136 59.39	58.6	979856.814	0.732	-2.695	G783
37		36 36.71	136 59.56	72.2	979855.693	0.938	0.525	G783
38		36 36.22	136 59.39	78.3	979854.531	1.053	1.380	G783
39		36 35.20	136 59.51	94.3	979850.852	1.626	2.879	G783
40		36 35.44	136 58.05	82.5	979850.673	1.061	-0.523	G783
41		36 35.76	136 58.07	79.3	979851.668	0.981	-0.696	G783
42		36 36.58	136 58.07	70.1	979854.367	0.817	-1.146	G783
43		36 37.00	136 57.65	64.7	979855.794	0.729	-1.470	G783

44		36 36.63	136 57.16	66.6	979854.426	0.753	-1.909	G783
45		36 36.19	136 57.25	70.6	979852.595	0.827	-2.247	G783
46		36 35.70	136 57.06	73.1	979850.488	0.906	-3.079	G783
47		36 36.02	136 56.59	65.7	979852.571	0.820	-2.993	G783
48		36 36.54	136 55.93	57.4	979855.496	0.714	-2.550	G783
49		36 36.81	136 55.25	50	979857.580	0.662	-2.356	G783
50		36 35.82	136 55.06	52	979855.473	0.795	-2.511	G783
51		36 35.17	136 55.13	58	979852.133	0.900	-3.633	G783
52		36 35.13	136 53.75	53	979853.394	0.874	-3.320	G783
53	2	36 35.13	136 53.14	60	979851.780	0.943	-3.494	G783
54		36 36.02	136 53.45	55	979851.666	1.117	-5.697	G783
55		36 35.94	136 53.96	47.1	979856.430	0.773	-2.708	G783
56		36 36.74	136 54.05	46.1	979856.768	0.657	-3.836	G783
57		36 36.76	136 53.22	50.1	979853.861	0.775	-5.871	G783
58		36 37.43	136 53.24	41.9	979858.215	0.592	-4.272	G783
59		36 37.25	136 53.90	43.9	979856.326	0.599	-5.503	G783
60		36 37.23	136 55.04	46.5	979859.047	0.613	-2.230	G783
61		36 36.96	136 56.36	57.1	979856.439	0.680	-2.305	G783
62		36 37.65	136 56.02	49.3	979858.822	0.594	-2.531	G783
63		36 38.20	136 55.97	46.2	979860.034	0.545	-2.769	G783
64		36 38.22	136 55.23	41.8	979860.970	0.528	-2.740	G783
65		36 38.14	136 54.24	42.6	979859.255	0.518	-4.193	G783
66		36 38.05	136 53.52	38.8	979860.489	0.519	-3.573	G783
67		36 37.95	136 52.71	36.4	979860.890	0.540	-3.476	G783
68		36 38.64	136 53.18	33.8	979862.945	0.482	-2.984	G783
69		36 39.03	136 52.88	31.5	979864.384	0.460	-2.580	G783
70		36 38.94	136 54.05	34.6	979863.020	0.469	-3.198	G783
71		36 38.62	136 54.39	37.4	979860.988	0.487	-4.202	G783
72		36 39.77	136 59.79	36.7	979862.161	0.538	-4.775	G783
73		36 39.93	136 53.92	28.1	979866.662	0.435	-2.292	G783
74		36 39.50	136 55.23	34.4	979864.227	0.450	-2.858	G783
75		36 39.70	136 56.08	34.1	979864.575	0.453	-2.854	G783
76		36 39.43	136 57.03	38.5	979862.161	0.488	-3.982	G783
77		36 39.58	136 57.78	37.9	979862.149	0.495	-4.321	G783
78	2	36 39.92	136 58.07	35	979863.217	0.481	-4.325	G783
79		36 39.83	136 58.56	37.4	979862.179	0.498	-4.746	G783
80		36 37.84	136 58.74	57.8	979857.300	0.679	-2.578	G783
81		36 37.41	136 58.32	62.4	979856.611	0.709	-1.715	G783
82		36 38.05	136 58.32	54.6	979857.874	0.634	-2.978	G783
83		36 38.37	136 57.28	49.5	979859.116	0.569	-3.262	G783
84		36 38.98	136 57.44	43.5	979860.451	0.526	-4.025	G783
85		36 38.89	136 56.76	42.2	979860.831	0.515	-3.781	G783
86		36 39.43	136 54.30	33.5	979864.580	0.446	-2.584	G783
87		36 40.00	136 52.58	27	979867.795	0.462	-1.448	G783
88		36 39.31	136 52.65	30.8	979864.724	0.455	-2.786	G783
89		36 43.41	136 51.79	114.2	979884.494	1.039	27.985	G783

90		36 43.32	136 51.26	110.5	979886.436	0.953	29.251	G783
91		36 43.71	136 50.97	171.4	979875.232	0.864	29.325	G783
92		36 44.20	136 50.48	249.7	979861.276	1.560	30.700	G783
93		36 43.86	136 50.06	188.4	979873.807	1.612	31.762	G783
94		36 43.28	136 50.04	87.9	979891.944	2.896	32.327	G783
95		36 42.99	136 50.20	99.4	979887.971	1.534	29.665	G783
96	2	36 42.77	136 51.01	51	979896.433	2.191	29.620	G783
97		36 42.74	136 51.01	49	979896.608	2.340	29.593	G783
98		36 42.10	136 51.11	35.5	979895.027	2.323	26.278	G783
99		36 41.43	136 51.49	34.4	979887.283	1.270	18.233	G783
100		36 41.98	136 51.94	149.4	979866.845	2.864	21.123	G783
101		36 41.19	136 52.42	27.7	979876.812	0.953	6.479	G783
102		36 40.36	136 51.02	46.2	979874.047	1.166	8.748	G783
103		36 41.13	136 50.28	84.6	979879.684	0.743	20.372	G783
104		36 41.65	136 49.60	150.4	979870.697	0.630	23.413	G783
105		36 42.09	136 48.99	190.6	979864.411	1.673	25.414	G783
106		36 42.37	136 48.48	186.9	979867.121	1.000	26.322	G783
107		36 42.63	136 47.85	140.5	979879.331	0.801	28.863	G783
108	1	36 42.96	136 48.47	114.0	979886.783	0.716	30.557	G783
109		36 43.57	136 48.32	171.4	979877.346	1.122	31.898	G783
110		36 42.29	136 50.01	145.1	979875.781	0.832	26.737	G783
111		36 40.39	136 49.66	104.8	979870.474	1.716	17.160	G783
112		36 40.12	136 49.56	157.9	979856.725	1.203	13.693	G783
113		36 43.53	136 59.56	12.4	979877.148	0.356	-0.157	G783
114		36 43.71	136 59.03	12.2	979878.239	0.347	0.626	G783
115		36 43.27	136 58.83	13.6	979876.443	0.359	-0.248	G783
116		36 42.69	136 58.76	15.5	979874.431	0.373	-1.037	G783
117		36 42.75	136 57.64	17.3	979875.142	0.370	-0.063	G783
118		36 42.46	136 57.07	18.3	979874.496	0.379	-0.085	G783
119		36 41.90	136 55.16	19.5	979875.092	0.437	1.610	G783
120		36 41.01	136 52.81	26.1	979873.913	0.572	3.146	G783
121		36 40.05	136 54.92	28.5	979866.650	0.434	-2.400	G783
122		36 40.20	136 55.68	29.2	979866.762	0.430	-2.371	G783
123		36 40.19	136 56.72	30.9	979865.660	0.441	-3.115	G783
124		36 40.27	136 57.42	31.6	979864.976	0.448	-3.770	G783
125		36 40.81	136 56.81	26.6	979868.471	0.416	-2.066	G783
126		36 41.04	136 56.55	23.8	979869.799	0.410	-1.624	G783
127		36 41.04	136 55.93	23.5	979870.204	0.408	-1.280	G783
128		36 41.53	136 56.04	21	979871.943	0.400	-0.746	G783
129		36 44.15	136 58.63	9	979881.469	0.348	2.595	G783
130		36 44.42	136 57.88	14.9	979882.077	0.379	4.000	G783
131		36 44.84	136 58.84	8.1	979884.318	0.346	4.269	G783
132	2	36 44.65	136 53.12	105	979886.487	2.528	27.873	G783
133		36 44.85	136 54.14	217.2	979863.212	1.335	25.106	G783
134	2	36 44.37	136 54.77	90	979884.912	0.906	22.142	G783

135		36 44.65	136 55.10	35.5	979894.432	2.327	22.004	G783
136		36 44.95	136 55.72	23.9	979893.538	1.938	18.016	G783
137		36 44.44	136 56.42	15.9	979886.112	0.619	8.441	G783
138		36 44.15	136 56.36	15	979885.024	0.510	7.487	G783
139		36 43.85	136 56.88	12.5	979881.614	0.405	3.916	G783
140		36 40.44	136 59.94	29.7	979864.523	0.502	-4.787	G783
141		36 41.01	136 59.48	25.8	979866.978	0.454	-3.966	G783
142		36 41.04	136 59.03	25.8	979867.245	0.440	-3.756	G783
143		36 41.71	136 59.24	19.5	979870.696	0.419	-2.527	G783
144		36 42.51	136 59.55	13.9	979874.507	0.391	-0.996	G783
145		36 44.76	136 57.42	13	979885.529	0.422	6.631	G783
146		36 44.44	136 57.01	12.7	979884.842	0.435	6.361	G783
147	2	36 44.24	136 55.77	25	979885.904	1.363	11.048	G783
148	2	36 43.88	136 55.42	30	979883.996	2.186	11.462	G783
149		36 43.87	136 56.18	13.5	979884.275	0.520	6.859	G783
150		36 43.40	136 56.30	14	979880.673	0.435	3.948	G783
151		36 43.30	136 55.77	14	979881.753	0.531	5.269	G783
152	2	36 43.36	136 55.41	19	979882.966	0.955	7.798	G783
153		36 43.01	136 55.32	16	979881.252	0.631	5.678	G783
154		36 42.58	136 55.05	17	979879.179	0.537	4.328	G783
155	2	36 42.69	136 54.41	25	979884.008	0.974	11.002	G783
156		36 43.14	136 54.04	43	979888.877	1.457	19.229	G783
157	2	36 43.24	136 53.40	150	979870.939	0.847	21.498	G783
158	2	36 43.51	136 54.13	100	979879.619	0.840	19.984	G783
159	2	36 44.16	136 53.88	200	979862.952	1.401	22.537	G783
160		36 44.42	136 52.67	128	979884.809	1.288	29.794	G783
161		36 43.86	136 52.68	118	979884.132	1.011	27.689	G783
162		36 42.12	136 52.90	194.9	979851.521	3.233	14.884	G783
163		36 42.26	136 53.85	33	979881.170	1.632	11.009	G783
164		36 42.03	136 54.39	19	979877.811	0.653	4.262	G783
165		36 41.86	136 53.85	29	979876.444	0.825	5.270	G783
166		36 41.61	136 53.28	30.4	979876.361	0.941	5.938	G783
167		36 40.72	136 54.18	25.4	979869.426	0.432	-1.200	G783
168		36 40.24	136 58.82	37.5	979864.058	0.487	-3.451	G783
169		36 40.25	136 58.10	31.8	979864.521	0.463	-4.142	G783
170		36 40.88	136 57.95	26.7	979867.386	0.429	-3.219	G783
171		36 41.59	136 57.53	21.9	979871.289	0.396	-1.314	G783
172		36 42.00	136 57.47	20.2	979872.563	0.384	-0.977	G783
173		36 42.07	136 56.81	19.7	979873.241	0.384	-0.498	G783
174		36 41.83	136 58.52	19.7	979871.867	0.401	-1.508	G783
175		36 44.72	136 56.90	13.5	979886.419	0.660	7.915	G947
176		36 44.01	136 57.42	10.9	979881.588	0.377	3.318	G947
177		36 44.54	136 58.14	8.9	979883.441	0.361	3.997	G947
178		36 44.08	136 57.95	10	979881.853	0.360	3.288	G947
179		36 44.14	136 58.65	9	979881.229	0.348	2.370	G947
180		36 44.56	136 57.65	10	979884.363	0.389	5.134	G947

181		36 44.50	136 58.92	9	979882.725	0.341	3.339	G947
182		36 44.79	136 59.45	9	979882.962	0.336	3.152	G947
183		36 43.01	136 58.29	14.6	979875.695	0.367	-0.417	G947
184		36 42.54	136 58.19	13	979874.289	0.380	-1.444	G947
185		36 43.04	136 59.29	14	979875.131	0.369	-1.140	G947
186		36 43.30	136 59.69	11	979876.065	0.365	-1.172	G947
187		36 43.54	136 57.62	12.1	979879.835	0.367	2.468	G947
188		36 42.89	136 56.76	14.7	979877.715	0.385	1.814	G947
189		36 42.16	136 56.08	19	979874.770	0.397	0.777	G947
190		36 41.73	136 55.45	18	979873.334	0.422	-0.209	G947
191		36 44.19	136 59.80	8	979880.258	0.345	1.128	G947
192		36 44.92	136 56.45	76.2	979875.276	0.895	8.997	G947
193		36 49.73	136 52.18	53	979910.640	2.450	34.421	G783
194	2	36 48.80	136 51.96	70	979905.392	1.765	33.162	G783
195		36 48.05	136 52.08	193	979881.246	1.904	34.341	G783
196	2	36 46.99	136 52.01	312	979854.547	2.728	33.334	G783
197	2	36 47.19	136 51.71	360	979845.579	2.384	33.152	G783
198	2	36 46.30	136 52.41	290	979860.436	1.415	34.592	G783
199	2	36 45.45	136 51.97	200	979872.588	1.560	30.468	G783
200		36 46.09	136 51.49	326	979850.763	1.484	32.354	G783
201		36 46.41	136 51.26	396	979836.773	1.995	32.149	G783
202	2	36 46.91	136 51.08	460	979824.209	3.390	32.823	G783
203	2	36 46.85	136 50.16	465	979824.000	3.718	34.010	G783
204	2	36 46.70	136 49.63	450	979832.720	2.980	39.264	G783
205		36 46.51	136 48.59	578	979805.183	8.285	42.450	G783
206	2	36 47.46	136 49.58	482	979825.090	5.971	39.811	G783
207	2	36 47.99	136 50.24	375	979843.391	4.188	34.555	G783
208		36 49.28	136 52.35	43.8	979911.031	1.678	32.889	G947
209		36 49.23	136 51.77	130.8	979889.179	1.347	27.821	G947
210		36 49.64	136 51.56	128.4	979896.104	1.679	34.015	G947
211		36 49.35	136 51.46	127.2	979894.876	1.281	32.573	G947
212		36 48.66	136 51.64	76.8	979904.119	2.999	34.657	G947
213		36 48.52	136 52.32	82.2	979901.648	2.721	33.169	G947
214		36 49.23	136 59.87	6.7	979900.699	0.278	13.964	G783
215		36 48.07	136 59.55	30.1	979896.369	0.618	16.233	G783
216		36 48.44	136 58.85	9.6	979900.962	0.493	16.152	G783
217		36 47.87	136 58.85	20.2	979901.519	1.384	20.500	G783
218		36 46.92	136 59.10	47.3	979886.981	1.043	12.300	G783
219		36 48.36	136 58.19	6.7	979901.672	0.502	16.419	G783
220		36 47.54	136 58.17	17.9	979902.536	1.608	21.767	G783
221		36 47.12	136 58.27	133.8	979868.966	1.081	10.979	G783
222		36 49.15	136 58.92	4.6	979902.192	0.294	15.178	G783
223		36 49.70	136 58.92	4	979903.611	0.316	15.706	G783
224	2	36 49.60	136 52.75	30	979914.817	1.408	33.240	G783
225	2	36 49.74	136 53.66	30	979916.564	0.731	34.107	G783

226	2	36 49.86	136 57.12	3	979906.959	0.585	18.896	G783
227		36 49.34	136 56.97	2.1	979905.056	0.420	17.404	G783
228		36 49.73	136 56.33	8.8	979907.031	0.797	20.504	G783
229		36 49.73	136 57.67	1.4	979905.115	0.296	16.638	G783
230		36 49.92	136 58.35	1.1	979905.046	0.277	16.216	G783
231		36 45.01	136 58.20	9.2	979885.697	0.385	5.657	G783
232		36 45.21	136 57.95	8.5	979887.650	0.513	7.312	G783
233		36 45.59	136 58.43	8.7	979888.042	0.449	7.130	G783
234		36 45.42	136 58.90	10	979885.979	0.366	5.485	G783
235		36 45.98	136 58.50	15.5	979889.483	1.096	9.986	G783
236		36 46.29	136 59.48	9.8	979889.874	0.493	8.210	G783
237		36 46.08	136 57.67	18.5	979891.881	1.502	13.233	G783
238		36 46.27	136 57.42	25.8	979892.652	2.132	15.789	G783
239		36 46.66	136 57.34	45.6	979891.421	1.957	17.697	G783
240		36 46.89	136 56.66	23.8	979901.816	2.006	23.540	G783
241		36 47.23	136 56.77	18.3	979904.231	1.291	23.671	G783
242		36 47.58	136 56.68	15.5	979905.557	0.745	23.397	G783
243	2	36 47.57	136 55.58	40	979904.963	2.193	29.063	G783
244	2	36 47.39	136 54.93	45	979906.156	2.516	31.819	G783
245		36 47.97	136 56.92	11.9	979904.372	0.614	20.813	G783
246	2	36 48.07	136 56.01	20	979905.083	0.991	23.342	G783
247	2	36 48.53	136 55.29	30	979902.774	1.664	23.000	G783
248		36 48.84	136 57.71	4.4	979903.340	0.342	16.783	G783
249		36 48.81	136 56.56	9.7	979904.091	0.594	18.867	G783
250	2	36 48.91	136 55.63	30	979901.237	0.978	20.227	G783
251	2	36 49.15	136 54.93	165	979873.746	1.746	19.605	G783
252	2	36 48.87	136 53.81	31	979904.825	1.885	24.976	G783
253	2	36 48.27	136 53.45	70	979899.814	2.692	29.277	G783
254	2	36 48.29	136 52.54	125	979890.859	1.628	30.004	G783
255		36 47.78	136 52.62	227	979874.827	1.490	34.564	G783
256	2	36 47.51	136 53.36	210	979875.924	1.590	32.818	G783
257		36 46.92	136 53.76	157.6	979883.483	1.629	30.998	G783
258		36 46.57	136 53.71	156.1	979884.324	1.639	32.060	G783
259		36 46.10	136 53.52	192	979876.487	1.528	31.828	G783
260		36 46.57	136 53.38	232.5	979868.240	1.122	30.436	G783
261		36 46.88	136 52.95	320.5	979849.907	1.910	29.703	G783
262		36 46.79	136 52.57	329.6	979849.783	1.971	31.555	G783
263		36 46.24	136 52.76	241.9	979864.665	1.611	29.670	G783
264		36 46.06	136 52.89	204.3	979874.421	2.144	32.847	G783
265		36 45.45	136 53.05	193.9	979875.138	1.156	31.419	G783
266		36 45.10	136 57.14	15.7	979887.450	0.700	8.868	G783
267		36 45.45	136 56.06	34.4	979894.394	2.062	20.330	G783
268		36 45.51	136 55.47	37.5	979897.178	1.633	23.205	G783
269		36 46.06	136 55.49	141.7	979877.204	0.916	22.132	G783
270		36 46.43	136 54.69	180.4	979874.422	0.975	26.459	G783

271		36 46.11	136 54.69	137.4	979882.814	1.098	27.009	G783
272		36 45.88	136 54.66	173.2	979873.490	0.996	24.932	G783
273		36 46.02	136 54.09	211.2	979869.383	1.254	28.330	G783
274		36 45.51	136 54.09	207.1	979869.384	1.201	28.211	G783
275		36 45.40	136 54.11	196.4	979871.131	1.407	28.225	G783
276		36 45.96	136 56.15	118.1	979876.774	1.189	17.495	G783
277		36 48.86	136 59.64	11.1	979900.025	0.370	14.779	G947
278		36 48.54	136 59.51	38.6	979893.384	0.411	14.026	G947
279		36 48.86	136 58.70	6	979901.598	0.298	15.281	G947
280		36 49.61	136 59.53	4	979902.328	0.326	14.563	G947
281		36 49.31	136 58.39	1.8	979902.782	0.271	14.965	G947
282		36 48.79	136 58.15	4.7	979901.897	0.302	15.431	G947
283		36 47.80	136 57.83	13	979902.731	1.135	20.154	G947
284		36 48.54	136 57.64	6.5	979902.596	0.415	16.957	G947
285		36 48.10	136 57.58	9.1	979902.688	0.738	18.517	G947
286		36 48.27	136 57.05	10	979902.848	0.475	18.344	G947
287		36 48.40	136 56.60	20.7	979901.981	1.284	20.193	G947
288		36 48.62	136 57.09	4.7	979903.718	0.494	17.690	G947
289		36 49.43	136 56.62	3.5	979905.802	0.488	18.362	G947
290		36 49.09	136 57.28	1.8	979904.472	0.355	17.057	G947
291		36 49.24	136 57.71	2.6	979903.625	0.297	16.092	G947
292	2	36 47.53	136 59.55	70	979886.300	0.647	14.788	G947
293		36 46.44	136 59.98	7.4	979890.690	0.508	8.355	G947
294	2	36 46.96	136 59.62	25	979891.393	1.187	12.432	G947
295		36 46.88	136 59.70	17.4	979892.183	1.098	11.760	G947
296	2	36 45.05	136 58.81	6	979884.924	0.359	4.174	G947
297		36 45.18	136 59.83	9	979884.331	0.333	3.954	G947
298		36 45.62	136 59.45	6	979886.635	0.361	5.063	G947
299		36 45.92	136 59.94	4.5	979888.032	0.376	5.748	G947
300		36 45.97	136 59.19	6.2	979888.789	0.449	6.839	G947
301		36 45.77	136 58.02	13.2	979888.573	0.936	8.769	G947
302		36 49.46	136 56.07	67.5	979893.063	0.782	18.406	G947
303		36 49.63	136 55.92	63.7	979895.848	0.628	20.047	G947
304		36 49.88	136 55.69	34.8	979905.394	1.833	24.777	G947
305		36 49.81	136 54.56	26.8	979913.117	0.840	30.042	G947
306		36 49.78	136 54.14	22.1	979915.480	0.827	31.515	G947
307		36 49.87	136 52.88	31.1	979915.774	1.523	34.137	G947
308		36 49.39	136 52.90	70.1	979904.989	0.923	31.084	G947
309		36 49.39	136 53.18	103.5	979897.341	0.760	29.816	G947
310		36 49.50	136 53.69	30.9	979912.973	0.695	31.004	G947
311		36 49.14	136 53.52	62.4	979904.248	0.728	29.001	G947
312		36 49.24	136 53.86	27.9	979910.711	1.197	29.032	G947
313		36 49.60	136 54.09	74.7	979902.005	1.244	29.018	G947
314		36 49.23	136 54.37	123.9	979887.215	1.508	24.666	G947
315		36 48.94	136 54.39	136.2	979882.182	0.881	21.835	G947
316		36 48.76	136 54.84	100.3	979888.256	0.853	21.107	G947

317	36 47.95	136 56.45	14.3	979905.168	0.889	22.383	G947
318	36 48.20	136 55.67	21.4	979903.331	1.727	22.413	G947
319	36 48.37	136 56.22	18.3	979902.504	1.211	20.217	G947
320	36 48.60	136 55.86	23.1	979902.064	1.255	20.428	G947
321	36 49.08	136 55.26	115	979884.167	0.854	19.437	G947
322	36 49.39	136 54.73	97.7	979892.412	0.623	23.613	G947
323	36 47.58	136 56.35	19.2	979905.721	1.237	24.778	G947
324	36 47.18	136 56.18	134.1	979879.657	1.194	21.756	G947
325	36 47.60	136 56.07	22.4	979905.599	2.205	26.222	G947
326	36 47.28	136 55.39	133.2	979883.034	1.513	25.131	G947
327	36 47.04	136 54.94	166.9	979877.426	1.780	26.741	G947
328	36 46.72	136 54.48	179.7	979876.154	1.863	28.523	G947
329	36 46.70	136 53.99	102.9	979895.429	1.822	32.736	G947
330	36 47.12	136 54.33	61	979903.378	2.339	32.387	G947
331	36 47.17	136 53.63	229.5	979869.317	1.867	30.803	G947
332	36 47.91	136 53.63	109.8	979892.866	1.903	29.857	G947
333	36 47.83	136 53.82	103.3	979893.879	2.164	29.973	G947
334	36 47.53	136 53.92	200	979874.597	1.976	29.888	G947
335	36 47.26	136 52.73	244.1	979869.246	1.378	32.976	G947
336	36 47.58	136 52.69	224.9	979874.592	1.318	34.034	G947
337	36 46.57	136 54.90	155.7	979878.854	1.090	25.963	G947
338	36 48.42	136 54.39	164.3	979874.862	1.657	21.550	G947
339	36 48.42	136 53.43	67.3	979900.561	1.359	27.946	G947
340	36 46.87	136 56.22	34.9	979901.325	1.539	24.784	G947
341	36 46.60	136 55.75	70.6	979894.112	2.356	25.770	G947
342	36 45.70	136 55.18	48.7	979896.849	1.702	24.864	G947
343	36 45.53	136 54.65	69	979895.091	2.571	28.197	G947
344	36 45.31	136 56.54	20.9	979890.690	1.084	13.207	G947
345	36 45.63	136 56.49	35.9	979889.622	2.069	15.599	G947
346	36 45.61	136 56.96	120.9	979866.980	1.547	9.114	G947
347	36 45.98	136 56.81	173.9	979858.614	2.065	11.117	G947
348	36 45.73	136 57.45	36.5	979885.164	1.261	10.306	G947
349	36 46.19	136 58.26	30.5	979887.438	1.147	10.626	G947
350	36 46.47	136 57.85	113.5	979872.949	0.823	11.666	G947
351	36 46.71	136 57.73	153	979866.333	1.423	13.043	G947
352	36 46.46	136 58.87	26.4	979888.927	1.319	11.094	G947
353	36 46.79	136 58.39	100	979877.689	1.046	13.522	G947
354	36 47.56	136 57.11	50.7	979895.632	0.702	20.351	G947
355	36 47.26	136 57.20	111.6	979880.140	1.172	17.692	G947
356	36 51.38	136 52.15	112	979908.224	0.941	39.668	G783
357	36 51.21	136 59.72	0.9	979910.754	0.225	19.968	G783
358	36 53.44	136 59.41	8.8	979931.274	0.850	39.434	G783
359	36 54.16	136 59.18	71.3	979923.550	0.712	42.770	G783
360	36 53.82	136 59.79	16.2	979929.679	0.994	38.882	G783
361	36 55.00	136 59.68	27	979937.794	1.445	47.856	G783

362	2	36 54.91	136 58.73	100	979925.295	1.062	49.402	G783
363	2	36 54.80	136 58.17	202	979903.215	1.520	47.929	G783
364		36 54.26	136 57.50	41.6	979937.930	1.649	52.126	G783
365		36 53.85	136 57.88	22	979938.990	1.092	49.384	G783
366		36 53.56	136 58.20	16.5	979936.629	0.780	46.053	G783
367		36 53.10	136 58.82	12.2	979930.192	0.442	39.102	G783
368		36 52.38	136 58.72	4.1	979923.009	0.303	31.235	G783
369		36 51.45	136 58.72	4.2	979913.286	0.261	22.835	G783
370		36 50.06	136 59.45	3.6	979904.180	0.233	15.594	G783
371		36 50.41	136 58.60	1.6	979907.344	0.361	17.988	G783
372		36 50.01	136 58.22	2.9	979905.300	0.477	16.893	G783
373		36 50.31	136 57.65	2.1	979907.765	0.464	18.754	G783
374		36 51.08	136 57.30	4.9	979914.871	0.350	25.181	G783
375		36 51.18	136 58.04	4.1	979913.105	0.306	23.070	G783
376		36 51.79	136 58.19	4.4	979918.506	0.289	27.630	G783
377		36 51.75	136 57.47	7.4	979921.484	0.468	31.433	G783
378		36 52.74	136 57.44	11.8	979933.509	0.515	42.934	G783
379		36 52.66	136 57.97	9.1	979930.377	0.433	39.307	G783
380		36 53.44	136 57.35	107.2	979918.113	0.926	45.622	G783
381		36 52.90	136 56.87	13.3	979936.813	0.799	46.585	G783
382		36 53.06	136 55.98	28	979933.576	1.174	46.369	G783
383		36 53.90	136 55.78	102	979918.612	1.255	44.765	G783
384		36 54.42	136 55.88	161	979910.312	1.001	47.020	G783
385		36 54.25	136 55.37	224	979894.145	1.616	44.064	G783
386		36 52.81	136 55.32	27	979931.586	1.544	44.915	G783
387		36 53.26	136 54.36	54	979926.788	1.468	44.678	G783
388		36 54.02	136 54.25	151	979907.735	1.304	43.365	G783
389		36 54.80	136 54.58	223	979896.435	1.536	45.282	G783
390	2	36 54.25	136 53.46	303	979874.288	2.751	40.835	G783
391	2	36 53.63	136 53.49	190	979896.742	1.284	40.560	G783
392		36 53.01	136 53.28	170	979898.165	0.907	38.583	G783
393		36 52.80	136 53.66	136	979906.616	0.669	40.436	G783
394	2	36 52.28	136 53.60	90	979914.348	0.870	40.109	G783
395		36 51.97	136 54.90	39	979926.074	0.722	42.146	G783
396		36 51.76	136 55.88	13.4	979928.053	0.421	39.115	G783
397		36 51.76	136 56.75	8.8	979925.186	0.379	35.305	G783
398		36 52.16	136 56.49	9.2	979930.577	0.488	40.305	G783
399		36 52.29	136 55.90	30.5	979930.628	0.694	44.545	G783
400		36 50.96	136 54.68	19	979924.176	0.545	37.615	G783
401		36 50.58	136 55.17	18	979919.400	0.782	33.430	G783
402		36 51.29	136 53.70	40	979922.531	1.961	41.021	G783
403		36 50.90	136 52.66	114	979905.410	1.122	38.121	G783
404	2	36 50.22	136 52.63	82	979910.935	0.982	38.220	G783
405		36 50.27	136 54.11	24	979919.194	0.885	34.950	G783
406		36 51.27	136 55.82	17.2	979922.985	0.583	35.662	G783
407		36 51.12	136 56.14	10.1	979920.911	0.533	32.364	G783

408	36 50.64	136 56.31	16.9	979913.179	0.746	26.871	G783
409	36 50.25	136 56.50	44	979902.592	0.496	21.905	G783
410	36 50.00	136 56.99	2.6	979907.713	0.611	19.395	G783
411	36 50.39	136 59.68	8	979904.576	0.225	16.366	G947
412	36 51.24	136 59.34	2.4	979910.829	0.275	20.343	G947
413	36 50.20	136 59.04	1.1	979905.826	0.244	16.559	G947
414	36 50.42	136 58.21	4.6	979906.941	0.508	18.305	G947
415	36 50.91	136 57.38	5.5	979912.569	0.331	23.223	G947
416	36 50.62	136 56.93	11.3	979910.637	0.691	23.206	G947
417	36 51.01	136 56.80	45	979906.818	0.820	25.552	G947
418	36 51.39	136 57.02	7.7	979919.818	0.568	30.446	G947
419	36 51.58	136 56.46	9.1	979924.289	0.564	34.912	G947
420	36 51.38	136 57.68	4.6	979916.462	0.285	26.215	G947
421	36 51.17	136 58.81	6	979911.103	0.549	21.697	G947
422	36 50.72	136 59.04	15.8	979905.006	0.351	17.972	G947
423	36 50.76	136 58.27	67.7	979893.774	0.861	17.356	G947
424	36 50.65	136 57.78	60.5	979896.257	0.743	18.470	G947
425	36 51.61	136 58.42	6	979915.744	0.260	25.413	G947
426	36 52.00	136 58.76	5	979918.459	0.260	27.368	G947
427	36 52.06	136 57.85	7.2	979923.008	0.469	32.470	G947
428	36 52.37	136 58.34	8	979924.559	0.390	33.650	G947
429	36 52.35	136 59.19	2.8	979921.321	0.271	29.304	G947
430	36 52.67	136 59.70	4.5	979922.338	0.273	30.193	G947
431	36 52.94	136 59.89	3.2	979924.901	0.333	32.171	G947
432	36 53.27	136 59.96	7.8	979926.593	0.598	34.551	G947
433	36 53.07	136 59.40	6.4	979927.988	0.389	35.753	G947
434	36 53.59	136 58.53	20.2	979934.325	0.837	44.487	G947
435	36 53.57	136 59.21	15.5	979932.273	0.544	41.251	G947
436	36 53.91	136 58.98	53.7	979926.609	0.701	42.733	G947
437	36 53.02	136 58.40	51.2	979922.124	0.589	38.934	G947
438	36 52.65	136 58.47	5.4	979927.861	0.409	36.057	G947
439	36 52.58	136 58.98	5.2	979924.415	0.379	32.643	G947
440	36 50.74	136 55.95	33.9	979912.277	1.037	29.444	G947
441	36 50.84	136 56.21	14.5	979916.437	0.639	29.263	G947
442	36 51.38	136 56.27	9.5	979923.188	0.566	34.181	G947
443	36 52.10	136 57.19	12.4	979926.265	0.879	37.097	G947
444	36 53.10	136 56.95	14	979937.029	0.788	46.637	G947
445	36 53.56	136 57.02	70.9	979927.436	1.268	48.002	G947
446	36 53.62	136 57.25	168	979904.592	2.190	45.018	G947
447	36 53.89	136 57.02	170.2	979906.367	2.156	46.800	G947
448	36 54.14	136 56.46	248.4	979888.854	3.230	45.330	G947
449	36 54.65	136 56.40	227.2	979897.568	1.366	47.285	G947
450	36 54.77	136 57.02	121.5	979923.260	1.748	52.468	G947
451	36 54.71	136 57.46	55	979938.224	1.498	54.242	G947
452	36 54.04	136 55.46	161.1	979906.737	1.311	44.324	G947

453		36 54.66	136 55.70	204.2	979901.513	1.034	46.375	G947
454		36 54.06	136 54.91	223	979892.562	1.413	42.357	G947
455		36 53.67	136 54.89	195.8	979897.229	1.505	42.347	G947
456		36 53.67	136 53.99	121	979911.581	1.217	41.752	G947
457		36 53.05	136 54.65	44.1	979928.876	1.456	45.119	G947
458		36 52.87	136 54.99	33	979930.862	1.997	45.732	G947
459		36 53.26	136 55.25	114.7	979914.196	0.861	43.369	G947
460		36 53.39	136 55.78	37.4	979931.592	2.230	46.805	G947
461		36 51.96	136 56.14	10.8	979929.478	0.529	39.850	G947
462		36 51.73	136 55.38	17.6	979927.849	0.516	39.872	G947
463		36 51.36	136 55.27	12.8	979926.359	0.526	37.987	G947
464		36 51.24	136 54.91	13.5	979926.253	0.572	38.238	G947
465		36 50.60	136 54.65	17	979921.201	0.890	35.114	G947
466		36 50.32	136 54.33	19.4	979919.432	0.593	33.923	G947
467		36 50.72	136 54.01	19.6	979923.177	0.751	37.287	G947
468		36 50.77	136 54.48	17.3	979923.080	0.674	36.590	G947
469		36 51.54	136 54.25	103	979910.037	0.813	39.358	G947
470		36 51.49	136 54.52	61.4	979918.498	0.967	39.896	G947
471		36 52.15	136 54.25	48.2	979924.422	1.065	42.379	G947
472		36 52.58	136 53.99	89.6	979916.360	0.953	41.692	G947
473		36 52.37	136 54.16	67.8	979920.854	1.057	42.323	G947
474		36 52.23	136 54.95	43.9	979926.156	1.182	43.272	G947
475		36 52.45	136 55.53	89.8	979916.401	0.753	41.760	G947
476		36 52.58	136 56.55	49.4	979925.011	0.716	42.232	G947
477		36 52.38	136 56.44	15	979931.529	0.696	42.283	G947
478		36 52.53	136 56.89	67.4	979920.578	0.656	41.336	G947
479		36 50.10	136 55.48	25.3	979911.119	1.133	27.624	G947
480		36 50.29	136 55.16	20.3	979915.263	0.810	30.191	G947
481		36 50.10	136 54.20	22.3	979917.763	0.719	33.266	G947
482		36 53.86	136 59.28	19.2	979932.890	0.778	42.407	G947
483		36 54.53	136 59.06	120	979916.166	0.826	44.505	G947
484		36 54.36	136 58.34	161.5	979908.735	1.979	46.606	G947
485		36 53.91	136 58.17	30	979936.445	0.887	48.113	G947
486		36 54.14	136 58.04	39.1	979936.728	1.317	50.276	G947
487	2	36 57.60	136 59.87	330	979886.145	2.674	53.064	G783
488	2	36 57.42	136 58.72	452	979862.572	3.581	54.605	G783
489	2	36 56.42	136 59.77	110	979930.433	1.565	54.817	G783
490		36 55.94	136 59.54	132	979925.708	1.139	54.671	G783
491		36 55.05	136 59.34	34.9	979939.211	1.469	50.771	G783
492	2	36 55.71	136 58.05	170	979917.172	1.313	54.089	G783
493	2	36 56.12	136 57.63	230	979904.930	1.687	53.390	G783
494	1	36 56.91	136 56.45	385.9	979871.543	3.311	51.067	G783
495	2	36 56.56	136 56.78	275	979895.577	2.084	52.622	G783
496	2	36 55.44	136 56.41	160	979916.715	1.568	52.318	G783
497	2	36 55.81	136 56.08	249	979899.042	1.823	51.812	G783
498		36 55.06	136 57.05	78.2	979934.239	1.746	54.542	G783

499	2	36	55.02	136	55.50	280	979885.464	1.553	45.187	G783
500	2	36	55.51	136	54.61	385	979864.119	3.052	45.234	G783
501	2	36	55.29	136	55.14	350	979871.266	2.418	45.197	G783
502		36	55.40	136	56.88	118.6	979925.823	1.652	53.455	G947
503		36	55.31	136	57.37	153	979920.360	1.344	54.555	G947
504		36	55.67	136	57.60	213.1	979907.642	1.775	53.528	G947
505		36	39.90	137	4.35	24.1	979867.075	1.081	-1.973	G947
506		36	39.56	137	4.20	36	979864.193	1.033	-2.082	G947
507		36	39.04	137	4.07	42.7	979862.151	1.316	-1.778	G947
508		36	38.66	137	4.50	64	979856.719	1.132	-2.674	G947
509		36	38.09	137	4.60	72	979853.269	1.423	-3.444	G947
510		36	38.70	137	0.43	53.9	979857.740	0.686	-4.135	G783
511		36	38.16	137	0.02	53.9	979857.475	0.712	-3.595	G783
512		36	37.84	137	3.66	93.2	979850.089	1.202	-2.332	G783
513		36	38.04	137	3.24	74.3	979854.473	1.285	-1.855	G783
514		36	38.57	137	3.27	113.7	979846.872	0.945	-2.843	G783
515		36	38.75	137	1.44	47.4	979858.322	0.752	-4.832	G783
516		36	39.42	137	0.22	32.2	979861.299	0.616	-5.935	G783
517		36	39.80	137	2.23	62.1	979858.218	0.700	-3.625	G783
518		36	39.11	137	2.31	52.7	979860.321	0.765	-2.302	G783
519		36	39.40	137	1.64	39.5	979861.529	0.668	-4.195	G783
520		36	39.76	137	1.15	37.1	979862.122	0.595	-4.664	G783
521		36	39.05	137	1.18	44.3	979859.194	0.667	-5.085	G783
522		36	38.15	137	0.78	53.2	979858.329	0.765	-2.811	G783
523		36	37.61	137	0.01	61.6	979856.767	0.794	-1.920	G783
524		36	40.24	137	4.88	19.9	979868.020	0.964	-2.458	G947
525		36	40.88	137	4.77	14	979870.012	0.727	-2.782	G947
526		36	40.33	137	4.31	21	979868.488	0.917	-1.951	G947
527		36	44.98	137	4.83	3.4	979879.252	0.407	-1.858	G783
528		36	44.59	137	2.82	8.2	979879.648	0.382	0.016	G783
529		36	44.77	137	1.77	13	979881.542	0.361	2.569	G783
530		36	41.90	137	3.86	19	979870.305	0.539	-3.171	G783
531		36	42.20	137	2.67	11.8	979872.977	0.483	-2.397	G783
532		36	42.78	137	1.48	12.7	979874.490	0.423	-1.606	G783
533		36	43.16	137	1.86	16.8	979874.769	0.445	-1.051	G783
534		36	43.60	137	2.30	14.3	979876.065	0.429	-0.896	G783
535		36	42.18	137	4.72	7.4	979872.114	0.558	-4.018	G783
536		36	44.12	137	4.27	5	979876.535	0.428	-2.999	G783
537		36	44.67	137	4.65	2.8	979878.345	0.416	-2.426	G783
538		36	44.85	137	4.15	4.7	979879.343	0.398	-1.334	G783
539		36	44.27	137	3.62	5.5	979877.969	0.409	-1.702	G783
540		36	43.21	137	3.70	8.4	979873.567	0.459	-3.956	G783
541		36	42.67	137	4.15	9.2	979872.195	0.498	-4.352	G783
542		36	42.61	137	3.53	10.5	979872.865	0.483	-3.356	G783
543		36	42.95	137	2.93	7.9	979874.819	0.453	-2.432	G783

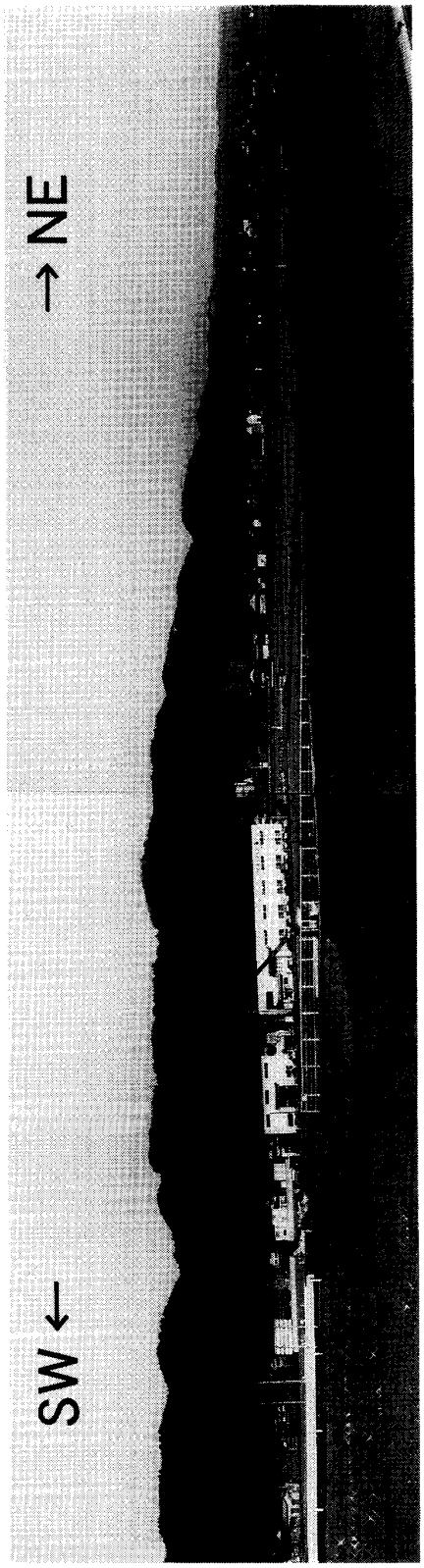
544		36	42.30	137	2.18	13.1	979873.093	0.465	-2.189	G783
545		36	42.90	137	0.92	12.6	979875.242	0.402	-1.068	G783
546		36	43.16	137	0.27	10.3	979876.878	0.381	-0.278	G783
547		36	41.70	137	2.46	16.2	979871.703	0.508	-2.063	G783
548		36	41.93	137	2.00	14.5	979872.217	0.476	-2.246	G783
549		36	41.98	137	1.24	6.3	979872.126	0.517	-3.974	G783
550		36	41.39	137	1.49	19.8	979870.094	0.495	-2.533	G783
551	1	36	40.87	137	1.33	24.6	979867.855	0.517	-3.059	G783
552		36	40.90	137	0.29	34.1	979864.181	0.508	-4.925	G783
553		36	41.82	137	0.24	18.3	979870.591	0.433	-3.012	G783
554		36	42.56	137	0.22	13.3	979874.559	0.401	-1.124	G783
555		36	43.54	137	0.18	8.7	979877.853	0.367	-0.179	G783
556		36	44.15	137	0.39	6.7	979880.361	0.352	1.041	G783
557		36	44.13	137	1.39	9.9	979879.635	0.367	0.985	G783
558		36	44.08	137	1.94	8.2	979879.123	0.377	0.223	G783
559		36	43.44	137	1.34	10.9	979877.072	0.394	-0.358	G783
560		36	41.24	137	2.99	17.9	979870.228	0.608	-2.441	G783
561		36	40.31	137	3.15	41.4	979864.381	0.896	-2.056	G783
562		36	41.04	137	2.05	23	979869.222	0.538	-2.230	G783
563		36	40.26	137	2.19	54.7	979860.203	0.620	-3.833	G783
564		36	44.94	137	2.31	6.9	979882.263	0.363	1.852	G947
565		36	44.47	137	0.75	9.1	979881.135	0.351	1.822	G947
566		36	44.53	137	0.12	5	979881.913	0.348	1.707	G947
567		36	44.03	137	0.93	10	979879.403	0.361	0.911	G947
568		36	43.73	137	0.65	8.5	979878.758	0.369	0.414	G947
569		36	43.33	137	0.72	12	979876.740	0.383	-0.327	G947
570		36	43.70	137	1.22	10.4	979877.762	0.376	-0.160	G947
571		36	43.74	137	1.84	10.6	979877.875	0.392	-0.049	G947
572		36	44.41	137	1.79	8.7	979880.206	0.364	0.914	G947
573		36	44.52	137	2.30	8	979880.396	0.373	0.817	G947
574	3	36	45.45	137	3.99	3.9	979881.488	0.374	-0.236	G783
575		36	46.09	137	4.55	2.2	979882.865	0.366	-0.125	G783
576		36	46.41	137	4.72	1.6	979883.678	0.358	0.101	G783
577		36	47.12	137	4.93	1.3	979885.581	0.340	0.901	G783
578		36	47.08	137	4.27	5.7	979886.262	0.345	2.506	G783
579		36	46.27	137	3.51	5.5	979884.551	0.354	1.935	G783
580		36	45.79	137	3.29	7	979882.849	0.359	1.226	G783
581		36	45.48	137	1.32	6.3	979884.758	0.346	3.432	G783
582		36	45.79	137	0.98	8.4	979886.393	0.367	5.052	G783
583		36	46.08	137	0.70	4.8	979889.099	0.420	6.687	G783
584		36	46.43	137	0.45	8.4	979891.072	0.662	9.101	G783
585		36	47.16	137	0.19	31.8	979890.521	1.044	12.459	G783
586		36	47.81	137	0.34	38.6	979891.828	1.030	14.144	G783
587		36	48.40	137	0.19	26.5	979894.644	0.394	13.102	G783
588		36	48.45	137	0.70	23.9	979894.470	0.575	12.528	G783
589		36	48.77	137	1.02	11.5	979897.367	0.458	12.417	G783

590		36 49.88	137	0.70	3.2	979901.232	0.239	12.833	G783
591		36 45.43	137	2.76	5.7	979883.242	0.356	1.881	G783
592		36 46.50	137	2.02	4.5	979888.865	0.585	5.952	G783
593		36 46.37	137	1.36	4.4	979890.019	0.812	7.502	G783
594		36 47.11	137	0.81	252.4	979837.946	6.279	8.421	G783
595		36 47.41	137	1.08	213.3	979851.988	2.831	10.915	G783
596		36 47.46	137	1.89	151.6	979862.754	1.667	8.350	G783
597		36 47.46	137	2.55	89.7	979874.659	1.082	7.542	G783
598		36 47.70	137	2.83	77.2	979877.136	1.156	7.297	G783
599	1	36 48.14	137	3.14	7.9	979893.570	0.512	8.880	G783
600		36 48.32	137	3.17	41.8	979884.843	0.856	6.875	G783
601		36 48.82	137	1.91	9.4	979896.688	0.436	11.233	G783
602	2	36 48.60	137	1.30	88	979879.182	1.968	10.970	G947
603		36 49.09	137	1.72	4	979898.112	0.316	11.089	G947
604		36 49.59	137	0.94	4.4	979899.281	0.253	11.551	G947
605		36 49.18	137	0.56	5	979899.578	0.280	12.585	G947
606		36 48.86	137	0.14	10.3	979899.355	0.370	13.952	G947
607		36 48.17	137	2.35	32.1	979891.196	1.548	12.237	G947
608		36 47.81	137	3.63	2.6	979891.804	0.342	6.383	G947
609		36 47.05	137	3.11	21	979885.975	0.413	5.326	G947
610		36 47.23	137	2.98	18.2	979887.960	0.426	6.516	G947
611		36 47.06	137	2.38	25.8	979887.511	0.866	8.241	G947
612		36 46.92	137	2.04	12.6	979890.523	1.056	9.060	G947
613		36 46.02	137	1.48	6	979887.560	0.395	5.445	G947
614	2	36 46.59	137	1.34	55	979881.496	0.794	8.551	G947
615	2	36 47.78	137	2.22	50	979888.599	1.471	13.632	G947
616	2	36 47.94	137	1.65	100	979879.656	1.175	13.956	G947
617	2	36 47.75	137	1.18	122	979874.978	1.381	14.069	G947
618		36 48.05	137	1.03	152.2	979866.863	1.725	11.782	G947
619		36 46.06	137	0.31	4.5	979888.788	0.397	6.323	G947
620		36 45.52	137	0.31	4.4	979886.036	0.347	4.282	G947
621		36 45.29	137	0.72	5	979885.139	0.345	3.832	G947
622		36 45.07	137	0.28	6.5	979883.887	0.339	3.186	G947
623		36 46.23	137	1.71	3.3	979888.075	0.444	5.177	G947
624		36 46.03	137	2.80	2.8	979885.047	0.358	2.254	G947
625		36 46.78	137	3.45	2.1	979887.615	0.354	3.597	G947
626		36 47.05	137	3.83	1.3	979887.861	0.344	3.286	G947
627		36 45.66	137	2.53	5.4	979883.736	0.354	1.982	G947
628		36 45.32	137	2.30	6.1	979883.290	0.356	2.166	G947
629		36 45.06	137	2.77	5.5	979882.144	0.364	1.287	G947
630		36 45.15	137	1.72	6.6	979882.945	0.350	2.159	G947
631		36 45.67	137	1.91	6.8	979884.493	0.354	2.999	G947
632	2	36 47.00	137	1.08	200	979856.253	3.515	13.849	G947
633		36 50.24	137	0.29	2.6	979903.523	0.226	14.473	G783
634		36 53.66	137	0.02	9.5	979929.082	1.136	37.347	G783

635		36	53.22	137	0.28	3.9	979925.384	0.430	32.483	G783
636		36	53.88	137	0.87	3.9	979928.091	0.767	34.572	G783
637		36	54.37	137	1.19	9.8	979928.716	0.447	35.329	G783
638		36	54.77	137	0.71	9.3	979934.414	0.772	40.670	G783
639		36	54.06	137	1.02	4.9	979928.565	0.558	34.773	G947
640		36	53.42	137	0.52	3.3	979926.084	0.384	32.730	G947
641	2	36	53.77	137	0.26	4	979920.742	0.672	34.356	G947
642		36	55.17	137	1.98	1.7	979929.174	0.555	33.146	G783
643		36	55.71	137	1.75	6.2	979935.252	0.791	39.560	G783
644		36	55.65	137	1.00	24.6	979937.138	1.098	45.442	G783
645		36	56.06	137	1.78	3.8	979938.903	0.658	42.101	G783
646		36	56.21	137	1.80	3.1	979940.287	0.718	43.191	G783
647		36	56.57	137	1.50	65.3	979933.371	1.215	48.431	G783
648		36	57.23	137	1.31	127.9	979924.465	1.672	51.291	G783
649		36	56.96	137	1.41	78.2	979933.016	1.058	49.882	G783
650		36	56.70	137	2.40	5.1	979939.876	0.732	42.476	G783
651		36	57.29	137	3.05	3.2	979941.649	0.538	42.829	G783
652		36	57.50	137	2.57	72.8	979930.792	0.866	45.626	G783
653		36	57.51	137	2.06	137.8	979918.764	1.144	46.596	G783
654		36	57.44	137	1.53	141.9	979920.642	1.258	49.493	G783
655		36	58.17	137	3.34	3	979943.939	0.506	43.774	G783
656		36	57.77	137	3.51	2.7	979942.870	0.418	43.137	G783
657		36	56.31	137	0.70	31.1	979943.500	1.584	52.608	G783
658	2	36	56.80	137	0.42	150	979921.827	1.308	53.242	G783
659	2	36	57.49	137	0.21	290	979893.963	3.471	53.991	G783
660		36	55.06	137	0.09	22.6	979936.881	0.930	45.479	G783
661		36	55.56	137	1.51	11.2	979934.554	0.911	40.178	G947
662		36	56.33	137	1.42	13.8	979941.681	0.994	46.782	G947

PLATE 1

Fault topography of the Isurugi fault. Looking northwest from near the Oyabe River.


NE
SW

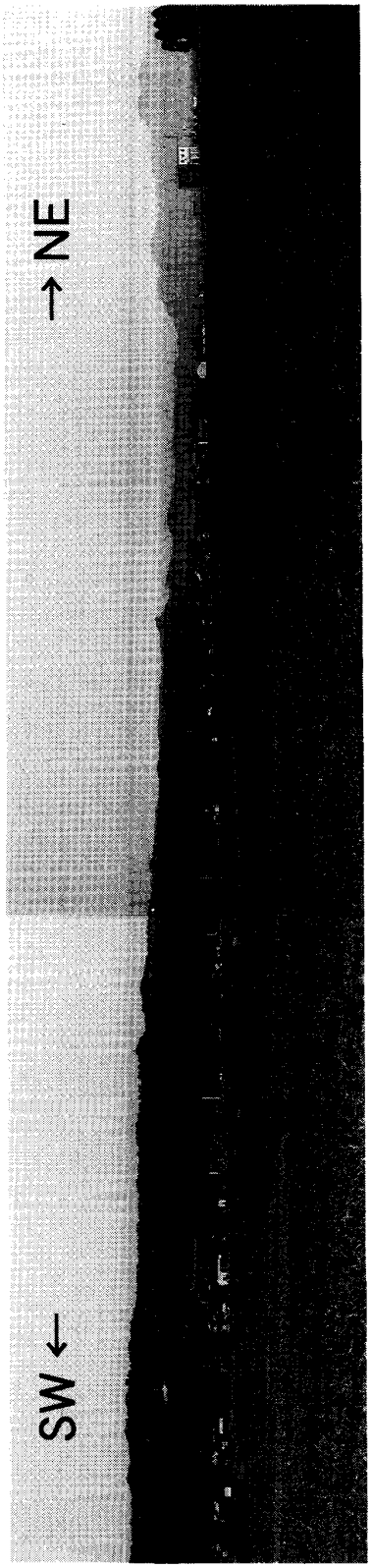
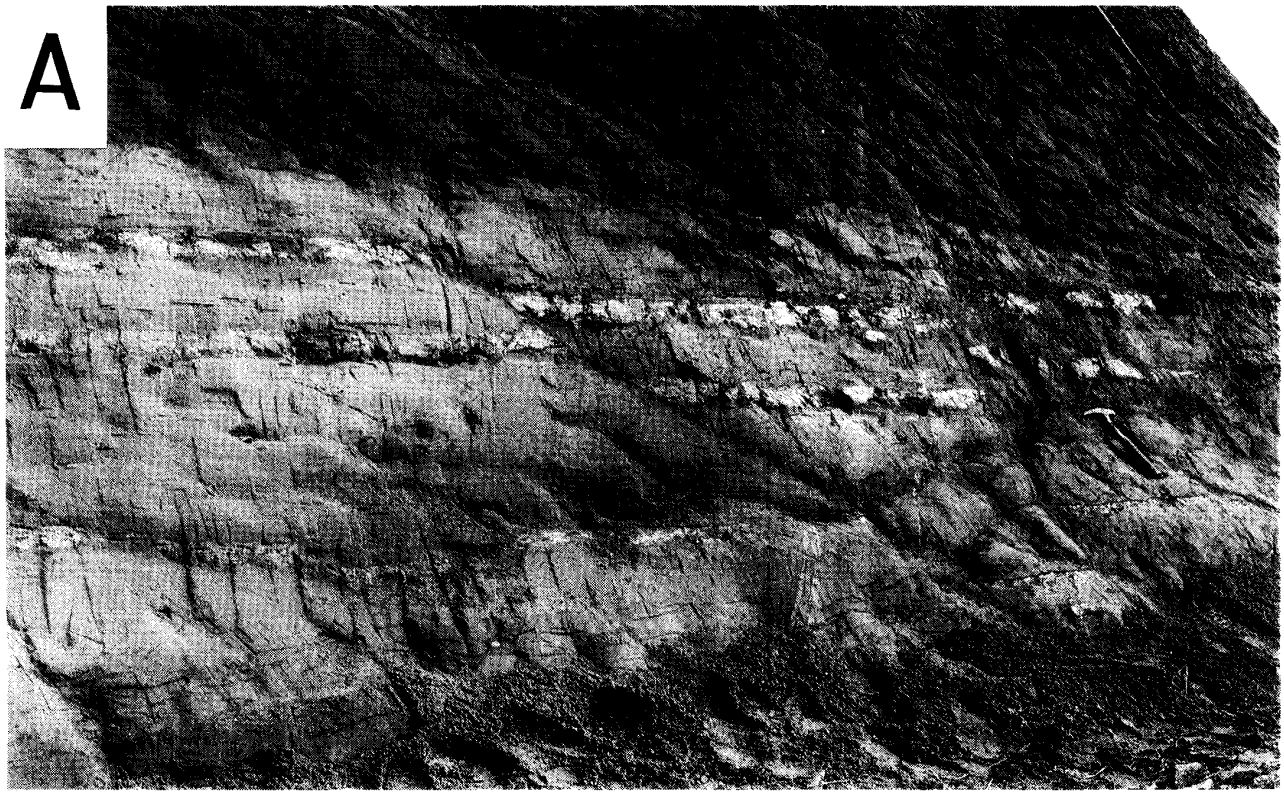

NE
SW

PLATE 2

Small-scale normal faults cutting the Pliocene sandstone and mudstone at Location 1 on Fig. 5. A: normal fault in center runs in N 7 W, 55 NE. B: several normal faults are seen, showing a general trend of N 40 E, 65 NW.


A


B