GRAVITY SURVEY IN LÜTZOW-HOLM BAY AND THE MIZUHO PLATEAU, EAST ANTARCTICA, 1981

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1. Introduction

The gravity is one of the most important and fundamental geophysical data in Antarctica. Since the International Geophysical Year of 1957-58, many gravity measurements have been carried out by the expeditions of various countries in Antarctica.

The 6th Japanese Antarctic Research Expedition (JARE-6) established a pendulum gravity station at Syowa Station using the GSI pendulum gravimeter (Harada et al., 1963). JARE-9 made the round-trip gravity measurements between Syowa Station and the South Pole by the use of a LaCoste-Lomberg gravimeter (Yanai and Kakinuma, 1971). In the Mizuho Plateau, many gravity measurements were made by the JARE field parties along the glaciological traverse routes (Yoshida and Yoshimura, 1972; Abe, 1975). Kaminuma et al. (1980) reported the gravity

measurements in ice-free areas at Cape Ryûgû and around Syowa Station (East and West Ongul Islands).

From April to December 1981, gravity measurements were carried out by the JARE-22 in the Lützow-Holm Bay region using LaCoste-Lomberg Model G gravimeter (No. G-183), and a total of 304 gravity stations were established. 117 stations out of 304 ones were in the ice-free areas around the Sôya Coast, 118 stations in the Mizuho Plateau and the Yamato Mountains, and 68 stations on sea ice in Lützow-Holm Bay. The results are tabulated in this report.

2. Measurements

The measurements were carried out in the following regions; 1) the ice-free areas around Lützow-Holm Bay, 2) on fast ice of Lützow-Holm Bay and 3) the Mizuho Plateau (on Syowa Station - Mizuho Station - the Yamato Mountains traverse routes and in the Yamato Mountains area).

Figure 1 shows gravity stations on fast ice and in small ice-free areas in Lützow-Holm Bay. The stations in the larger ice-free areas and the vicinity are given in Figs. 2-5. There are 41 gravity stations in the Ongul Islands (Fig. 2), 19 stations in Langhovde (Fig. 3), 23 stations in Skarvsnes (Fig. 4) and 7 stations in Skallen (Fig. 5). 27 stations are located in other small islands and the rock exposures on the Antarctic continental edge as shown with LUT01-28 in Fig. 1.

In ice-free areas around Lützow-Holm Bay, measurements were mostly made in the one-way round-trip along the

measurement route. However, at triangulation stations, measurements were made by the round-trip along the route or repeated twice measurements at the same station. The number of measurements was 250 times, while the number of gravity stations on the ice-free areas was 117 points.

Gravity measurements on sea ice were made from September 24th to October 6th, 1981. The gravity station was established usually every 4 km along the routes in echo-sounding survey of the submarine topography (Moriwaki and Yoshida, 1983). The number of stations on sea ice was 68 points, and the number of measurements was 71 times.

In the Mizuho Plateau, gravity measurements were made at every 10 km along the traverse routes from Mikaeri Terrace (S-16) to the Yamato Mountains through Mizuho Station, from November 22nd to December 25th, 1981. The number of gravity stations along the traverse routes was 68 points, and the number of measurements was 75 times. In the Yamato Mountains area, 50 gravity stations were established, and the number of measurements was 66 times.

3. Instrumental Drift

Drifts of the instrument were less than 30 μgal/day in most trips in ice-free areas in Lützow-Holm Bay. Before the start and after the end of the each measurement trip in the field, measurements were made at the gravity base point of Syowa Station. If the reading gravity values difference between the start and the end at Syowa Station was over

100 μgal, it was inferred that tear might have occurred during the measurements, and the gravity was re-measured.

In the measurements on sea ice, as mentioned in Section 6.1, the maximum error of measurements was estimated to be about 2 mgal. This value was much larger than the value of the drift. Therefore, the accuracy of data measured on sea ice is considerably low in comparison with the data in other areas.

In the measurements in the Mizuho Plateau, the drift of the gravimeter was -543 μgal/34days (-16.0 μgal/day) throughout all the measurements. The drift was assumed to have increased negative-linearly as time elapsed.

Corrections of drift of the instrument and the earth tide were made by the LaCoste Gravimetric Correction Program of Kyoto University (LGCP; Fukuda, personal communication).

4. Determination of Altitude

In coastal ice-free areas, many triangulation points were set up by the Geographical Survey Institute (G.S.I.) of Japan and the altitudes of these points were measured with the accuracy of centimeter. Triangulation points are shown with solid triangles in Figs. 1-5. In Figs. 1-5, an altitude value at a solid circle was estimated from the topographic maps and that at an open circle was determined by a hand-levelling compass.

In the measurements on sea ice, the altitude of the measurement point was always assumed to be 0 m, because all

measurements were made just on the surface of sea ice which was usually 5 to 10 cm above sea surface at that time.

From Mikaeri Terrace (S-16) to Mizuho Station, the altitudes of the measurement points were based on the results of the triangulation survey by JARE-14 (Naruse and Yokoyama, 1975), and the altitudes were determined by the Paulin barometric altimeters from Mizuho Station to the Yamato Mountains. In the Yamato Mountains, the altitudes were determined from the maps of Geographical Survey Institute. In the Minami-Yamato Nunataks and the Kabuto Nunatak, the altitudes determined by a barometric altimeter (Yokoyama, 1976) were used.

5. Data Reduction

The gravity value at Syowa gravity standard station was determined as 982525.6 mgal in the Japan gravity standardization net 1975 (JGSN75; Suzuki, 1976). All gravity values obtained from the measurements by JARE-22 were determined by referring to the gravity at the Syowa gravity standard station. No terrain correction was applied for data reduction. The normal gravity γ was calculated from the following equation of Gravity Formula 1967:

$$\gamma=(A\cdot GE\cdot\cos^2\phi+B\cdot GP\cdot\sin^2\phi)/SQRT(A^2\cos^2\phi+B^2\sin^2\phi)$$

where

A=6378.14(km)(equatorial radius of the earth)

B=A·(1-1/298.257)(polar radius of the earth)

GE=978031.846(mgal)(gravity value at the equator)

GP=983217.728(mgal)(gravity value at the poles)

ϕ : geographic latitude.

Free air anomaly Δg_0 and simple Bouguer anomaly $\Delta g_0''$ were calculated by the following equations:

$$\Delta g_0 = g - \gamma + 0.3086 \cdot H + 0.87 - 0.0000965 \cdot H$$

$$\Delta g_0'' = \Delta g_0 - 0.0419 \cdot \rho_1 \cdot H \quad ; \text{ in ice-free area}$$

$$\Delta g_0'' = \Delta g_0 - 0.0419 \cdot \rho_1 \cdot (H - IC) - 0.0419 \cdot \rho_2 \cdot IC \quad ; \text{ in the Mizuho Plateau}$$

$$\Delta g_0'' = \Delta g_0 + 0.0419 \cdot \rho_3 \cdot DPT \quad ; \text{ on sea ice}$$

where g is the gravity value corrected after the instrumental drift and the earth tide at a gravity station in mgal, H the altitude of a gravity station in meters, ρ_1 the density of bedrock (2.67 g/cm^3), IC the thickness of the ice sheet at a gravity station in meters, ρ_2 the density of ice (0.90 g/cm^3), ρ_3 the density difference between sea water and bedrock (1.64 g/cm^3), DPT the depth of the sea (Moriwaki and Yoshida, 1983). 0.87-0.0000965·H is a term of atmospheric correction. The results are given in Tables 1, 2 and 3. Table 1 is the gravity measurements on sea ice in Lützow-Holm Bay, Table 2 in ice-free areas in the Lützow-Holm Bay region

and Table 3 in the Mizuho Plateau and the Yamato Mountains. The letters A, B and C in remarks in Table 2 indicate the degree of the accuracy in the altitude determination at each station. "A" is the triangulation points. "B" shows that the altitude was determined from the topographic map and "C" by a hand-levelling compass. Figures 8-21 show the distribution of free air and simple Bouguer anomalies.

6. Accuracy

6.1. Accuracy of the gravity measurements

As mentioned before, the drift and the earth tide corrections were made by the LGCP. The standard deviation of determined gravity values is 52 μgal in ice-free areas and 222 μgal in the Mizuho Plateau. These values are equal to the degree of accuracy of gravity value in each area.

The crosshair of gravimeter kept moving slowly during measurements on sea ice due perhaps to tidal effect. The accuracy of the gravity measurements was estimated to be within 2 mgal from the amplitude of the crosshair movement.

6.2. Accuracy of free air and simple Bouguer anomaly

The altitude in ice-free areas was measured with three different methods, as mentioned before. The altitude at a triangulation point was determined by the optical levelling referring to the mean sea level and its accuracy was an order of 1 cm. This value causes an error of about 3 μgal in both free air and Bouguer anomalies. It is very small in

comparison with standard deviation of solutions. Therefore, the total accuracy of gravity anomaly values at a triangulation point is the same order of the standard deviation of solutions (52 μgal). The maximum error was estimated to be 0.5 m in determination of altitudes according to the topographic maps or by the hand-levelling compass surveying. This value causes an error of about 0.15 mgal in both free air and simple Bouguer anomalies.

The most difficult problem in the determination of gravity anomaly in the ice plateau of Antarctica is a large error in the altitude measurement at each station.

In the Mizuho Plateau, the altitude was measured by a Wild T2 theodolite or a barometric altimeter, the data was adopted for the gravity data reduction. Therefore, the maximum error of altitude at the gravity stations in the Mizuho Plateau might have reached an order of 10 m. This value causes an error of about 3.1 mgal in free air anōmaly. Furthermore, it is necessary to know the ice thickness for determing the simple Bouguer anomaly. The ice thickness was partly determined by radio echo sounding (Naruse and Yokoyama, 1975) from Syowa Station to Mizuho Station. But the accuracy of the ice thickness seems to be several tens of meters. If the density contrast between the ice sheet and bedrock is assumed 1.77 g/cm^3, an error of 100 m in the ice thickness causes about an error of about 7.4 mgal in simple Bouguer anomaly.

Acknowledgments

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Yoshida, M. and Yoshimura, A. (1972): Gravimetric survey in the Mizuho Plateau-West Enderby Land area, East Antarctica, 1969-1971. JARE Data Rep., 17 (Glaciol. 1), 168-203.

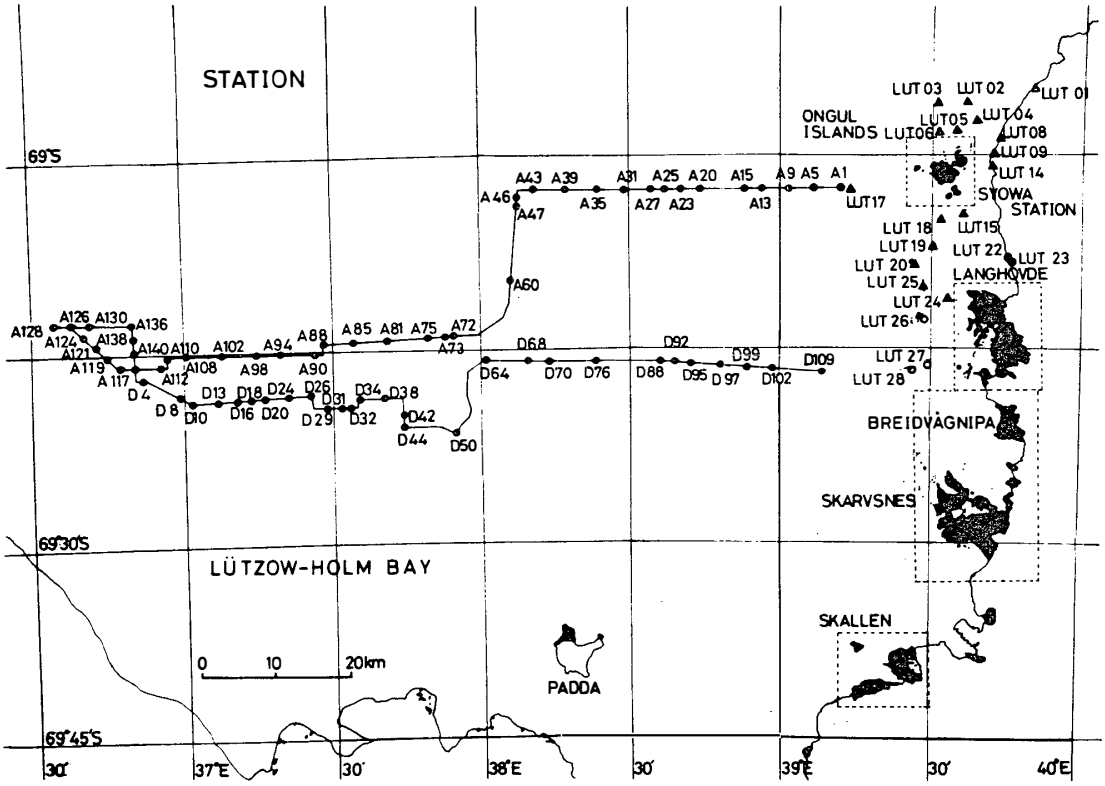

Fig. 1. The location of gravity stations in Lützow-Holm Bay. Stations from A-1 to D-109 are on sea ice and LUT01 to LUT28 in ice-free areas.

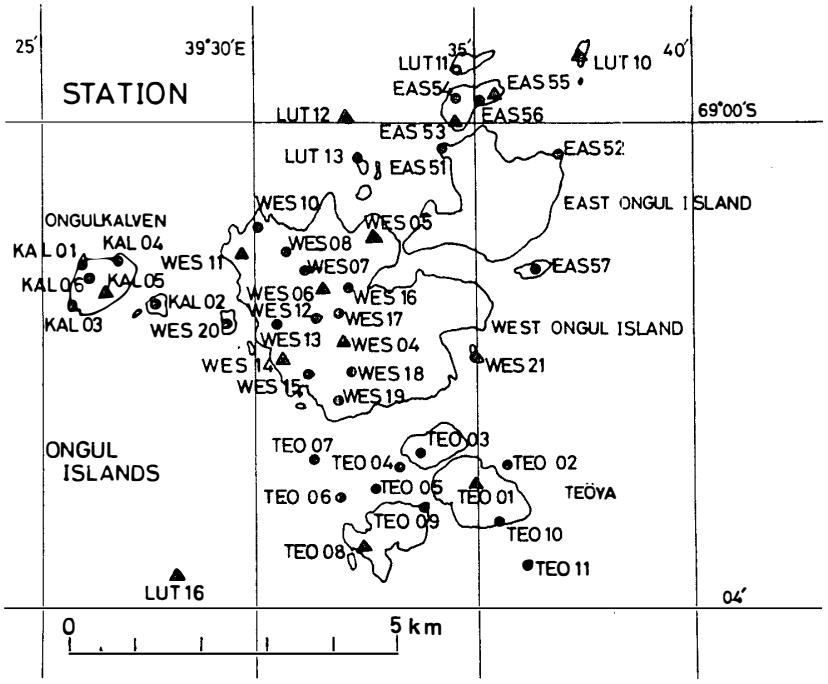

Fig. 2. Gravity stations in the Ongul Islands.

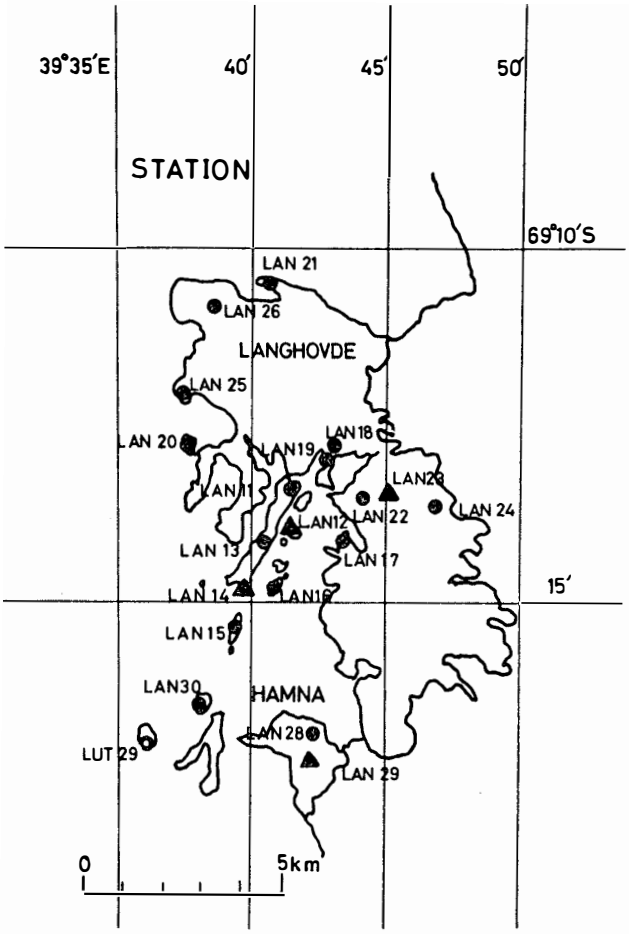

Fig. 3. Gravity stations in the Langhovde area.

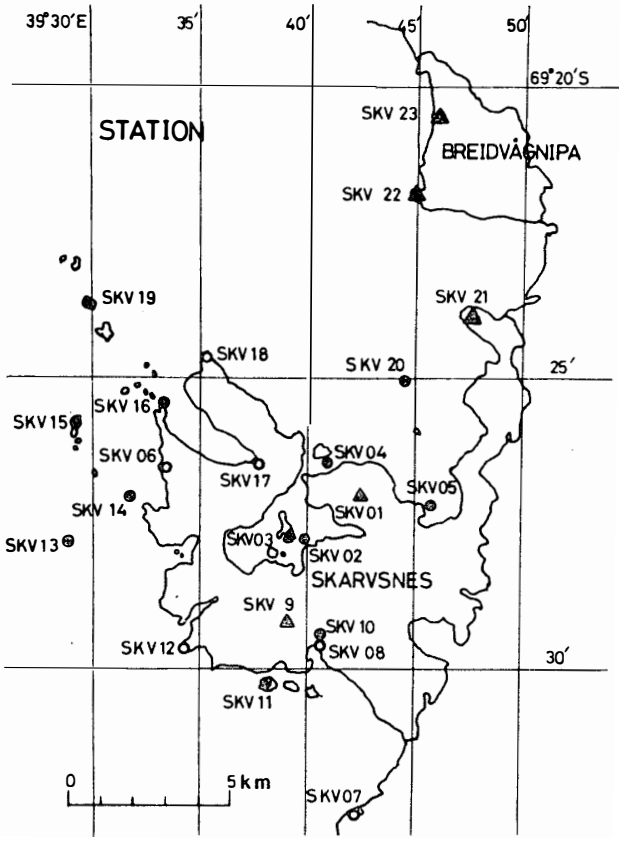

Fig. 4. Gravity stations in the Skarvsnes area.

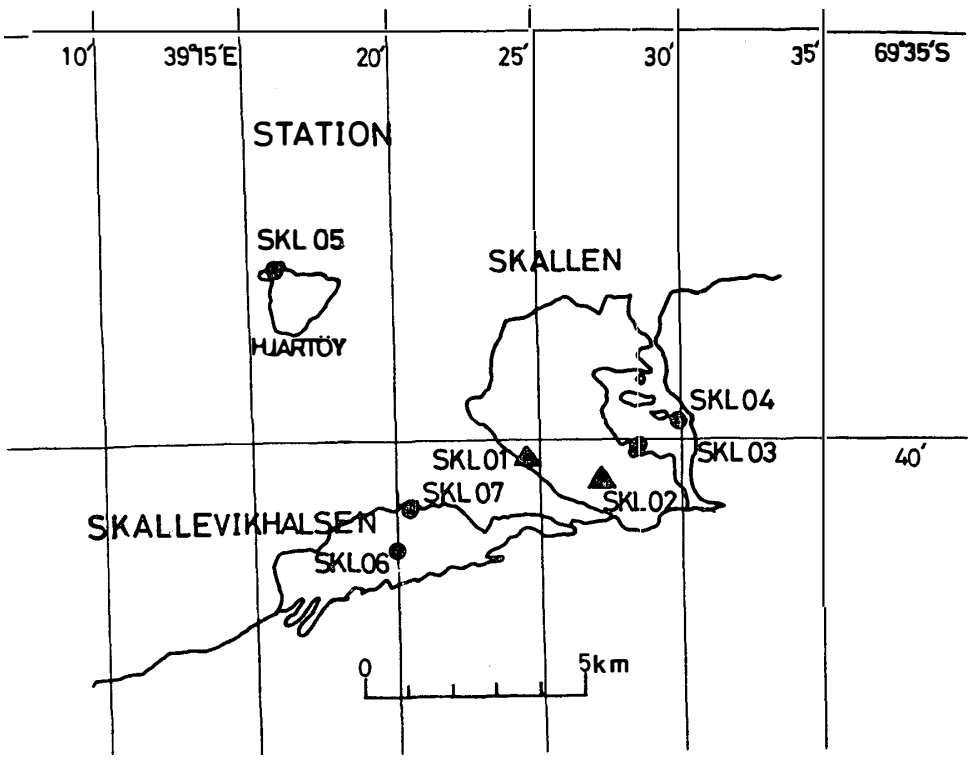

Fig. 5. Gravity stations in the Skallen and the Skallevikhalsen areas.

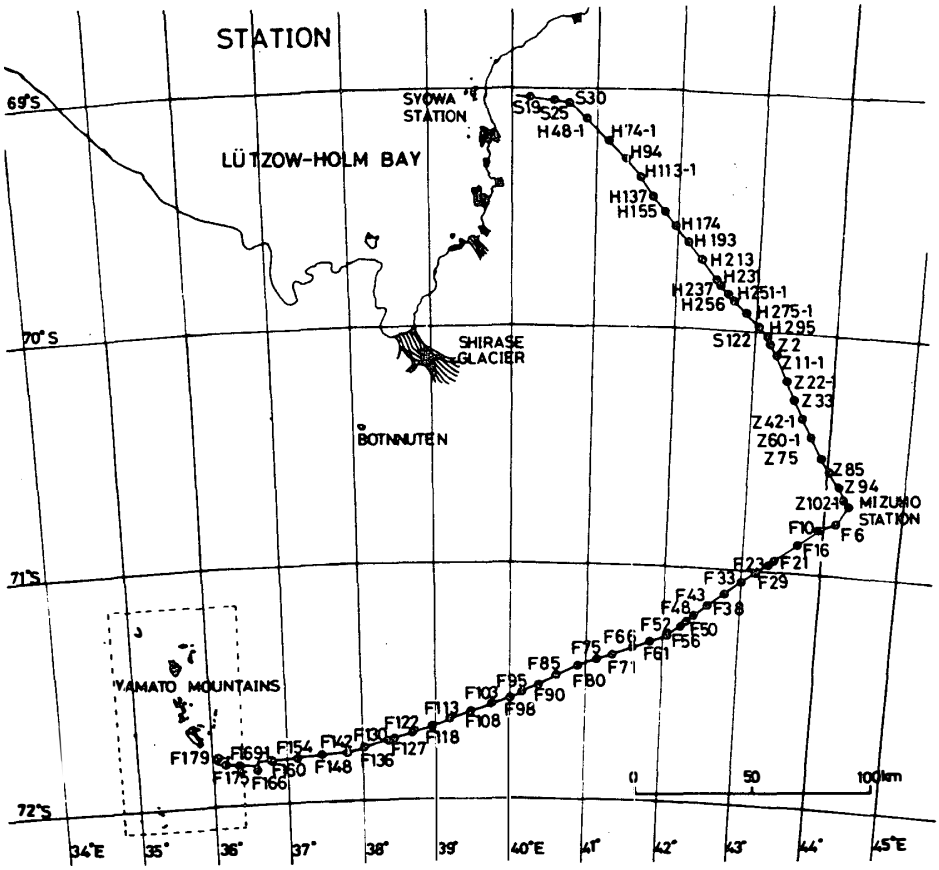

Fig. 6. Gravity stations along the traverse route in the Mizuho Plateau.

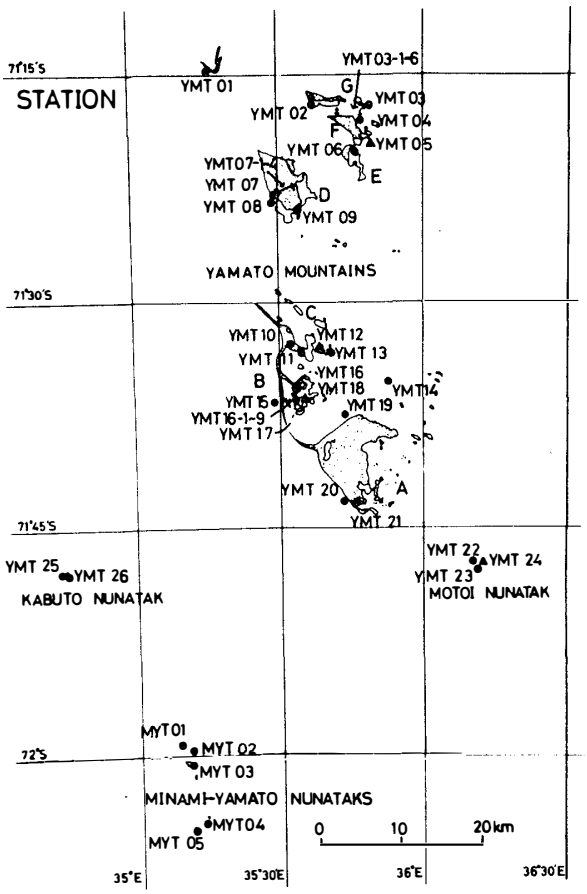

Fig. 7.

Gravity stations in the Yamato Mountains. YMT03-1~9, YMT07-1~4 and YMT16-1~9 are measurements on the cirque glaciers.

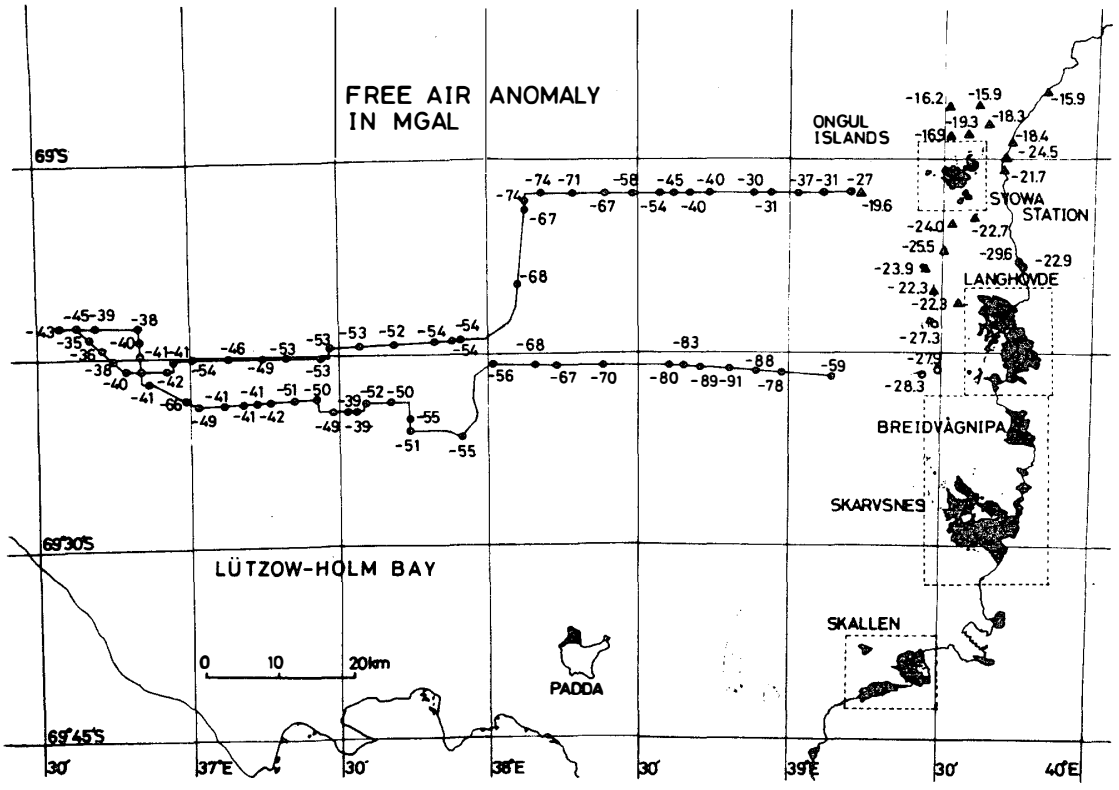

Fig. 8. Free air gravity anomaly in Lützow-Holm Bay. The data correspond to those in Table 1 and Table 2.

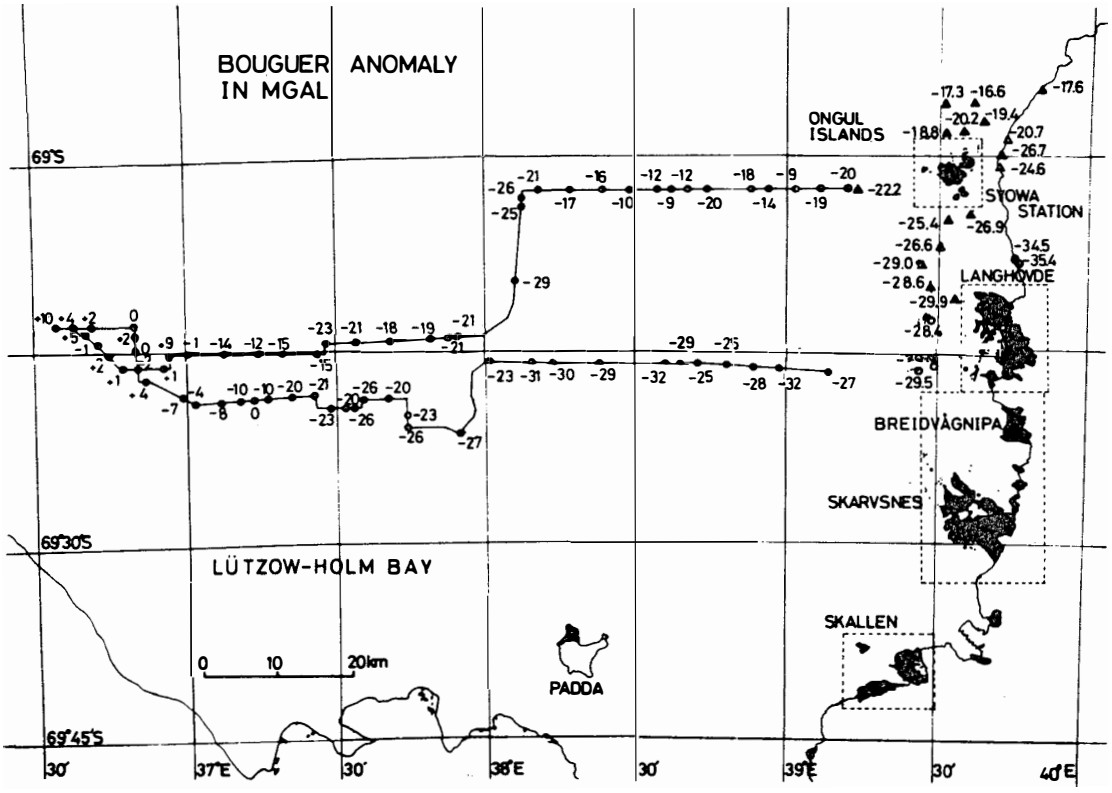

Fig. 9. Simple Bouguer gravity anomaly in Lützow-Holm Bay. The data correspond to those in Table 1 and Table 2.

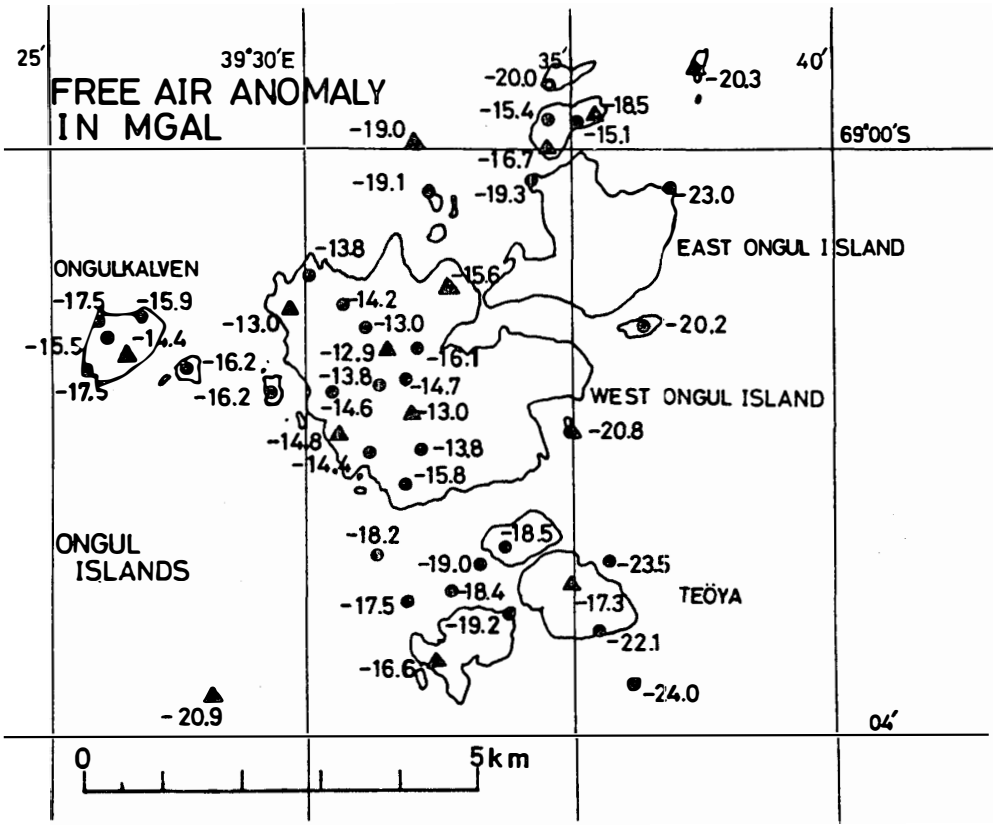

Fig. 10. Free air gravity anomaly in the Ongul Islands. The data correspond to those in Table 2.

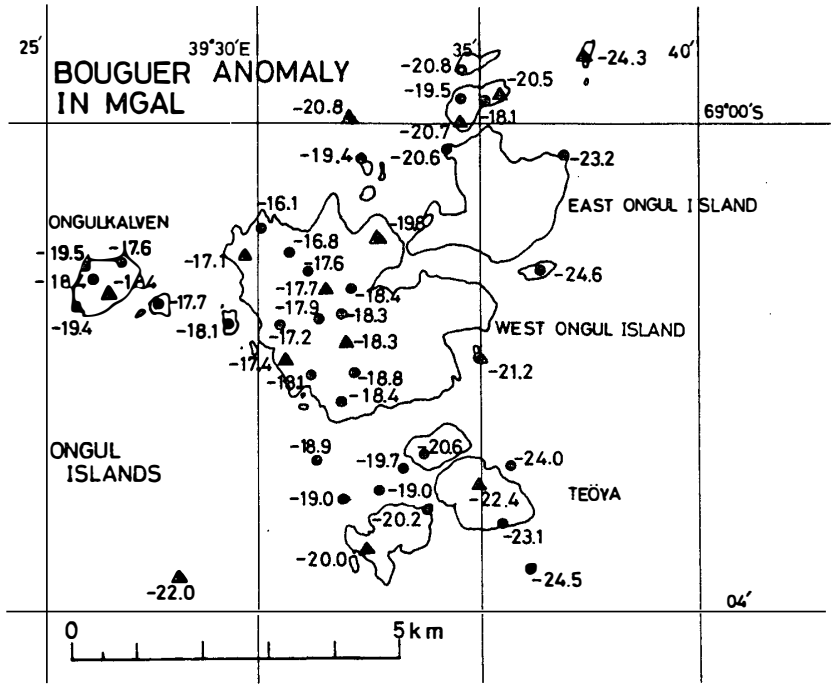

Fig. 11. Simple Bouguer gravity anomaly in the Ongul Island. The data correspond to those in Table 2.

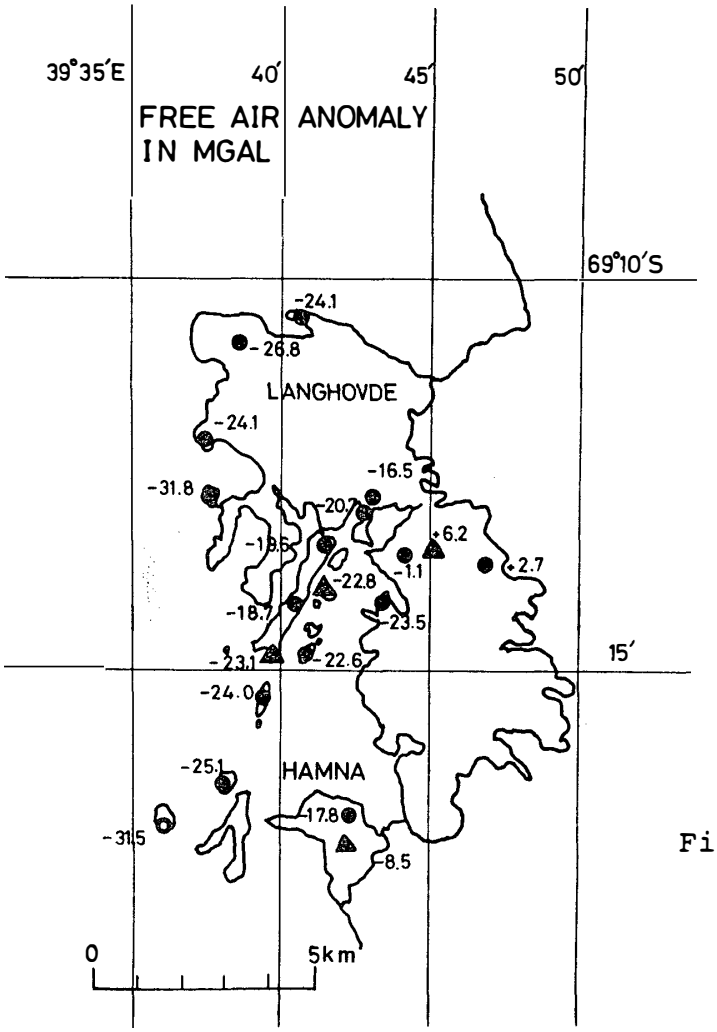

Fig. 12. Free air gravity anomaly in the Langhovde area. The data correspond to those in Table 2.

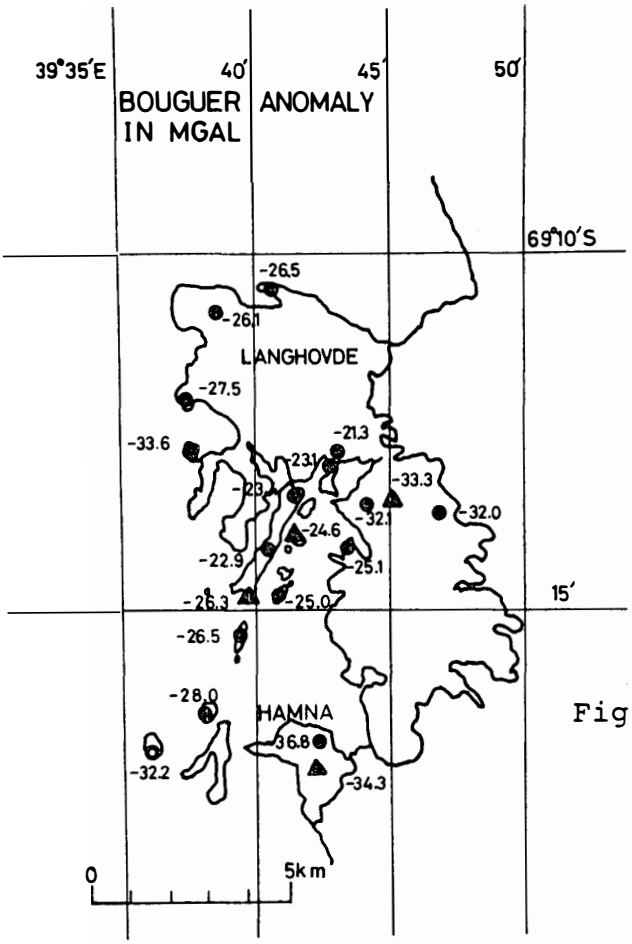

Fig. 13. Simple Bouguer gravity anomaly in the Langhovde area. The data correspond to those in Table 2.

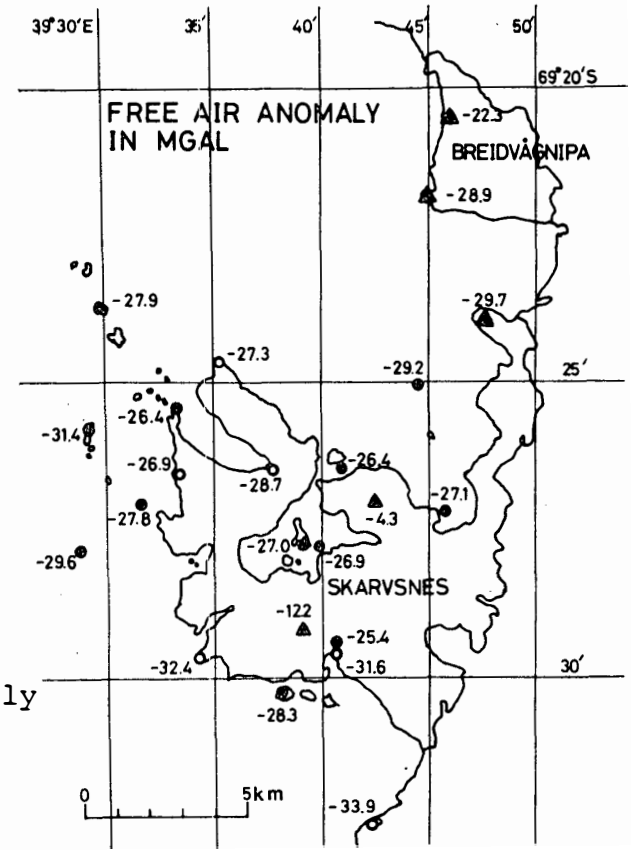

Fig. 14. Free air gravity anomaly in the Skarvsnes area. The data correspond to those in Table 2.

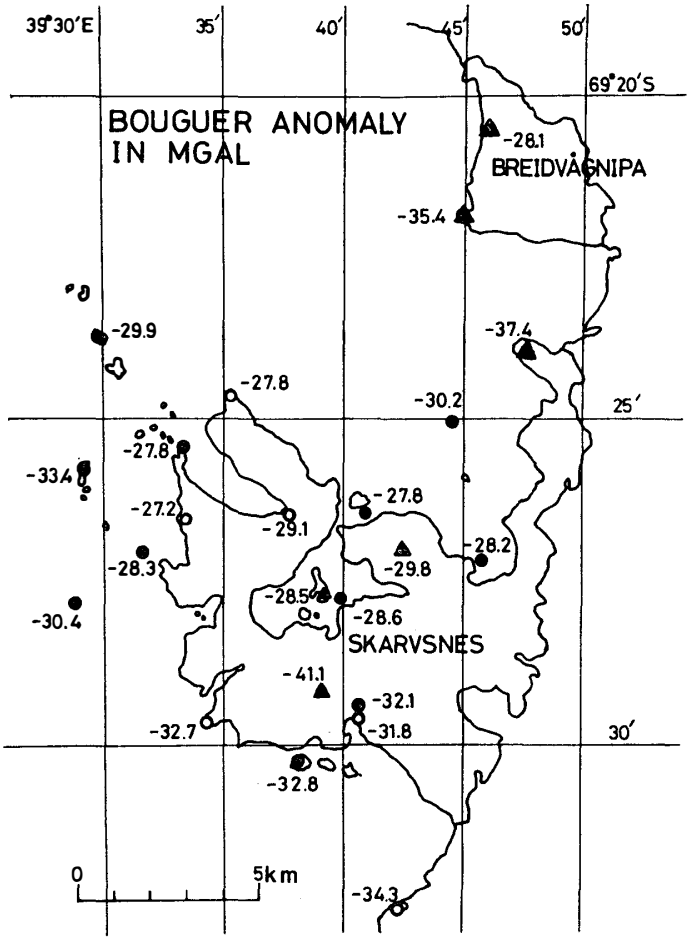

Fig. 15.
Simple Bouguer gravity anomaly in the Skarvsnes area. The data correspond to those in Table 2.

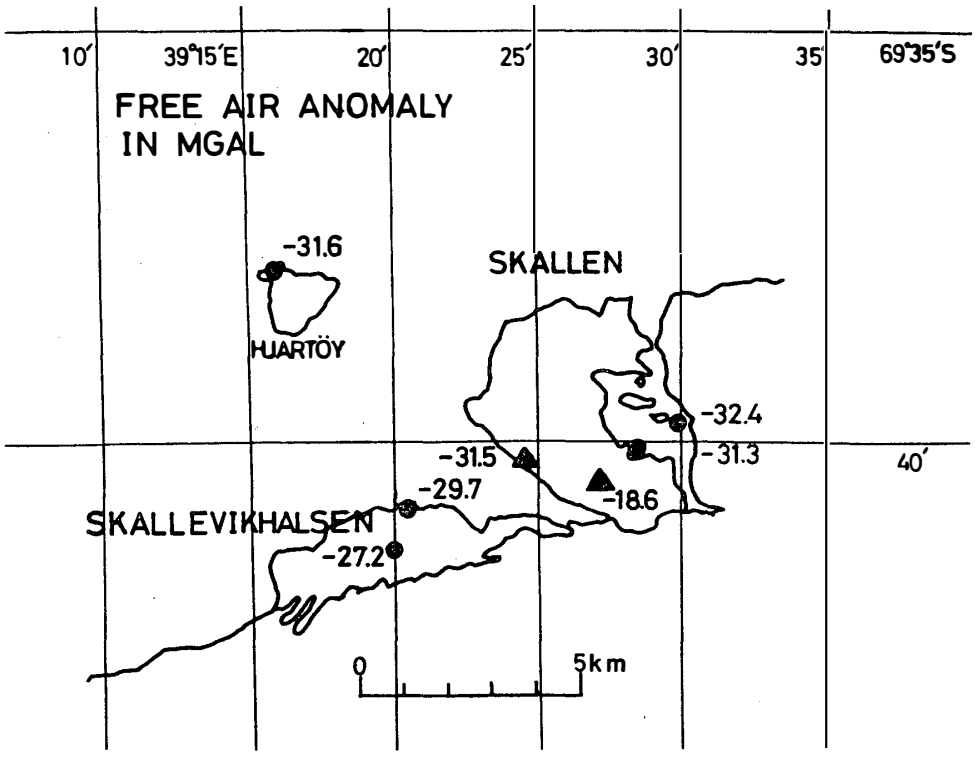

Fig. 16. Free air gravity anomaly in the Skallen and the Skallevikhalsen areas. The data correspond to those in Table 2.

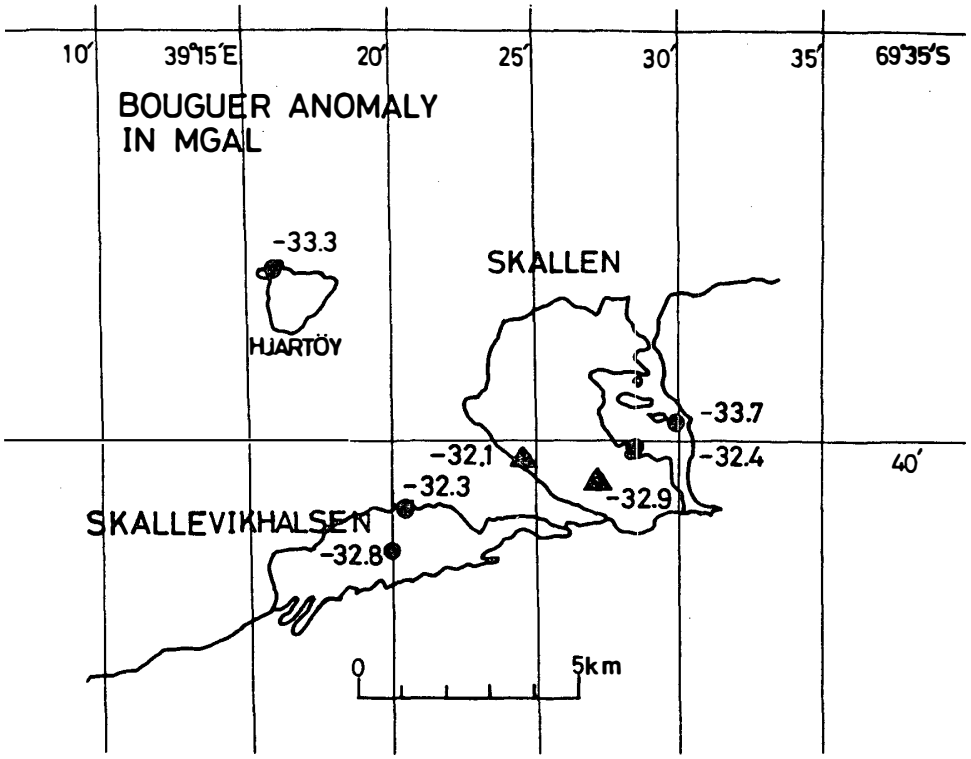

Fig. 17. Simple Bouguer gravity anomaly in the Skallen and the Skallevikhalsen areas. The data correspond to those in Table 2.

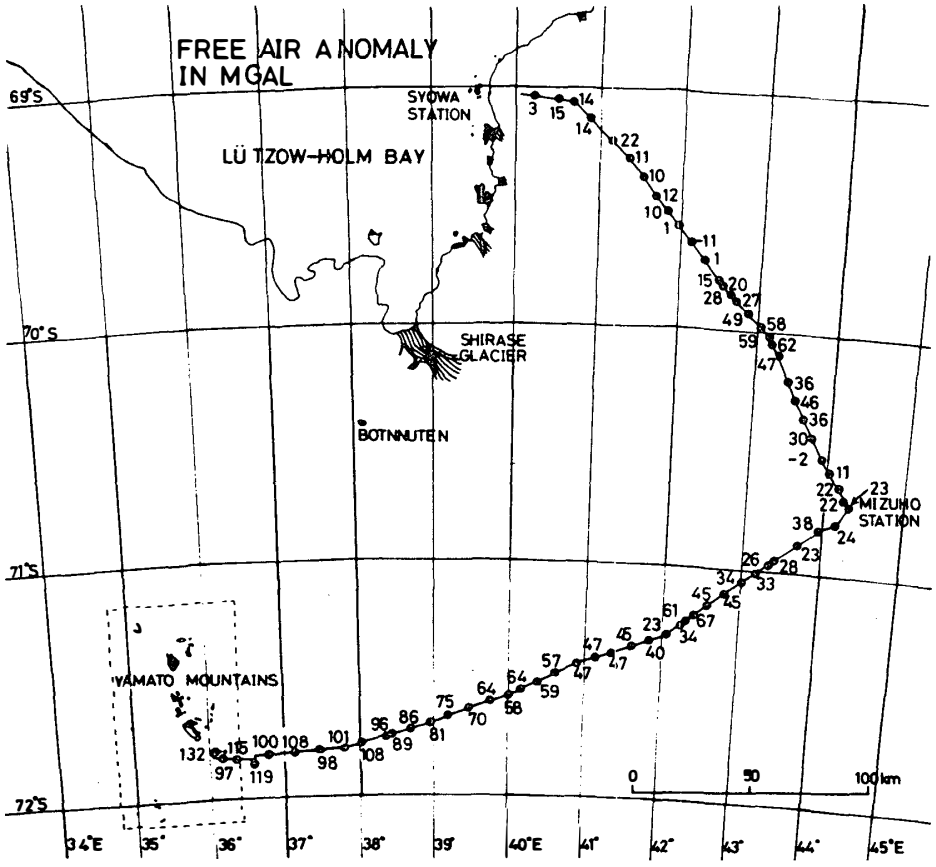

Fig. 18. Free air gravity anomaly in the Mizuho Plateau. The data correspond to those in Table 3.

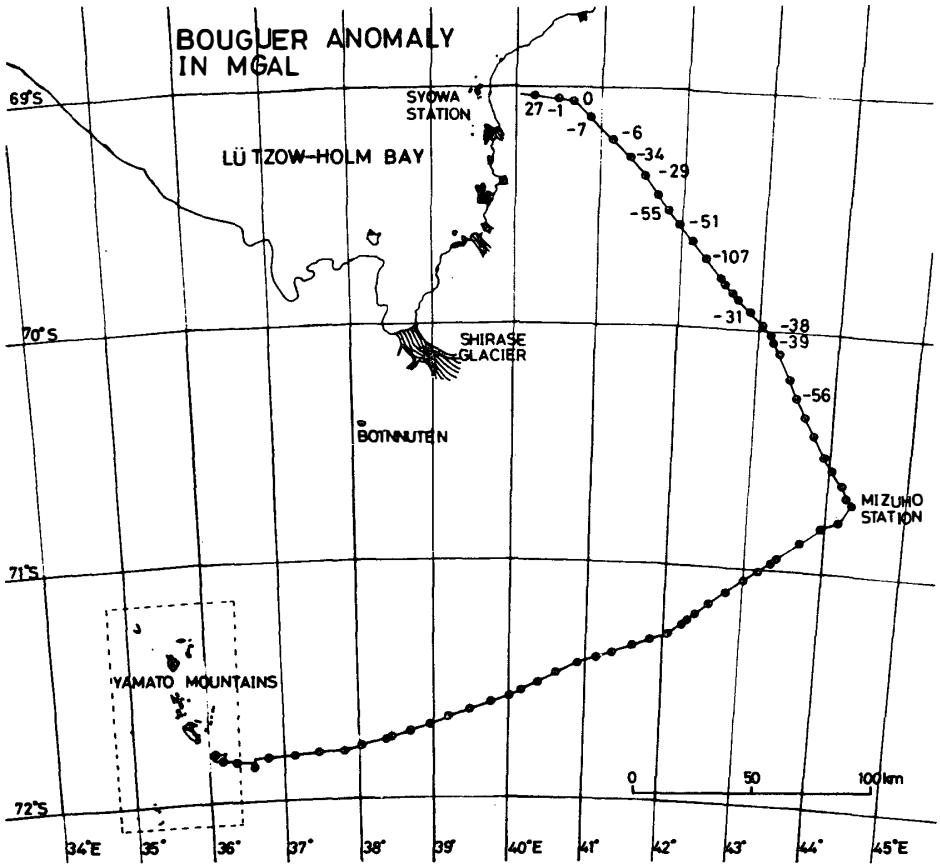

Fig. 19. Simple Bouguer gravity anomaly in the Mizuho Plateau. The data correspond to those in Table 3.

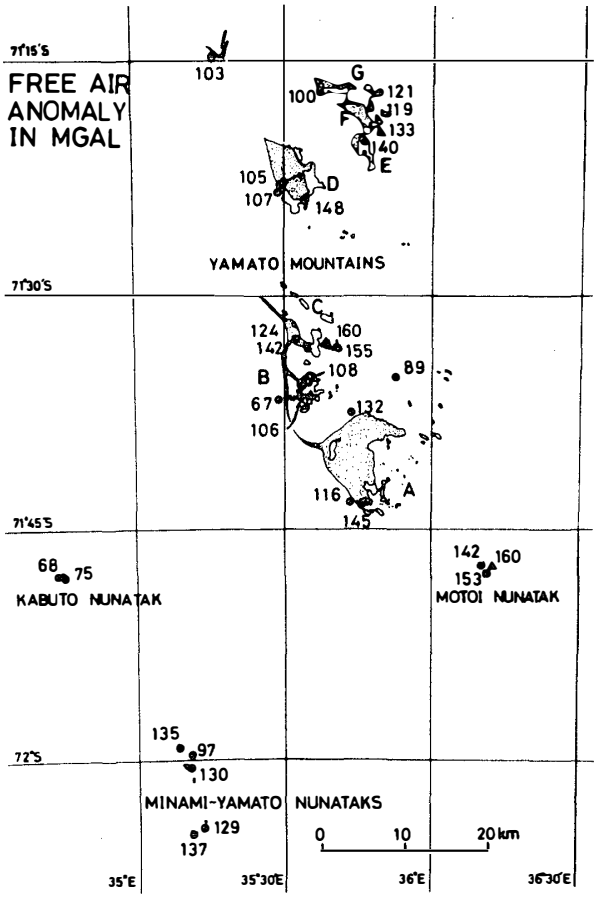

Fig. 20. Free air gravity anomaly in the Yamato Mountains. The data correspond to those in Table 3.

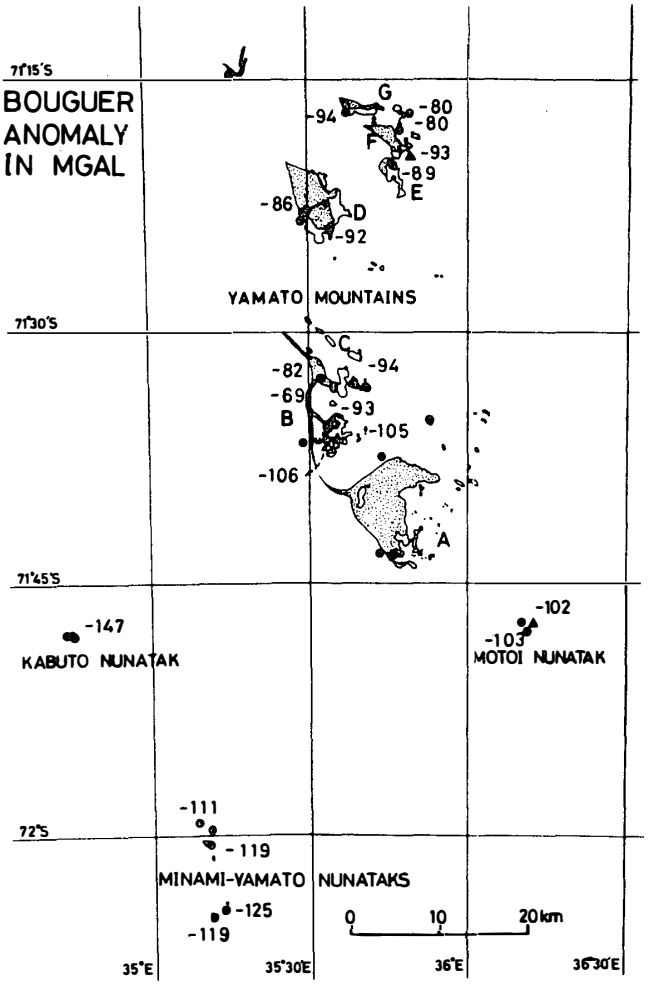

Fig. 21. Simple Bouguer gravity anomaly in the Yamato Mountains. The data correspond to those in Table 3.

Table 1. The results of gravity measurements on sea ice in Lützow-Holm Bay.

STATION NAME	GRAVITY VALUE (M-GAL)	FREE AIR ANOMALY (M-GAL)	BOUGUER ANOMALY (M-GAL)	LATITUDE DEG.MIN.	LONGITUDE DEG.MIN.	DEPTH (M)	NORMAL GRAVITY (M-GAL)
A- 1	982523.900	-26.903	-20.031	69 2.5	39 14.5	100	982551.673
A- 5	982519.800	-31.003	-19.665	69 2.5	39 8.1	165	982551.673
A- 9	982514.000	-36.803	-10.278	69 2.5	39 2.1	386	982551.673
A- 13	982520.100	-30.703	-15.036	69 2.5	38 56.1	228	982551.673
A- 15	982520.800	-30.003	-18.046	69 2.5	38 53.0	174	982551.673
A- 20	982511.100	-39.703	-20.737	69 2.5	38 45.3	276	982551.673
A- 23	982510.400	-40.403	-12.916	69 2.5	38 41.1	400	982551.673
A- 25	982505.400	-45.403	-10.358	69 2.5	38 37.9	510	982551.673
A- 27	982496.400	-54.403	-13.242	69 2.5	38 34.7	599	982551.673
A- 31	982492.500	-58.303	-10.958	69 2.5	38 28.8	689	982551.673
A- 35	982484.300	-66.503	-17.302	69 2.5	38 22.8	716	982551.673
A- 39	982480.100	-70.703	-18.960	69 2.5	38 16.5	753	982551.673
A- 43	982476.800	-74.003	-22.397	69 2.5	38 10.9	751	982551.673
A- 46	982477.700	-73.608	-26.194	69 3.0	38 7.8	690	982552.178
A- 47	982484.600	-67.315	-26.016	69 3.6	38 7.8	601	982552.785
A- 60	982490.700	-68.070	-29.933	69 10.4	38 6.0	555	982559.640
A- 72	982508.200	-54.388	-22.160	69 14.2	37 53.6	469	982563.458
A- 73	982508.500	-54.088	-22.135	69 14.2	37 52.5	465	982563.458
A- 75	982508.300	-54.288	-19.930	69 14.2	37 49.6	500	982563.458
A- 81	982510.400	-52.188	-19.135	69 14.2	37 40.4	481	982563.458
A- 85	982509.300	-53.288	-22.091	69 14.2	37 34.3	454	982563.458
A- 88	982509.900	-53.490	-23.255	69 15.0	37 28.2	440	982564.260
A- 90	982510.600	-52.890	-22.862	69 15.1	37 26.8	437	982564.360
A- 94	982510.800	-52.690	-13.660	69 15.1	37 20.4	568	982564.360
A- 98	982514.100	-49.390	-12.696	69 15.1	37 15.7	534	982564.360
A-102	982517.900	-45.590	-14.531	69 15.1	37 9.6	452	982564.360
A-108	982509.300	-54.190	-2.447	69 15.1	37 0.4	753	982564.360
A-110	982522.100	-41.390	7.123	69 15.1	36 57.3	706	982564.360
A-112	982521.900	-42.292	-0.719	69 15.8	36 55.9	605	982565.062
A-117	982524.200	-39.992	-0.549	69 15.8	36 48.0	574	982565.062
A-119	982525.900	-37.590	0.547	69 15.1	36 45.5	555	982564.360
A-121	982526.300	-36.288	-2.136	69 14.2	36 41.9	497	982563.458
A-124	982526.600	-35.084	4.221	69 13.3	36 39.7	572	982562.554
A-126	982515.800	-45.181	2.301	69 12.6	36 37.2	691	982561.851
A-128	982518.100	-42.881	8.312	69 12.6	36 34.0	745	982561.851
A-130	982522.000	-38.981	3.554	69 12.6	36 41.5	619	982561.851
A-136	982523.100	-37.881	-1.462	69 12.6	36 49.0	530	982561.851
A-138	982521.500	-40.385	0.776	69 13.5	36 49.4	599	982562.755
A-140	982521.800	-41.189	-0.784	69 14.6	36 50.1	588	982563.859
A-142	982525.000	-39.192	-2.773	69 15.8	36 50.5	530	982565.062
D- 4	982524.200	-40.894	3.084	69 16.7	36 54.8	640	982565.964
D- 8	982501.100	-65.596	-8.562	69 18.3	36 59.6	830	982567.566
D- 10	982517.900	-49.496	-2.907	69 19.0	37 2.1	678	982568.266
D- 13	982526.400	-40.996	-8.631	69 19.0	37 5.7	471	982568.266
D- 16	982526.800	-40.596	-10.842	69 19.0	37 10.4	433	982568.266
D- 18	982526,700	-40.696	-0.841	69 19.0	37 13.6	580	982568.266

STATION NAME	GRAVITY VALUE (M-GAL)	FREE AIR ANOMALY (M-GAL)	BOUGUER ANOMALY (M-GAL)	LATITUDE DEG.MIN.	LONGITUDE DEG.MIN.	DEPTH (M)	NORMAL GRAVITY (M-GAL)
D- 20	982525.200	-42.096	-11.449	69 18.9	37 16.4	446	982568.166
D- 24	982516.400	-50.896	-20.524	69 18.9	37 22.9	442	982568.166
D- 26	982516.800	-50.496	-22.529	69 18.9	37 25.7	407	982568.166
D- 29	982518.800	-48.697	-24.371	69 19.1	37 28.9	354	982568.367
D- 31	982528.500	-39.297	-21.018	69 19.4	37 32.1	266	982568.667
D- 32	982529.300	-38.597	-26.915	69 19.5	37 33.9	170	982568.767
D- 34	982515.300	-52.096	-26.534	69 19.0	37 36.1	372	982568.266
D- 38	982517.100	-49.796	-21.279	69 18.5	37 41.8	415	982567.766
D- 42	982513.600	-54.696	-23.499	69 19.9	37 44.8	454	982569.166
D- 44	982518.400	-50.996	-27.289	69 21.0	37 44.8	345	982570.266
D- 50	982514.600	-55.395	-28.527	69 21.6	37 53.2	391	982570.865
D- 64	982508.400	-55.692	-23.808	69 15.7	38 0.4	464	982564.962
D- 68	982496.400	-67.692	-31.685	69 15.7	38 6.0	524	982564.962
D- 70	982497.000	-67.192	-30.910	69 15.8	38 9.2	528	982565.062
D- 76	982494.600	-69.693	-30.387	69 15.9	38 18.5	572	982565.163
D- 88	982484.100	-80.493	-37.271	69 16.2	38 36.6	629	982565.463
D- 92	982482.100	-82.593	-30.575	69 16.3	38 42.9	757	982565.563
D- 95	982476.000	-88.794	-27.018	69 16.4	38 47.2	899	982565.664
D- 97	982474.100	-90.794	-27.025	69 16.5	38 50.4	928	982565.764
D- 99	982477.000	-87.994	-30.135	69 16.6	38 53.3	842	982565.864
D-102	982487.200	-77.894	-33.778	69 16.7	38 57.9	642	982565.964
D-109	982506.300	-59.095	-27.623	69 17.0	39 8.7	458	982566.265

Table 2. The results of gravity measurements in ice-free areas in and around Lützow-Holm Bay.

STATION NAME	GRAVITY VALUE (M-GAL)	FREE AIR ANOMALY (M-GAL)	BOUGUER ANOMALY (M-GAL)	LATITUDE DEG.MIN.	LONGITUDE DEG.MIN	HEIGHT (M)	NORMAL GRAVITY (M-GAL)	REMARKS
EAS51	982525.553	-19.282	-20.602	69 0.2	39 34.3	11.80	982549.346	B
EAS52	982525.325	-23.045	-23.156	69 0.4	39 37.0	1.00	982549.548	B MIHARASI
EAS53	982520.539	-16.708	-20.707	69 0.0	39 34.7	35.74	982549.143	A NESOYA NO.12
EAS54	982521.164	-15.338	-19.533	68 59.8	39 34.6	37.50	982548.941	B NESOYA
EAS55	982524.102	-18.533	-20.504	68 59.8	39 35.6	17.62	982548.941	A NESOYA NO.1016
EAS56	982524.522	-15.065	-18.141	68 59.8	39 35.0	27.50	982548.941	B NESOYA
EAS57	982517.308	-20.210	-24.551	69 1.2	39 36.4	38.80	982550.358	A POLLHOLMEN
WES04	982522.286	-12.995	-18.330	69 1.7	39 31.6	47.69	982550.864	A NO.8
WES05	982522.032	-15.555	-19.797	69 1.0	39 32.6	37.92	982550.155	A NO.7
WES06	982523.544	-12.934	-17.688	69 1.3	39 31.1	42.50	982550.459	A NO.35
WES07	982524.253	-13.013	-17.555	69 1.5	39 30.9	40.60	982550.661	B
WES08	982527.990	-14.209	-16.815	69 1.1	39 30.5	23.30	982550.257	B
WES10	982529.212	-13.842	-16.102	69 1.0	39 30.0	20.20	982550.155	B
WES11	982525.219	-12.990	-17.080	69 1.2	39 29.9	36.56	982550.358	A NO.10
WES12	982524.749	-13.813	-17.885	69 1.5	39 31.1	36.40	982550.661	B
WES13	982528.193	-14.551	-17.180	69 1.7	39 30.5	23.50	982550.864	B
WES14	982528.262	-14.777	-17.372	69 1.9	39 30.5	23.20	982551.066	A NO.34
WES15	982525.545	-14.409	-18.123	69 1.9	39 31.0	33.20	982551.066	B
WES16	982527.093	-16.141	-18.445	69 1.3	39 32.0	20.60	982550.459	B
WES17	982525.042	-14.692	-18.339	69 1.5	39 31.6	32.60	982550.661	B
WES18	982522.643	-13.763	-18.764	69 1.9	39 31.9	44.70	982551.066	B
WES19	982527.457	-15.815	-18.399	69 2.1	39 31.4	23.10	982551.268	B
WES20	982528.317	-16.177	-18.135	69 1.6	39 29.3	17.50	982550.763	B MAME-ZIMA
WES21	982528.328	-20.766	-21.202	69 2.0	39 35.1	3.90	982551.167	B
KAL01	982526.256	-17.485	-19.532	69 1.1	39 26.0	18.30	982550.257	B
KAL02	982529.349	-16.247	-17.768	69 1.5	39 27.7	13.60	982550.661	B
KAL03	982527.076	-17.471	-19.373	69 1.5	39 25.9	17.00	982550.661	B
KAL04	982528.831	-15.897	-17.587	69 1.1	39 26.9	15.10	982550.257	B
KAL05	982524.231	-14.403	-18.376	69 1.3	39 26.5	35.51	982550.459	A NO.114
KAL06	982526.064	-15.464	-18.351	69 1.2	39 26.1	25.80	982550.358	B
TEO01	982519.852	-17.302	-22.435	69 3.0	39 34.9	45.88	982552.178	A NO.103
TEO02	982526.189	-23.489	-23.971	69 2.7	39 36.1	4.30	982551.875	B
TEO03	982526.696	-18.478	-20.593	69 2.7	39 33.6	18.90	982551.875	B
TEO04	982530.222	-19.033	-19.704	69 2.8	39 33.2	6.00	982551.976	B
TEO05	982531.270	-18.403	-18.996	69 3.0	39 32.7	5.30	982552.178	B
TEO06	982529.589	-17.470	-19.048	69 3.1	39 31.8	14.10	982552.279	B
TEO07	982531.016	-18.177	-18.871	69 2.8	39 31.3	6.20	982551.976	B
TEO08	982525.818	-16.605	-20.010	69 3.5	39 32.2	30.44	982552.684	A NO.113
TEO09	982529.556	-19.231	-20.182	69 3.1	39 33.8	8.50	982552.279	B
TEO10	982526.895	-22.125	-23.065	69 3.3	39 35.0	8.40	982552.481	B
TEO11	982526.460	-23.951	-24.533	69 3.7	39 36.2	5.20	982552.886	B

STATION NAME	GRAVITY VALUE (M-GAL)	FREE AIR ANOMALY (M-GAL)	BOUGUER ANOMALY (M-GAL)	LATITUDE DEG.MIN.	LONGITUDE DEG.MIN	HEIGHT (M)	NORMAL GRAVITY (M-GAL)	REMARKS
LAN11	982531.684	-19.612	-23.415	69 13.4	39 41.7	34.00	982562.655	B
LAN12	982534.629	-22.839	-24.586	69 13.9	39 41.8	15.62	982563.157	A R-7
LAN13	982532.179	-18.686	-22.937	69 14.2	39 40.7	38.00	982563.458	B
LAN14	982531.374	-23.111	-26.304	69 14.9	39 39.8	28.54	982564.160	A NO.117
LAN15	982533.107	-23.997	-26.459	69 15.5	39 39.6	22.00	982564.762	B
LAN16	982533.735	-22.567	-25.028	69 14.7	39 41.0	22.00	982563.959	B
LAN17	982534.755	-23.514	-25.080	69 14.2	39 43.6	14.00	982563.458	B
LAN18	982531.484	-16.533	-21.344	69 12.9	39 43.0	43.00	982562.153	B
LAN19	982533.933	-20.663	-23.124	69 13.0	39 43.0	22.00	982562.253	B
LAN20	982524.352	-31.794	-33.584	69 12.7	39 37.8	16.00	982561.952	B
LAN21	982528.270	-24.122	-26.471	69 10.5	39 41.0	21.00	982559.741	B
LAN22	982475.461	-1.069	-32.058	69 13.6	39 44.3	277.00	982562.856	B
LAN23	982459.183	6.169	-33.311	69 13.5	39 45.6	352.90	982562.755	A R-2
LAN24	982469.017	2.668	-32.013	69 13.6	39 46.5	310.00	982562.856	B
LAN25	982526.978	-24.145	-27.502	69 12.0	39 37.7	30.00	982561.249	B
LAN26	982534.109	-26.814	-26.142	69 10.7	39 38.8	-6.00	982559.942	B
LAN28	982495.160	-17.789	-36.807	69 17.0	39 42.5	170.00	982566.265	B
LAN29	982485.919	-8.523	-34.325	69 17.2	39 42.5	230.64	982566.465	A NO.104
LAN30	982531.781	-25.092	-28.000	69 16.5	39 38.4	26.00	982565.764	B
SKV01	982500.948	-4.291	-29.764	69 27.1	39 42.6	227.70	982576.347	A NO.132
SKV02	982544.612	-26.934	-28.612	69 27.8	39 39.9	15.00	982577.043	B
SKV03	982544.987	-26.959	-28.456	69 27.7	39 39.1	13.38	982576.944	A NO.140
SKV04	982544.730	-26.448	-27.790	69 26.5	39 40.9	12.00	982575.750	B
SKV05	982545.652	-27.148	-28.155	69 27.2	39 45.9	9.00	982576.446	B
SKV06	982547.317	-26.937	-27.164	69 26.5	39 33.0	2.03	982575.750	C HUNAZOKO CAMP
SKV07	982545.954	-33.898	-34.256	69 32.5	39 42.4	3.20	982581.710	C
SKV08	982545.919	-31.649	-31.828	69 29.7	39 40.9	1.60	982578.931	C
SKV09	982485.764	-12.219	-41.078	69 29.2	39 39.4	257.96	982578.435	A NO.135
SKV10	982534.032	-25.420	-32.132	69 29.6	39 41.0	60.00	982578.832	B
SKV11	982537.749	-28.260	-32.846	69 30.3	39 38.1	41.00	982579.527	B TRILLINGOVANE
SKV12	982544.841	-32.357	-32.670	69 29.7	39 34.1	2.80	982578.931	C
SKV13	982544.380	-29.634	-30.417	69 27.8	39 38.4	7.00	982577.043	C NOKKELOYA
SKV14	982546.152	-27.782	-28.342	69 27.1	39 31.4	5.00	982576.347	C
SKV15	982537.276	-31.354	-33.368	69 25.8	39 28.7	18.00	982575.053	B
SKV16	982543.736	-26.446	-27.789	69 25.5	39 32.9	12.00	982574.754	B
SKV17	982545.049	-28.744	-29.102	69 26.4	39 37.1	3.20	982575.650	C
SKV18	982544.336	-27.270	-27.807	69 24.7	39 35.0	4.80	982573.957	C
SKV19	982538.802	-27.935	-29.948	69 23.9	39 29.3	18.00	982573.160	B NOKKELHOLMANE
SKV20	982541.500	-29.209	-30.216	69 25.1	39 44.7	9.00	982574.356	B
SKV21	982521.396	-29.724	-37.401	69 23.9	39 47.6	68.62	982573.160	A NO.139 TANKOBU
SKV22	982523.513	-28.898	-35.383	69 21.9	39 45.1	57.97	982571.164	A NO.119
SKV23	982530.545	-22.306	-28.124	69 20.5	39 46.2	52.01	982569.766	A NO.120

STATION NAME	GRAVITY VALUE (M-GAL)	FREE AIR ANOMALY (M-GAL)	BOUGUER ANOMALY (M-GAL)	LATITUDE DEG.MIN.	LONGITUDE DEG.MIN	HEIGHT (M)	NORMAL GRAVITY (M-GAL)	REMARKS
SKLØ1	982555.371	-31.459	-32.119	69 4Ø.4	39 24.5	5.9Ø	982589.52Ø	A SN-1Ø
SKLØ2	98253Ø.771	-18.56Ø	-32.89Ø	69 4Ø.6	39 27.Ø	128.Ø9	982589.718	A NO.1Ø9
SKLØ3	982553.947	-31.323	-32.441	69 4Ø.1	39 27.3	1Ø.ØØ	982589.225	B
SKLØ4	982552.1Ø3	-32.4Ø8	-33.694	69 39.8	39 28.8	11.5Ø	982588.929	B
SKLØ5	98255Ø.Ø2Ø	-32.714	-34.ØØ1	69 38.Ø	39 14.8	11.5Ø	982587.152	B HJARTOY
SKLØ6	982546.977	-27.234	-32.828	69 41.4	39 18.6	5Ø.ØØ	98259Ø.5Ø6	B
SKLØ7	982552.363	-29.685	-32.258	69 4Ø.9	39 19.3	23.ØØ	98259Ø.Ø13	B
LUTØ1	982522.316	-15.857	-17.57Ø	68 54.7	39 49.7	15.31	982543.767	A NO.13 TOTTUKI
LUTØ2	982526.321	-15.919	-16.599	68 55.9	39 37.Ø	6.Ø8	982544.985	A NO.229 KITA-ZIMA
LUTØ3	982525.Ø55	-16.191	-17.342	68 56.2	39 3Ø.3	1Ø.29	982545.29Ø	A NO.141 UTHOLMEN
LUTØ4	982524.Ø99	-18.272	-19.457	68 57.4	39 38.9	1Ø.59	982546.5Ø8	A NO.154 NAKA-ZIMA
LUTØ5	982524.619	-19.266	-2Ø.233	68 58.3	39 34.7	8.64	982547.421	A NO.152 MUMEINOSIMA
LUTØ6	982524.252	-16.857	-18.83Ø	68 58.3	39 3Ø.8	17.64	982547.421	A NO.137 MEHOLMEN
LUTØ8	982521.465	-18.417	-2Ø.725	68 58.Ø	39 44.6	2Ø.63	982547.116	A NO.228 MITU-IWA
LUTØ9	982518.Ø66	-24.486	-26.671	69 Ø.3	39 42.6	19.53	982549.447	A NO.155
LUT1Ø	982516.446	-2Ø.261	-24.271	68 59.5	39 37.6	35.85	982548.637	A NO.151 IWA-ZIMA
LUT11	982525.573	-19.966	-2Ø.81Ø	68 59.6	39 34.6	7.55	982548.738	C HATUSIMA
LUT12	982524.291	-19.ØØ3	-2Ø.772	68 59.9	39 32.2	15.81	982549.Ø42	A NO.136 ONDORI-ZIMA
LUT13	982528.487	-19.Ø72	-19.441	69 Ø.3	39 32.3	3.3Ø	982549.447	B MENDORI-ZIMA
LUT14	98252Ø.571	-21.696	-24.6Ø8	69 2.Ø	39 42.2	26.Ø3	982551.167	A NO.142 MUKAI ROCKS
LUT15	982518.1ØØ	-22.6Ø8	-26.892	69 4.2	39 37.2	38.29	982553.391	A NO.115 ONGULGALTEN
LUT16	982528.Ø39	-2Ø.948	-22.Ø1Ø	69 3.6	39 28.9	9.49	982552.785	A NO.1ØØ
LUT17	982524.Ø24	-19.585	-22.193	69 2.5	39 15.2	23.32	982551.673	A NO.1Ø5 BENTEN-ZIMA
LUT18	982525.735	-23.984	-25.4Ø3	69 5.3	39 31.2	12.68	982554.5Ø1	A NO.1Ø2 HIDARI-ZIMA
LUT19	982527.136	-25.52Ø	-26.6Ø5	69 7.3	39 28.1	9.7Ø	982556.518	A NO.1Ø7 MIGI-ZIMA
LUT2Ø	982518.944	-23.856	-29.Ø27	69 8.7	39 24.3	46.22	982557.929	A NO.1Ø8 RUMPA
LUT22	982513.784	-29.62Ø	-34.498	69 8.5	39 46.Ø	43.61	982557.728	A
LUT23	982499.6Ø3	-22.936	-35.417	69 8.6	39 46.4	111.57	982557.828	A
LUT24	982516.195	-22.336	-29.894	69 11.Ø	39 32.9	67.56	98256Ø.243	A NO.124 INDREHOVDE
LUT25	982519.379	-22.31Ø	-28.577	69 1Ø.6	39 26.9	56.Ø2	982559.841	A NO.146 SIGAREN
LUT26	982531.ØØ9	-27.332	-28.4Ø6	69 13.Ø	39 26.9	9.6Ø	982562.253	C YTREHOVDEHOLMEN
LUT27	982533.913	-27.942	-28.971	69 16.3	39 33.8	9.2Ø	982565.563	C UNGANE
LUT28	982533.695	-28.329	-29.515	69 16.9	39 26.Ø	1Ø.6Ø	982566.165	C SYSTERFLESENE
LUT29	982531.8Ø5	-31.515	-32.231	69 16.9	39 36.2	6.4Ø	982566.165	C NABBOYA

Table 3. The results of gravity measurements in the Mizuho Plateau and the Yamato Mountains. Term of **** of ICE THICKNESS, which shows that ice thickness is unknown.

STATION NAME	GRAVITY VALUE (M-GAL)	FREE AIR ANOMALY (M-GAL)	BOUGUER ANOMALY (M-GAL)	LATITUDE DEG.MIN.	LONGITUDE DEG.MIN.	HEIGHT (M)	ICE THICKNESS (M)	NORMAL GRAVITY (M-GAL)	REMARKS
S19	982342.328	3.447	26.564	69 1.3	40 10.7	683.00	1342	982550.459	
S25	982297.598	15.082	-0.890	69 2.0	40 28.1	868.00	1094	982551.167	
S30	982260.348	13.841	-0.277	69 3.0	40 42.2	988.00	1300	982552.178	
H48-1	982221.796	14.271	-6.576	69 8.7	40 57.3	1133.00	1428	982557.929	
H74-1	982210.873	22.054	-6.478	69 12.8	41 7.4	1207.00	1436	982562.052	
H94	982184.165	11.371	-34.296	69 16.2	41 16.7	1270.00	1300	982565.463	
H113-1	982166.199	10.389	-29.054	69 20.5	41 27.6	1339.00	1488	982569.766	
H137	982155.176	11.664		69 25.8	41 38.9	1396.00	****	982575.053	
H155	982136.424	10.022	-55.087	69 30.0	41 47.5	1465.00	1332	982579.229	
H174	982112.985	0.719	-50.966	69 34.1	41 57.3	1524.00	1602	982583.295	
H193	982094.287	-10.618		69 38.2	42 7.5	1561.00	****	982587.349	
H213	982093.446	1.478	-107.334	69 42.6	42 18.0	1617.00	972	982591.688	
H231	982095.296	15.016		69 46.4	42 27.6	1667.00	****	982595.425	
H237	982096.574	20.165		69 47.8	42 30.7	1684.00	****	982596.799	
H251-1	982091.055	27.650		69 50.9	42 37.8	1736.00	****	982599.837	
H256	982089.423	26.988		69 51.8	42 40.7	1742.00	****	982600.718	
H275-1	982096.318	49.004	-31.336	69 55.9	42 51.9	1804.00	1638	982604.724	
H295	982086.481	58.343		70 0.6	43 1.1	1881.00	****	982609.303	
S-122	982078.963	59.091	-37.928	70 1.3	43 9.4	1910.00	1573	982609.983	
Z2	982077.600	61.790	-38.873	70 2.2	43 11.1	1926.00	1548	982610.858	
Z11-1	982048.704	46.907		70 6.2	43 19.4	1984.00	****	982614.738	
Z22-1	982034.299	35.899		70 11.3	43 28.0	2011.00	****	982619.670	
Z33	982032.274	45.695	-55.722	70 16.0	43 36.1	2064.00	1746	982624.200	
Z42-1	982016.922	36.393		70 20.3	43 43.5	2097.00	****	982628.331	
Z60-1	982007.716	29.739		70 24.4	43 50.7	2118.00	****	982632.258	
Z75	981967.461	-1.974		70 28.7	43 58.6	2159.00	****	982636.364	
Z85	981983.488	10.576		70 33.0	44 7.1	2161.00	****	982640.458	
Z94	981991.486	22.206		70 37.3	44 12.9	2186.00	****	982644.539	
Z102-1	981986.899	21.855		70 41.3	44 18.3	2212.00	****	982648.324	
MIZUHO	981982.639	22.581		70 41.9	44 19.9	2230.00	****	982648.891	MIZUHO STATION
F6	981991.887	24.261		70 46.0	44 9.2	2218.00	****	982652.757	
F10	982003.032	37.508		70 47.7	43 56.7	2230.00	****	982654.357	
F16	981998.423	23.093		70 51.9	43 41.9	2211.00	****	982658.301	
F21	982006.045	28.451		70 53.0	43 30.0	2207.00	****	982659.332	
F23	982007.968	25.771		70 56.6	43 24.4	2203.00	****	982662.700	
F29	982010.009	33.120		71 0.5	43 10.0	2232.00	****	982666.338	
F33	982028.670	34.338		71 3.0	42 59.2	2183.00	****	982668.665	
F38	982031.222	45.455		71 6.4	42 46.7	2221.00	****	982671.823	
F43	982029.903	44.874		71 9.6	42 34.2	2233.00	****	982674.787	
F48	982057.372	66.670		71 12.4	42 22.5	2223.00	****	982677.376	
F50	982038.899	61.373		71 13.5	42 17.7	2269.00	****	982678.391	
F52	982010.267	34.102		71 14.7	42 12.6	2277.00	****	982679.498	
F56	982008.564	22.725		71 17.5	42 2.5	2254.00	****	982682.076	
F61	982026.580	40.078		71 19.9	41 46.6	2259.00	****	982684.281	
F66	982041.076	45.393		71 21.5	41 30.4	2234.00	****	982685.749	
F71	982044.756	46.715		71 23.4	41 14.4	2232.00	****	982687.490	
F75	982044.704	46.548		71 24.2	41 4.1	2234.00	****	982688.223	
F80	982047.230	47.337		71 26.1	40 48.5	2234.00	****	982689.960	

STATION NAME	GRAVITY VALUE (M-GAL)	FREE AIR ANOMALY (M-GAL)	BOUGUER ANOMALY (M-GAL)	LATITUDE DEG.MIN.	LONGITUDE DEG.MIN.	HEIGHT (M)	ICE THICKNESS (M)	NORMAL GRAVITY (M-GAL)	REMARKS
F85	982052.533	57.383		71 28.0	40 31.5	2255.00	****	982691.695	
F90	982046.739	59.400		71 30.6	40 17.9	2288.00	****	982694.065	
F95	982046.305	64.368		71 32.8	40 3.4	2312.00	****	982696.067	
F98	982045.483	57.501		71 34.7	39 56.6	2298.00	****	982697.793	
F103	982050.025	64.039		71 35.9	39 42.0	2308.00	****	982698.882	
F108	982048.591	69.740		71 37.9	39 25.7	2337.00	****	982700.694	
F113	982049.254	74.816		71 39.5	39 9.4	2356.00	****	982702.142	
F118	982056.161	81.075		71 40.9	38 53.1	2358.00	****	982703.407	
F122	982056.994	85.542		71 42.0	38 41.1	2373.00	****	982704.401	
F127	982053.218	89.450		71 43.4	38 25.7	2402.00	****	982705.664	
F130	982056.943	95.591		71 43.8	38 21.4	2411.00	****	982706.024	
F136	982065.235	107.981		71 46.1	38 2.6	2431.00	****	982708.096	
F142	982049.464	100.965		71 47.0	39 48.0	2462.00	****	982708.905	
F148	982046.920	98.358		71 48.1	37 27.3	2465.00	****	982709.894	
F154	982051.026	108.403		71 48.7	37 8.4	2486.00	****	982710.432	
F160	982048.760	100.096		71 48.9	36 46.4	2467.00	****	982710.612	
F166	982069.061	119.181		71 50.6	36 35.3	2468.00	****	982712.137	
F169-1	982082.320	114.568		71 49.2	36 21.5	2406.00	****	982710.881	
F175	982080.299	96.595		71 49.1	36 13.8	2354.00	****	982710.792	
F179	982136.312	131.845		71 46.8	36 7.9	2280.00	****	982708.725	
YMT01	982229.108	103.010		71 14.7	35 16.3	1791.00	****	982679.498	MORAINE
YMT02	982245.222	99.638	-94.462	71 17.1	35 37.2	1735.00		982681.708	MASSIF G
YMT03	982247.400	121.035	-80.001	71 17.0	35 49.0	1797.00		982681.616	MASSIF G
YMT03-1	982243.175	110.764		71 17.2	35 48.5	1778.00	****	982681.800	CIRQUE
YMT03-2	982241.224	108.846		71 17.5	35 48.0	1779.00	****	982682.076	CIRQUE
YMT03-3	982243.251	111.523		71 17.8	35 47.5	1782.00	****	982682.352	CIRQUE
YMT03-4	982232.223	94.476		71 17.3	35 42.5	1761.00	****	982681.892	CIRQUE
YMT03-5	982227.201	88.344		71 17.5	35 42.5	1758.00	****	982682.076	CIRQUE
YMT03-6	982216.163	77.739		71 17.7	35 42.5	1760.00	****	982682.260	CIRQUE
YMT04	982251.827	119.298	-79.836	71 18.0	35 47.0	1780.00		982682.536	MASSIF F
YMT05	982194.313	132.923	-92.708	71 20.1	35 48.9	2016.85		982684.465	NO.206
YMT06	982191.567	140.496	-88.844	71 20.0	35 46.0	2050.00		982684.373	MASSIF E
YMT07	982265.340	104.959	-85.673	71 22.8	35 29.0	1704.00		982686.941	NIZI NO KUBO
YMT07-1	982252.443	92.154		71 22.7	35 30.0	1704.00	****	982686.849	CIRQUE
YMT07-2	982245.387	87.132		71 22.5	35 31.2	1710.00	****	982686.666	CIRQUE
YMT07-3	982244.442	85.753		71 22.3	35 32.4	1708.00	****	982686.483	CIRQUE
YMT07-4	982256.620	99.257		71 22.2	35 33.6	1712.00	****	982686.391	CIRQUE
YMT08	982266.318	107.147		71 23.5	35 28.7	1710.00	****	982687.582	D BASE CAMP
YMT09	982172.277	148.481	-92.046	71 23.9	35 34.3	2150.00		982687.948	MASSIF D
YMT10	982251.463	123.731	-82.116	71 33.0	35 32.2	1840.00		982696.249	MASSIF C
YMT11	982257.037	141.989	-68.556	71 33.3	35 33.9	1882.00		982696.521	MASSIF C
YMT12	982155.199	160.403	-93.881	71 33.7	35 40.1	2272.97		982696.885	NO.174
YMT13	982187.610	155.459	-85.180	71 33.4	35 41.0	2151.00		982696.612	NO.174 EAST
YMT14	982165.944	88.877		71 35.3	35 52.4	2011.00	****	982698.337	JARE 4 NUNATAKS
YMT15	982198.113	67.037		71 41.8	35 29.7	1855.00	****	982704.220	B BASE CAMP
YMT16	982252.184	107.845	-92.967	71 36.0	35 38.5	1795.00		982698.972	B AKAKABE
YMT16-1	982253.684	108.420		71 36.0	35 38.5	1792.00	****	982698.972	CIRQUE
YMT16-2	982252.831	105.099		71 36.0	35 38.5	1784.00	****	982698.972	CIRQUE

STATION NAME	GRAVITY VALUE (M-GAL)	FREE AIR ANOMALY (M-GAL)	BOUGUER ANOMALY (M-GAL)	LATITUDE DEG.MIN.	LONGITUDE DEG.MIN.	HEIGHT (M)	ICE THICKNESS (M)	NORMAL GRAVITY (M-GAL)	REMARKS
YMT16-3	982247.Ø68	1Ø3.655		71 36.Ø	35 38.5	1798.ØØ	****	982698.972	CIRQUE
YMT16-4	982244.884	1Ø4.247		71 36.Ø	35 38.5	18Ø7.ØØ	****	982698.972	CIRQUE
YMT16-5	982244.249	1Ø4.846		71 36.Ø	35 38.5	1811.ØØ	****	982698.972	CIRQUE
YMT16-6	982244.295	1Ø5.2Ø1		71 36.Ø	35 38.5	1812.ØØ	****	982698.972	CIRQUE
YMT16-7	982244.Ø63	1Ø3.899		71 36.5	35 32.Ø	1810.ØØ	****	982699.426	CIRQUE
YMT16-8	982223.985	95.544		71 36.5	35 32.Ø	1848.ØØ	****	982699.426	CIRQUE
YMT16-9	982212.158	84.642		71 36.5	35 32.Ø	1851.ØØ	****	982699.426	CIRQUE
YMT17	982240.6Ø1	1Ø5.823	-1ØØ.359	71 41.8	35 29.7	1843.ØØ		982704.22Ø	MASSIF B
YMT18	982123.622	162.1Ø5	-1Ø5.267	71 36.8	35 36.1	2389.96		982699.698	NO.176
YMT19	982210.197	132.189		71 37.7	35 44.Ø	2Ø15.ØØ	****	982700.513	MASSIF B
YMT2Ø	982207.238	116.366		71 43.4	35 44.Ø	199Ø.ØØ	****	982705.664	MASSIF A
YMT21	982206.Ø17	146.921		71 43.4	35 46.3	2Ø93.ØØ	****	982705.664	MASSIF A
YMT22	982138.338	142.239		71 47.1	36 1Ø.5	2308.ØØ	****	982708.995	MOTOI IWA BASE CAMP
YMT23	982156.5Ø4	152.513	-1Ø2.893	71 47.3	36 12.4	2283.ØØ		982709.175	214 SUBPOINT
YMT24	982146.443	16Ø.416	-1Ø1.5Ø4	71 47.3	36 12.4	2341.23		982709.175	NO.214
YMT25	982194.774	68.295		71 48.Ø	34 44.Ø	1888.ØØ	****	982709.8Ø4	KABUTO NUNATAK
YMT26	982171.471	75.4Ø5	-146.775	71 47.8	34 45.8	1986.ØØ		982709.624	KABUTO PEAK
MYTØ1	982176.217	134.959	-11Ø.826	71 59.3	35 8.2	2197.ØØ		982719.91Ø	NO.29
MYTØ2	982180.231	97.147		71 59.5	35 1Ø.9	2Ø62.ØØ	****	982720.Ø88	KURAKAKE BASE CAMP
MYTØ3	982165.541	129.516	-118.618	72 Ø.7	35 1Ø.9	2218.ØØ		982721.156	KURAKAKE
MYTØ4	982151.887	128.618	-125.333	72 4.4	35 13.3	227Ø.ØØ		982724.442	KUWAGATA
MYTØ5	982156.62Ø	136.699	-118.596	72 4.8	35 11.5	2282.ØØ		982724.796	KUWAGATA