IV. GRAVITY ANOMALIES IN THE GH79-1 AREA

Teruki Miyazaki

Gravity data were continuously collected throughout the whole cruise (from Funabashi to Funabashi), using a gyrostabilized LaCoste and Romberg Sea Air Gravity Meter (S-63). Digital gravity data sampled at an interval of 30 seconds were transferred to NNSS in real time and were recorded on magnetic tapes together with navigational, bathymetric, and geomagnetic data. An on-board computer YHP-2100A with 48 kB was used for data processing. All the gravity data were connected with the base station at the Funabashi Berth in Japan. The relative difference of the reading value of the base station after the cruise (on the 13th March 1979) was +11.3 mgal as compared with that before the cruise on the 13th January 1979, and the drift rate of the gravity meter amounted to +5.7 mgal/month. Correlation to a land gravity was also carried out by using the base station of HIG in Honolulu, Hawaii on the 7th February, and the drift rate of +6.6 mgal/month was detected. Those drift rates were significant as compared with the accuracy of the obtained gravity data, so that the data was processed with a drift correction.

Free air and Bouguer gravity anomalies were calculated after the recalculation of positions by NNSS and were recorded on a magnetic tape as a cruise file. Bouguer anomaly was given under the assumption of a water density of 1.03 g/cm^3 and a rock density of 2.67 g/cm^3. Using those data, profiles and maps of the survey area were drawn with a XY plotter.

Gravity anomaly profiles along major tracks indicated by heavy solid lines (Fig. IV-1) are shown in Fig. IV-2 together with the profiles of topography and magnetic anomaly.

Free air anomalies in the survey area (Fig. IV-3) are rather uniform and nearly zero mgal except over seamount areas. Anomaly value reaches several tens to a hundred milligal at the crests of seamounts and is negative by the side of seamount.

Line F1 and Line F2 in Fig. IV-4 show the geophysical data along the long traverses with the distance more than 5,000 km each between Japan and the GH79–1 area. There are a continental slope, a trench, an outer trench swell and ocean basins with scattered seamounts in those profiles. Free air anomaly profiles show gravity features corresponding to those topographies. Negative free air anomaly develops at the Izu-Ogasawara (Bonin) Trench, and a positive anomaly on the outer trench swell continues about 500 km out of the outer trench slope. Free air anomaly far from the trench is nearly zero mgal or slightly negative. Magnetic lineations of the Hawaian group are detected in the left part of Line F2, where M16 to M23 can be easily found. The seamounts at a distance of about 2,800 km from Japan are the Mapmaker Seamounts, and those near the survey area are the Mid-Pacific Mountains.

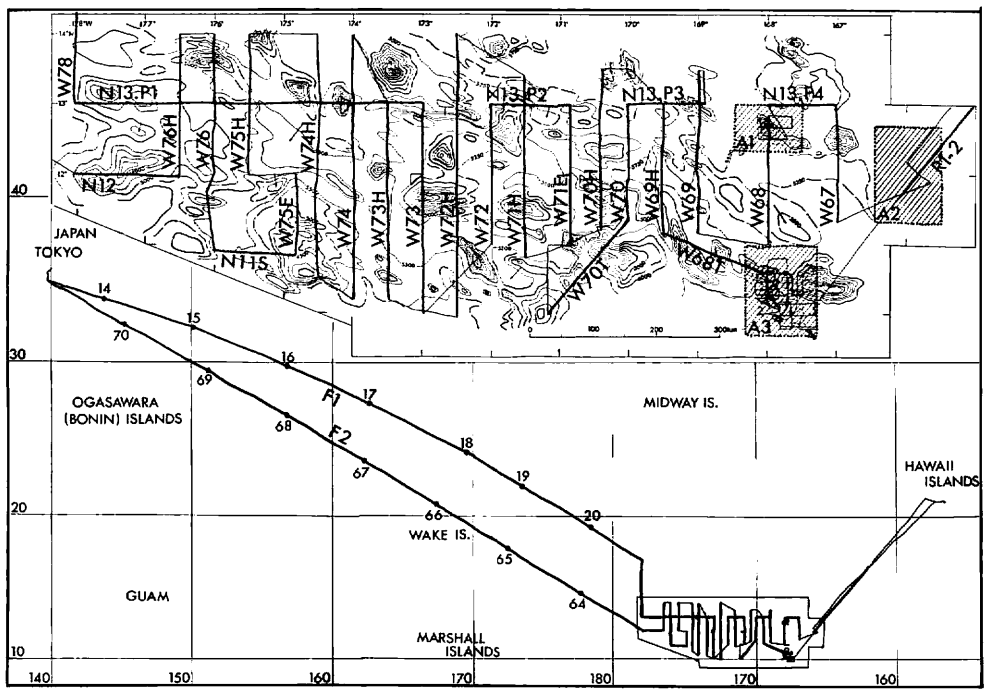
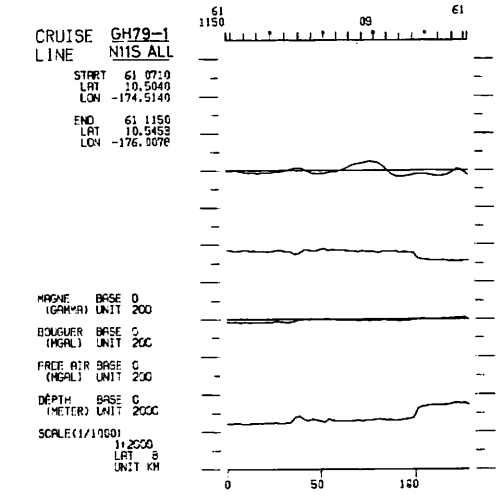


Fig. IV-1 Index to the gravity anomaly profile in Figs. IV-2 and IV-4 and the gravity anomaly map in Fig. IV-3. All tracks are shown in the figure. The GH79-1 area is enlarged in the upper part. Gravity profiles are given along the tracks indicated by thick solid line, where number by dot on Line F1 and Line F2 shows the Julian day. Hatched areas, A1, A2, and A3 in the upper part show location of free air anomaly map in Fig. IV-3 and also magnetic anomaly map in Fig. VI-1.



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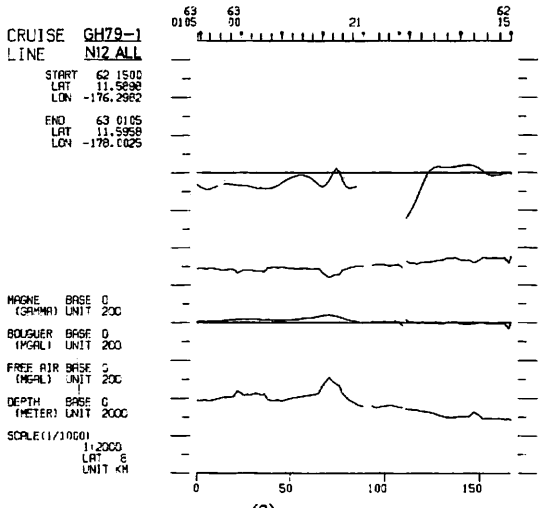

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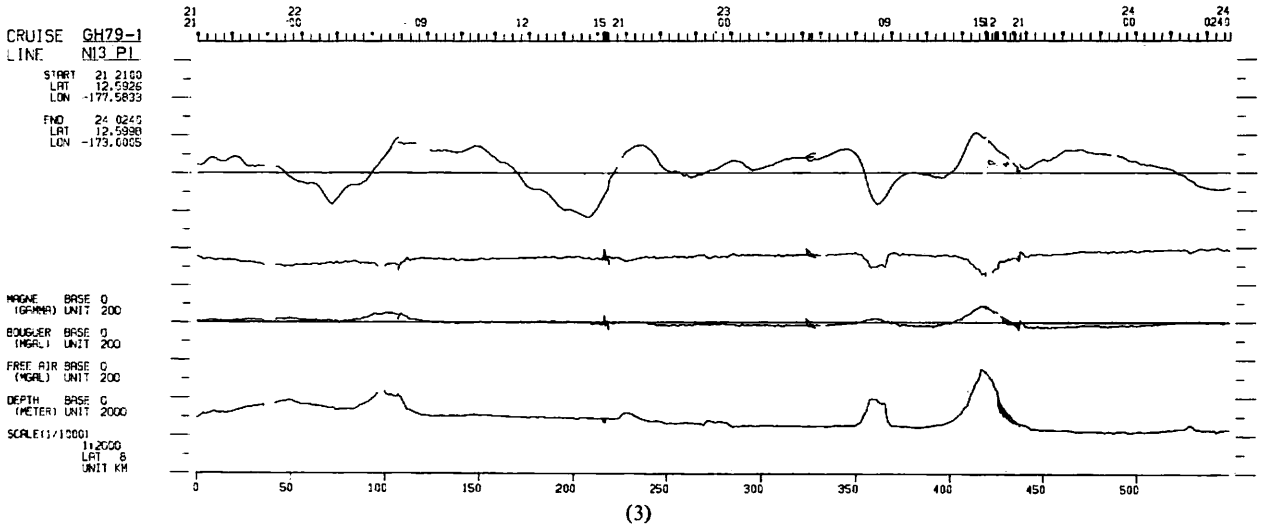
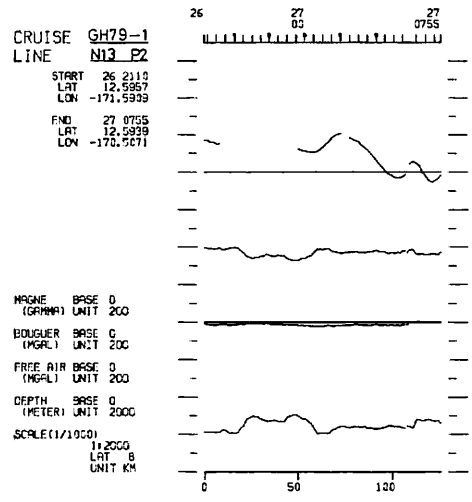


(3)

Fig. IV-2 Gravity and magnetic anomaly profile with topography.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LAT 12.5939
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BOUGUER BASE 0
(MGAL) UNIT 200
FREE AIR BASE 0
(MGAL) UNIT 200
DEPTH BASE 0
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UNIT KM
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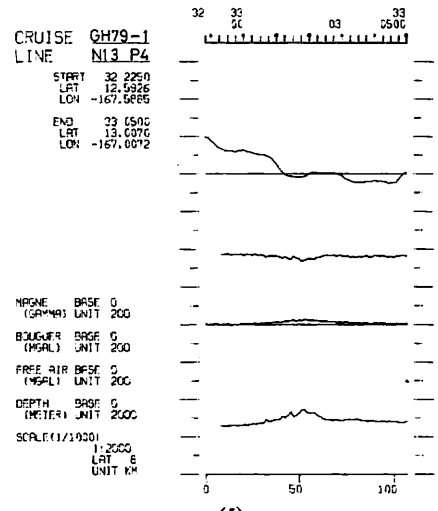
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LINE N13 P4
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LAT 12.5926
LON -167.5885
END 33 0500
LAT 13.0070
LON -167.0072
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FREE AIR BASE 0
(MGAL) UNIT 200
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03
33
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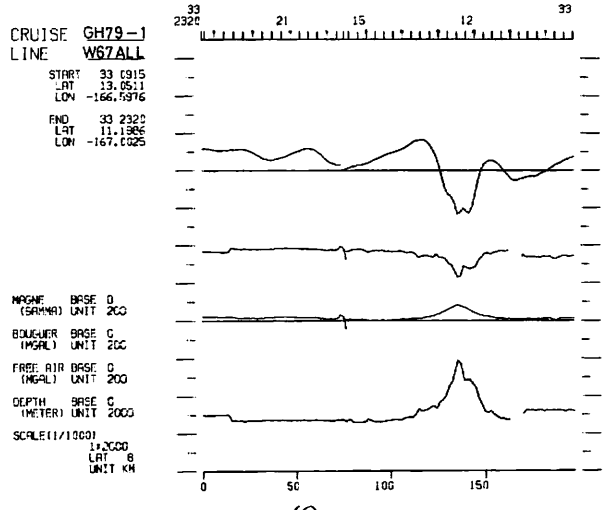
(5)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LON -166.5976
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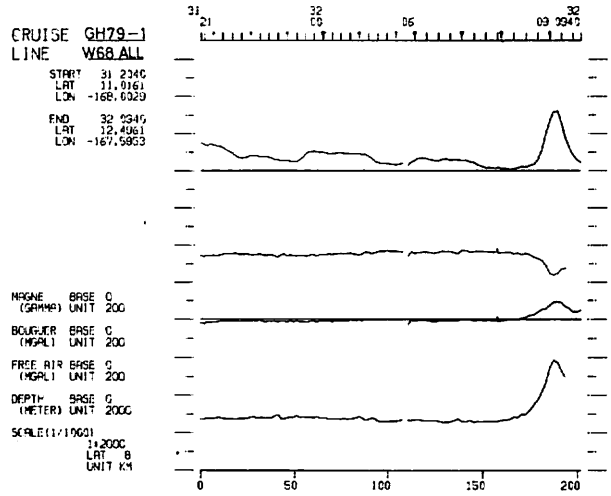
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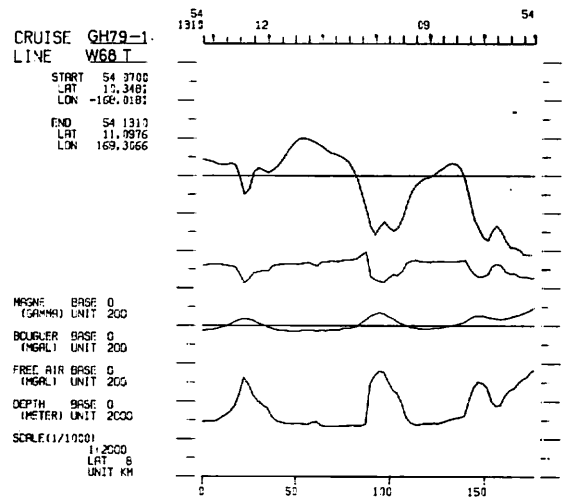
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LAT 11.0976
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FREE AIR BASE 0
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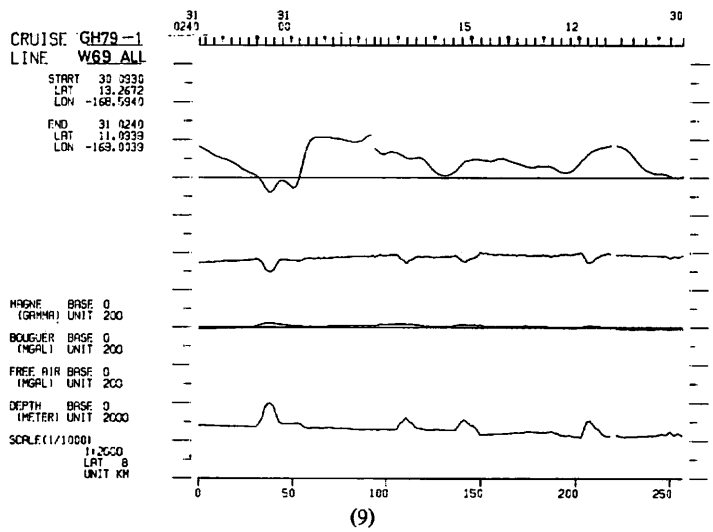
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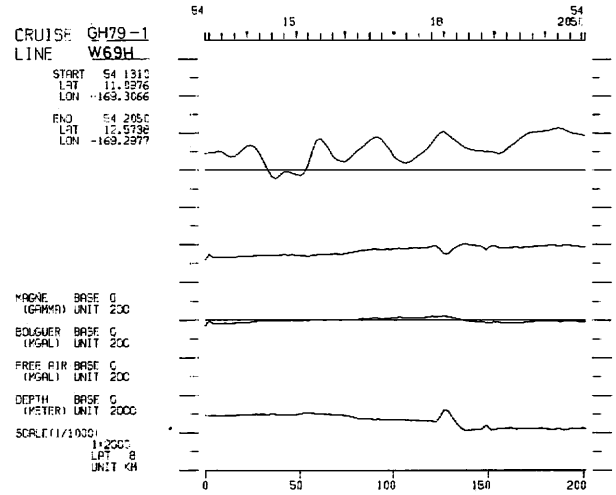
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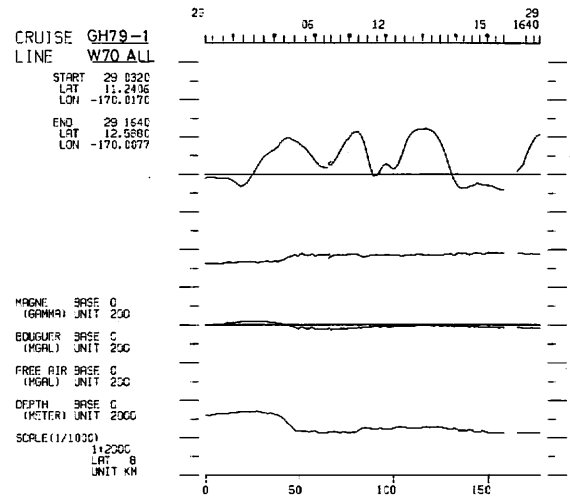
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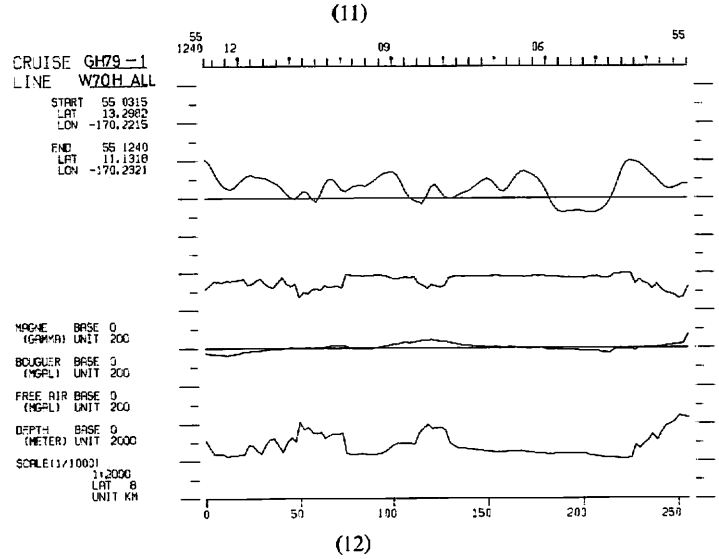
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END 55 1240
LAT 11.1318
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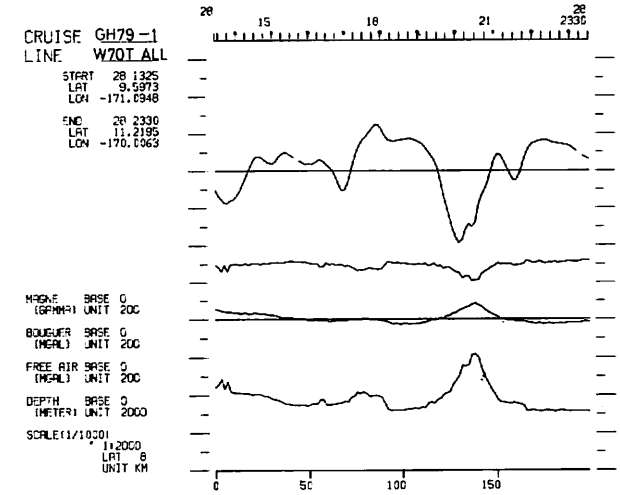
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UNIT KM
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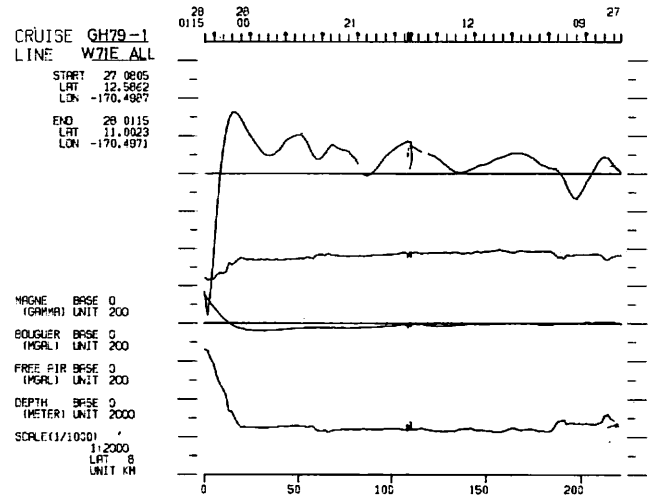
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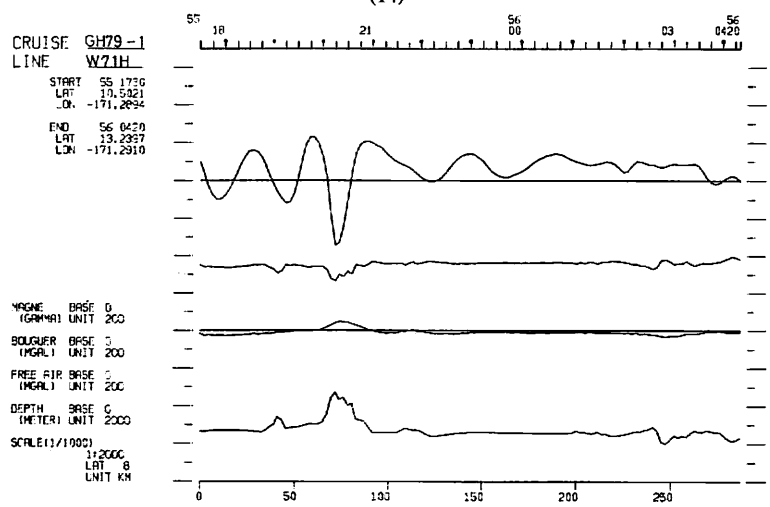
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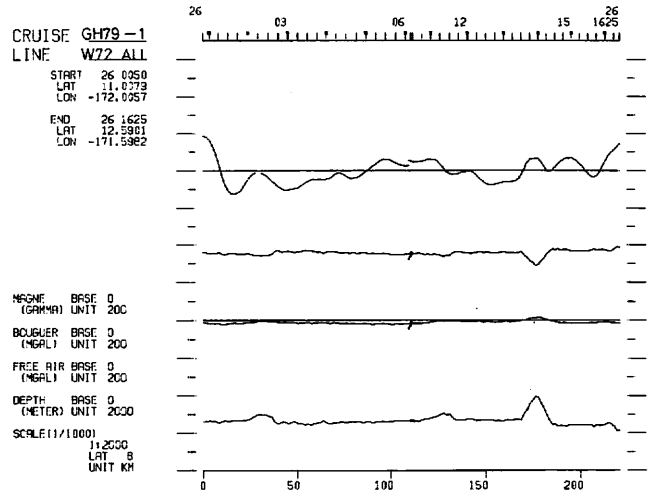
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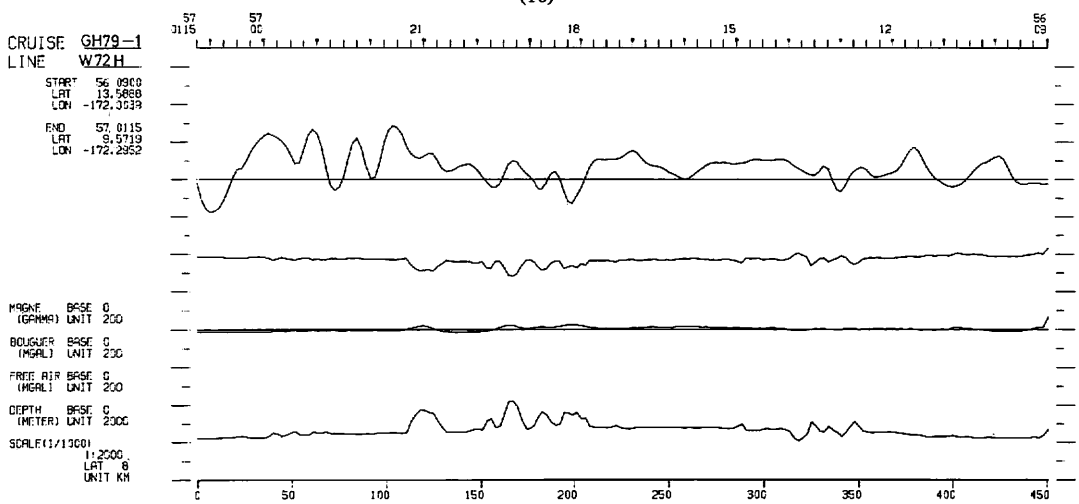
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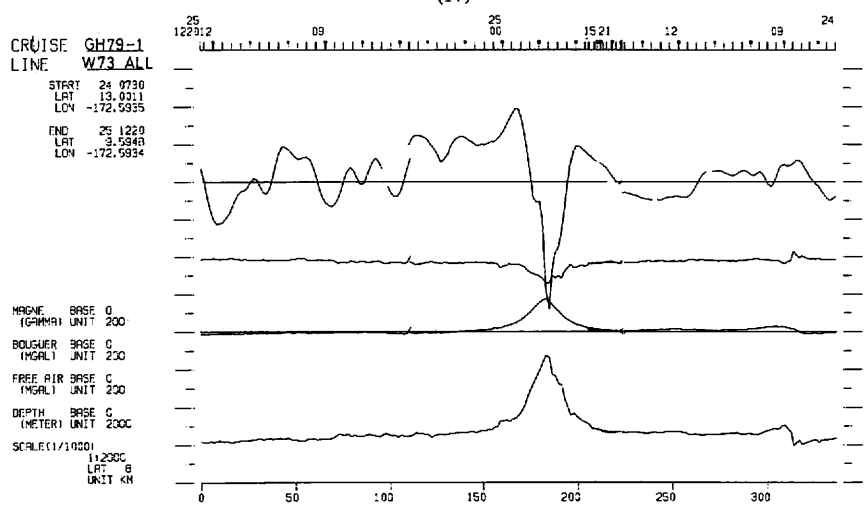
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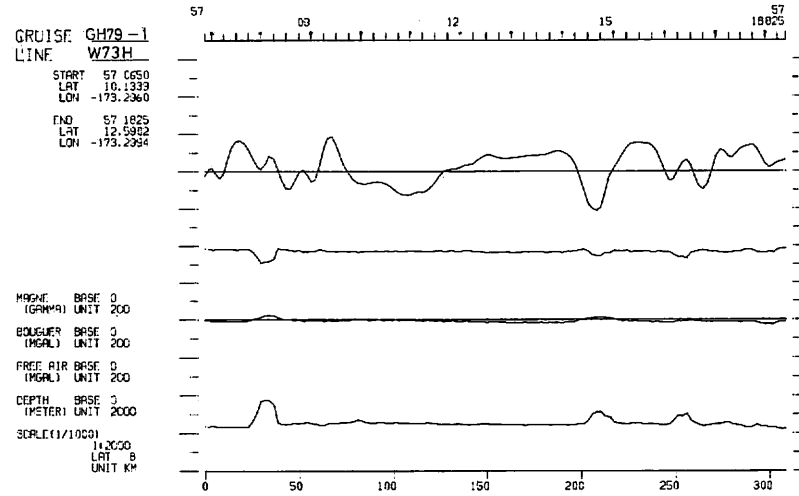
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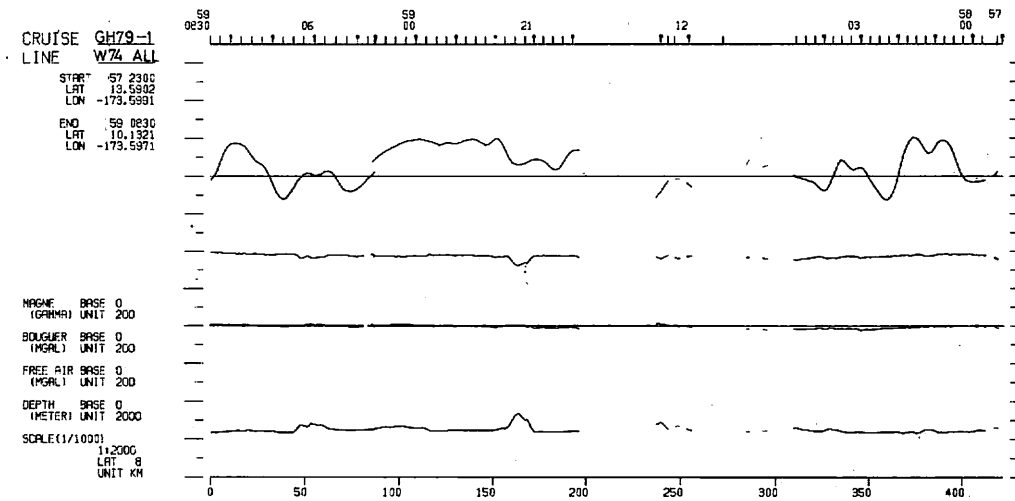
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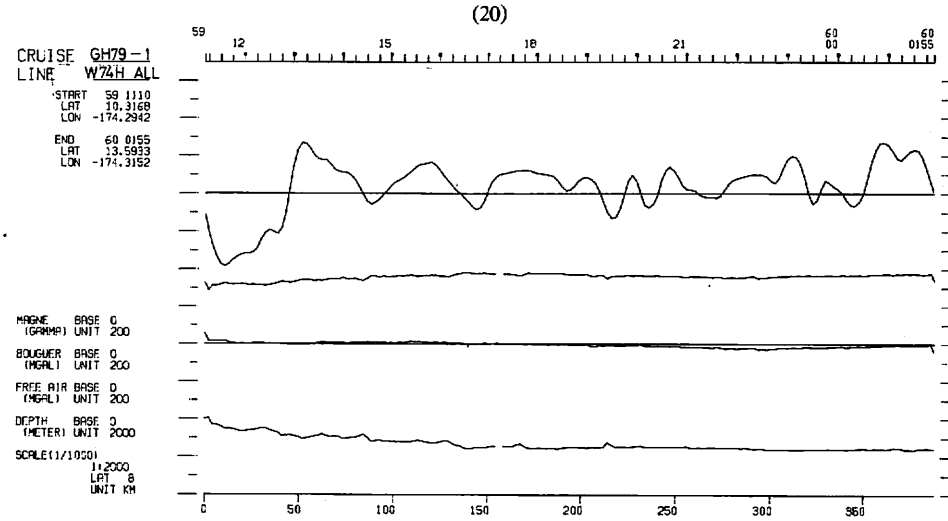
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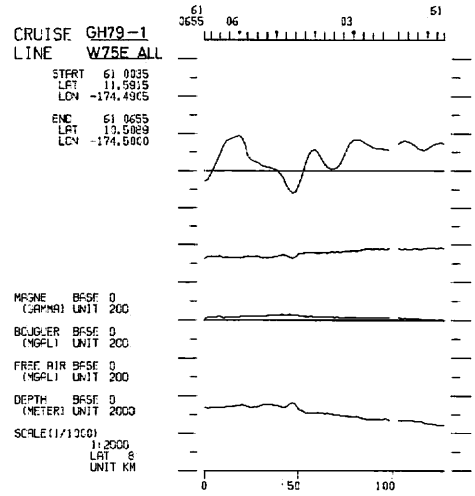
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FREE AIR BASE 0
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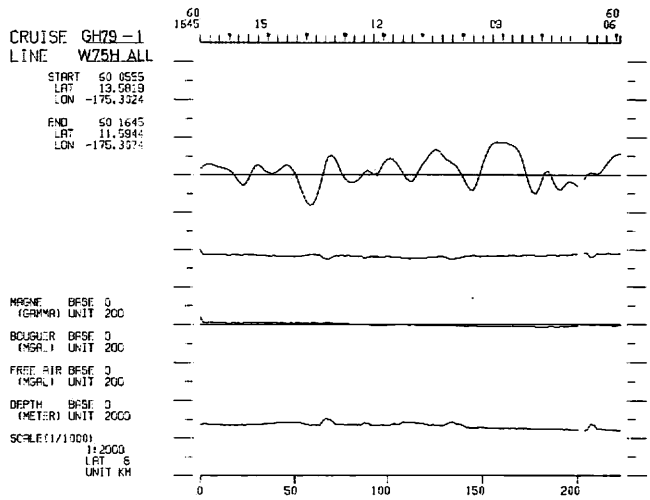
100

(22)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FREE AIR BASE 0
(MGAL) UNIT 200
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UNIT KM
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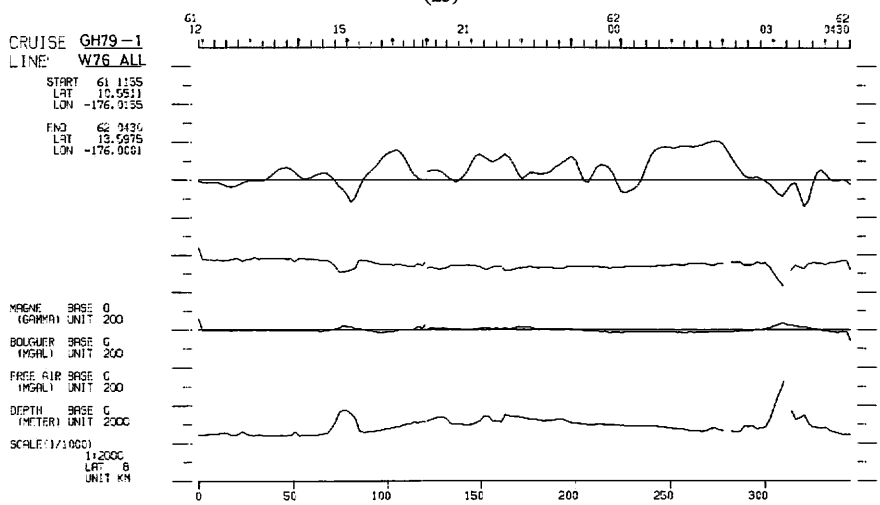
100
150
200

(23)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END 62 0430
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FREE AIR BASE 0
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DEPTH BASE 0
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1:2000
LAT 6
UNIT KM
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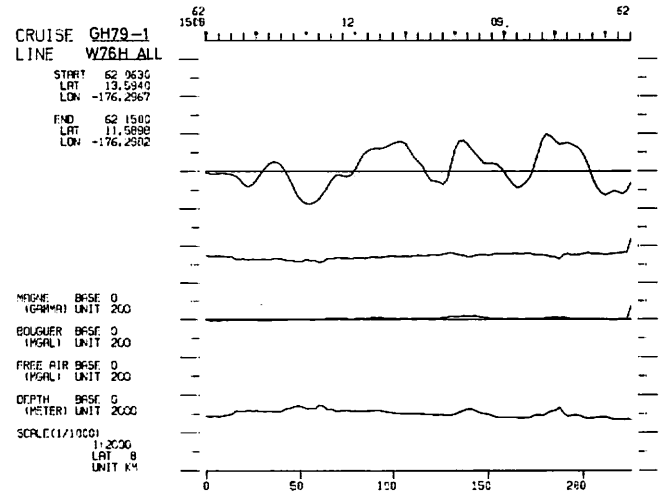
50
100
150
200
250
300

(24)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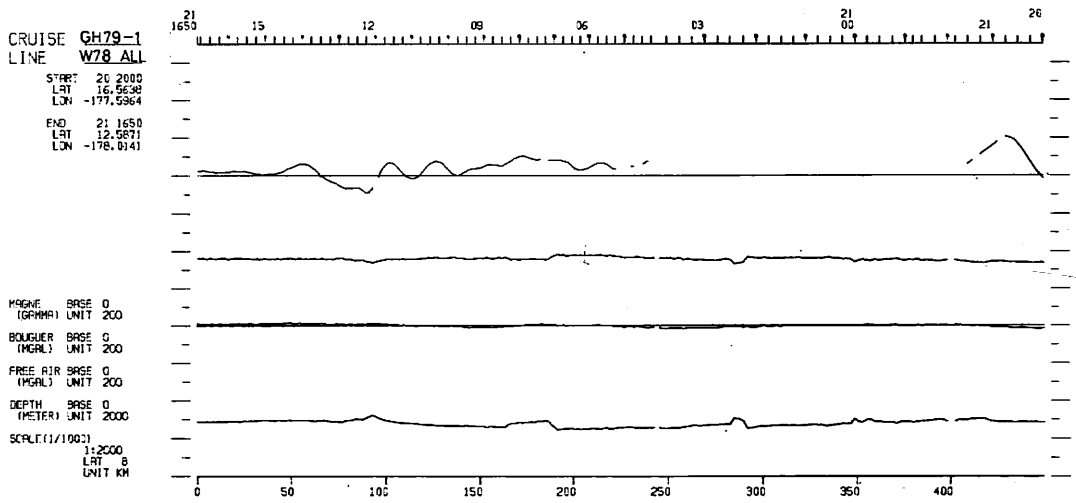
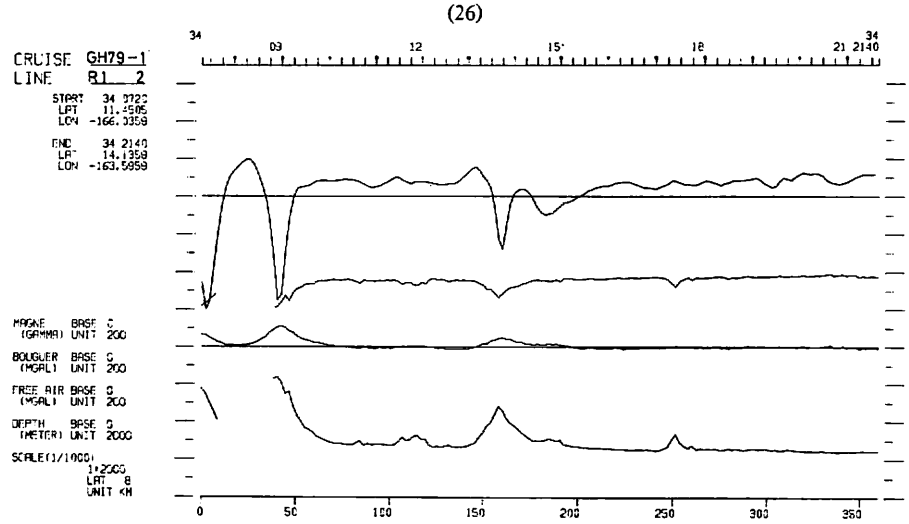
MAGNE BASE 0
(GAMMA) UNIT 200
BOUGUER BASE 0
(MGAL) UNIT 200
FREE AIR BASE 0
(MGAL) UNIT 200
DEPTH BASE 0
(METER) UNIT 2000
SCALE(1/1000)
1:2000
LAT 8
UNIT KM
62
1500
12
09
62
0
50
100
150
200

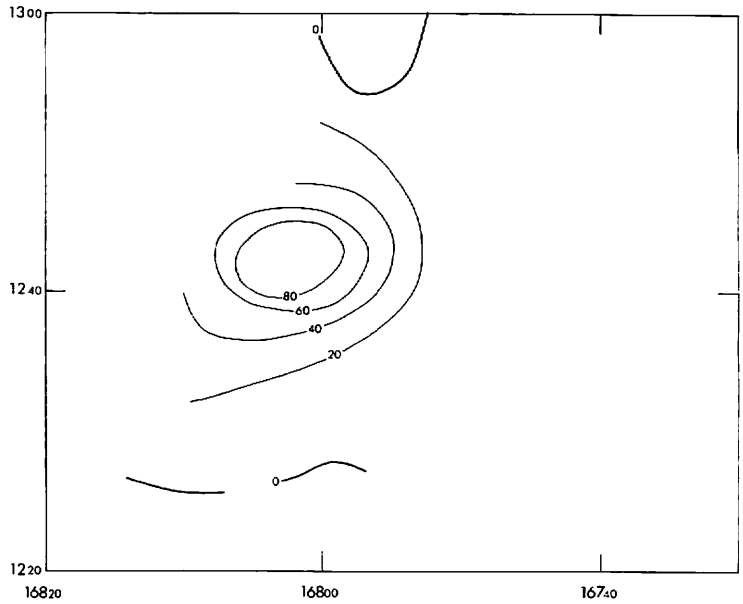
(25)


CRUISE GH79-1
LINE W78 ALL
START 20 2000
LAT 16.5638
LON -177.5964
END 21 1650
LAT 12.5871
LON -178.0141
MAGNE BASE 0
(GAMMA) UNIT 200
BOUGUER BASE 0
(MGAL) UNIT 200
FREE AIR BASE 0
(MGAL) UNIT 200
DEPTH BASE 0
(METER) UNIT 2000
SCALE(1/1000)
1:2000
LAT 8
UNIT KM
21
1650
15
12
09
06
03
21
00
21
20
0
50
100
150
200
250
300
350
400

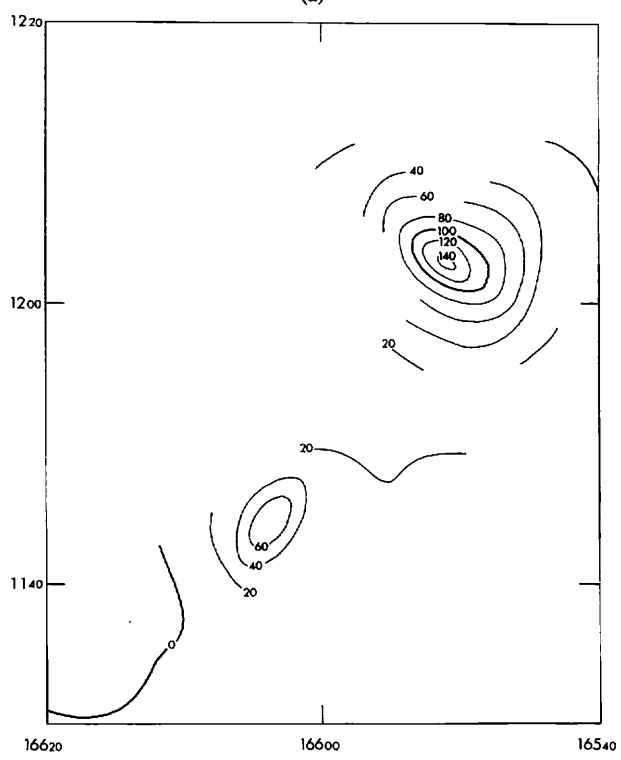
(26)


CRUISE GH79-1
LINE R1 2
START 34 2120
LAT 11.4505
LON -166.3358
END 34 2140
LAT 14.1358
LON -163.5959
MAGNE BASE 0
(GAMMA) UNIT 200
BOUGUER BASE 0
(MGAL) UNIT 200
FREE AIR BASE 0
(MGAL) UNIT 200
DEPTH BASE 0
(METER) UNIT 2000
SCALE(1/1000)
1:2000
LAT 8
UNIT KM
34
09
12
15
18
21
2140
34
0
50
100
150
200
250
300
350

(27)

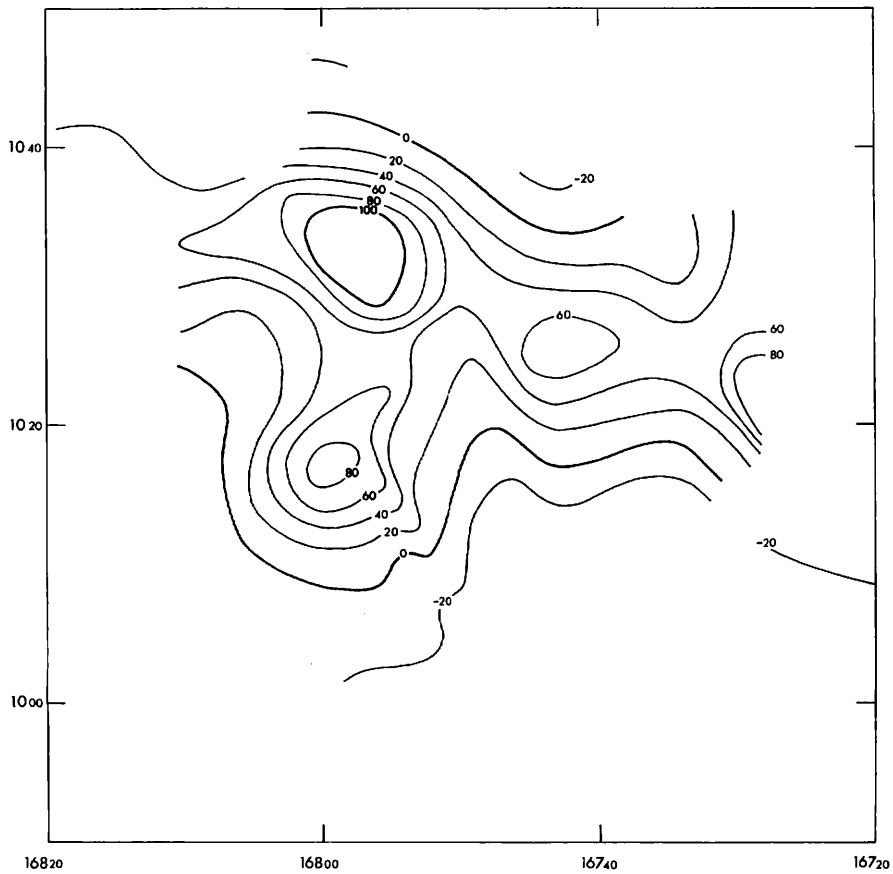


(a)



(b)

Fig. IV-3 Free air anomaly map over seamount areas, A1, A2, and A3 in Fig. IV-1. Contour interval is 20 mgal.


10 40
10 20
10 00
168 20
168 00
167 40
167 20
0
20
40
60
80
100
-20
60
80
-20
80
60
40
20
0
-20

(c)

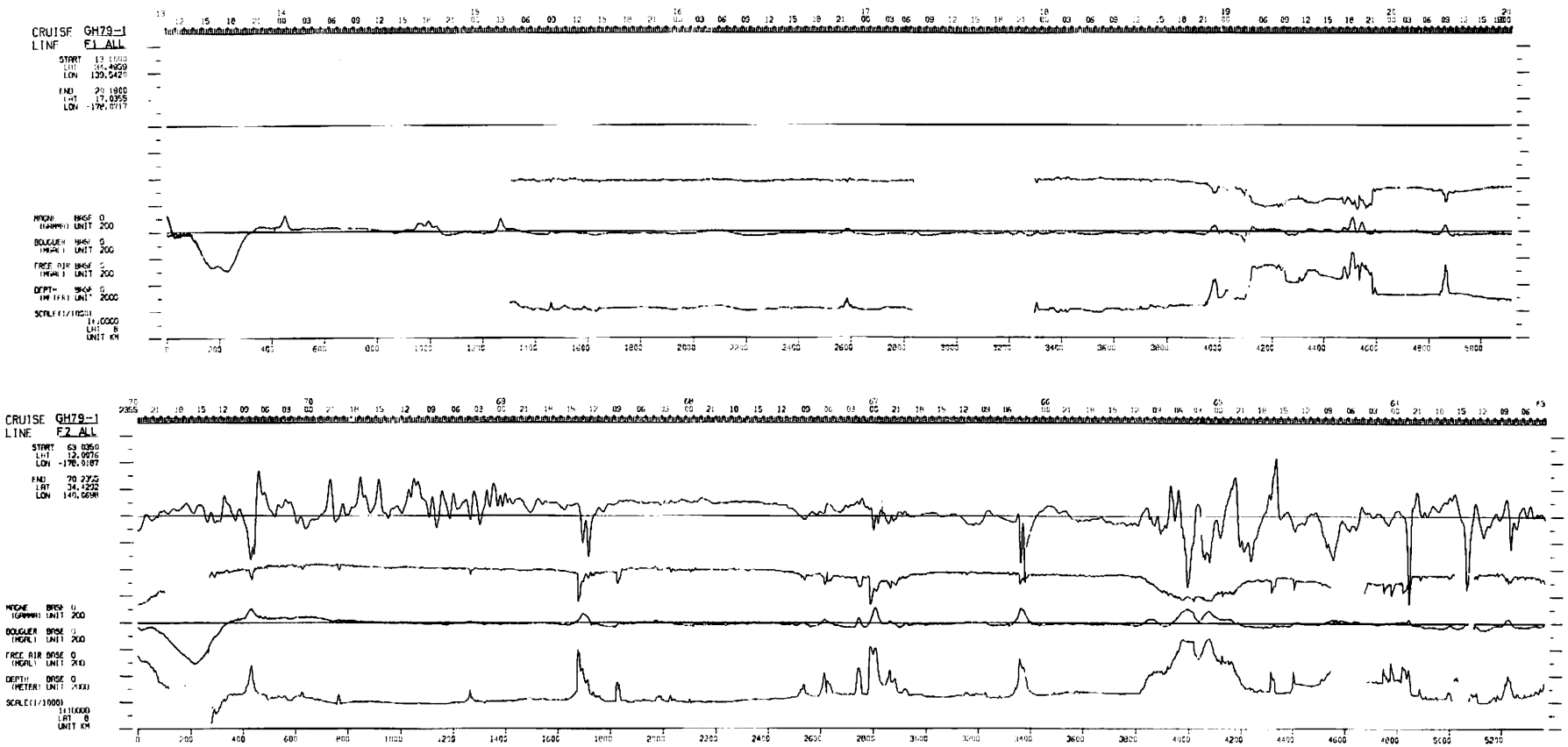


Fig. IV-4 Gravity profile between Japan and survey area.