

IV. GRAVITY SURVEY

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Gravity measurements were carried out with the Sea-Air gravity meter, S-63 (LaCoste and Romberg Co.) for the whole term of the cruise except when trouble with the gravity sensor occurred on part of the survey lines L39 and L40. Real-time data of gravity were transferred to NNSS every 30 sec and were recorded on magnetic tapes together with navigational data, bathymetric data and total magnetic force data. Real-time data files in the magnetic tapes were edited with an onboard data processing system. After post-analysis, a GH78-2 cruise file including all above data was created in a magnetic tape.

Free air anomalies were calculated by making latitudinal correction (International Gravity Formula 1930) and Eotvos correction. Bouguer anomalies were computed under the assumption of a water density of 1.03 g/cm^3 and a rock density of 2.67 g/cm^3 . Correlation to gravity values on land were made at Funabashi and also at Niigata and Hakodate. The drift of the gravity meter was linear with a rate of 1.8 mgal/month during the cruise.

Contour maps of the free air and the Bouguer anomalies are shown in Fig. IV-1 and 2 which were drawn based on the cruise file. All profiles of the survey lines are shown in Fig. IV-3, where free air anomaly, Bouguer anomaly, magnetic anomaly and topography are shown along the ship's tracks.

Results

There are many topographic features in the survey area, and these produce variation between free air and Bouguer anomalies varied. The trend of the free air anomalies in the southwestern part of the surveyed area (the area of the Yamato Ridge, the Yamato Basin, the Oki Ridge and the Oki Trough, etc.) is in a NE-SW direction, while a N-S direction occurs in the eastern part following other topographic trends. Bouguer anomalies are higher in the Yamato and Japan Basin where both crusts seem to be oceanic. The isogal lines of the Bouguer anomaly near Honshu and Hokkaido lie in a NE-SW direction in the south and in a N-S direction in the north.

Yamato Basin and Ridge

Except in the center and northeastern parts, free air anomalies in the Yamato Basin have a negative value. In the Basin center, the Bouguer anomaly reaches more than 200 mgal. An isogal line of 160 mgal on the Bouguer anomaly corresponds to isobaths of 2,000 m to 2,500 m.

Several free air highs are located on the Yamato, the Kita-Yamato and the Takuyo Banks, while a low occurs in the Yamato Trough. Bouguer anomalies become lower on these banks. In the Kita-Oki Bank, free air anomalies are high and Bouguer anomalies are low.

Oki Ridge and Trough

Free air anomalies have negative values in the Oki Trough, and values of more than 40 mgal along the Oki Ridge, where they form a high anomaly zone. Another high anomaly,

barely forming a belt and corresponding to no pronounced topographic feature, is found at the southeastern side of the trough and continues to Off Noto. The high may correspond to a hidden ridge under the continental slope. North of the Wakasa Bay there is a free air low anomaly which could be produced by thick sediments dammed behind the hidden ridge.

Some high anomalies still exist along the ridges on the Bouguer anomaly map based on a simple Bouguer correction.

In the vicinity of Sado

There are many free air anomaly highs following topographic highs; for instance Off Noto, the Hakusan Shoal, the Sado Ridge and its vicinity. A low free air anomaly, with a minimum value of less than -40 mgal, is found along the Toyama Channel. However the Bouguer anomaly shows no anomalous features near to the coast and a slight increase further offshore along the channel.

North part of survey area

The trends of both anomalies adopt a common, N-S direction, north of the Oga Peninsular. The Nishi-Tsugaru and Okushiri Basins are characterized by low free air anomalies. However no distinctive Bouguer anomalies can be distinguished. A free air high anomaly zone starts just south of the Oga Peninsular and reaches the Oshima Plateau, passing to the west of the Nishi-Tsugaru Basin. Beyond the high anomaly zone to the west of the Nishi-Tsugaru Basin, another free air low is found. The size and magnitude of this low is the same as that in the Nishi-Tsugaru Basin.

There is a further high around Okushiri Island which trends northeast and has a maximum value of more than 100 mgal. Another free air high anomaly zone lies on and just offshore the Shakotan Peninsular and trends toward northwest. Along the east of the Okushiri Ridge, free air anomalies are negative and form a low zone, which extends southward to the west of the Oshima Plateau through the west of the Okushiri Island.

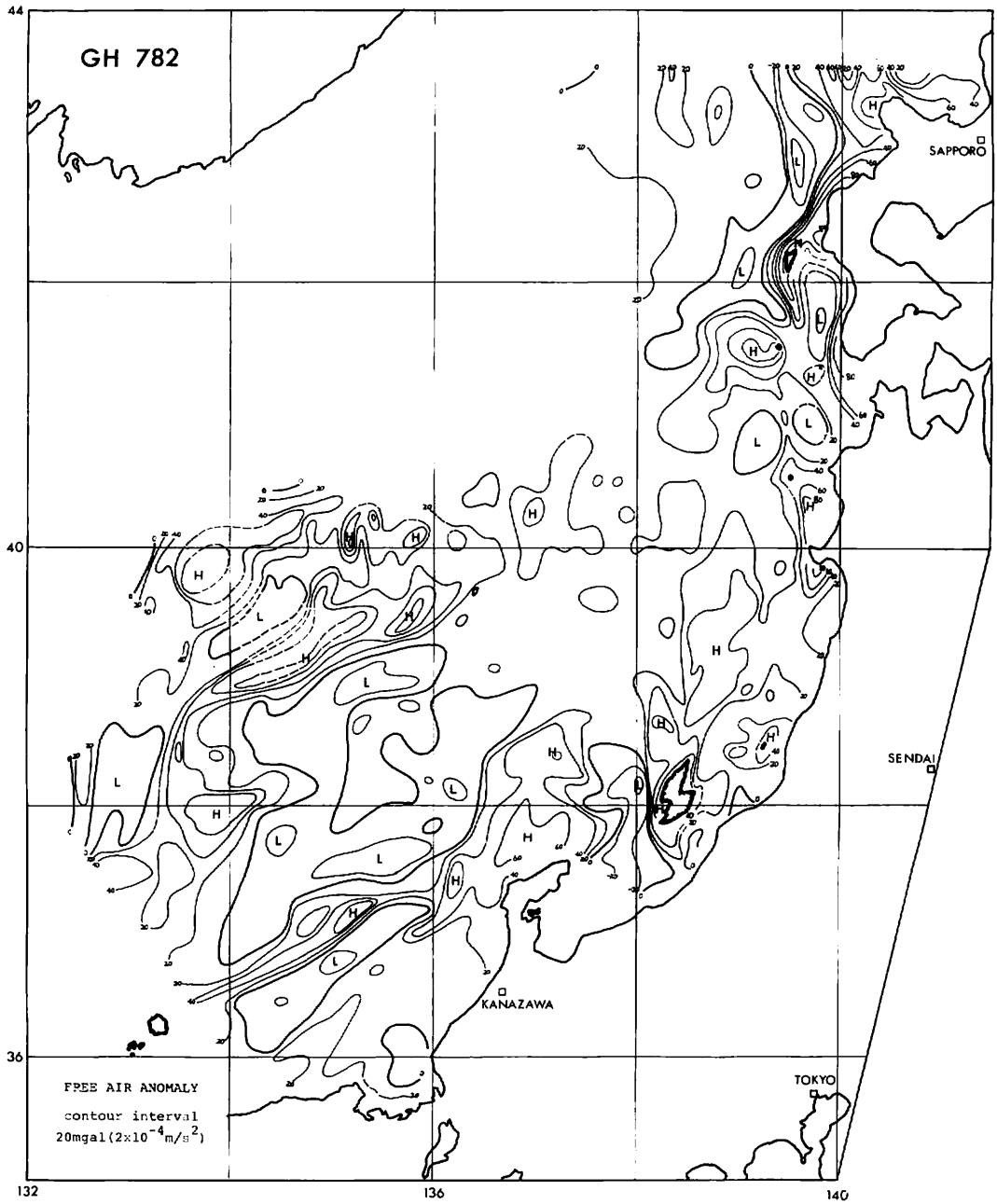


Fig. IV-1 Contour map of free air anomalies. Contour interval is 10 mgal.

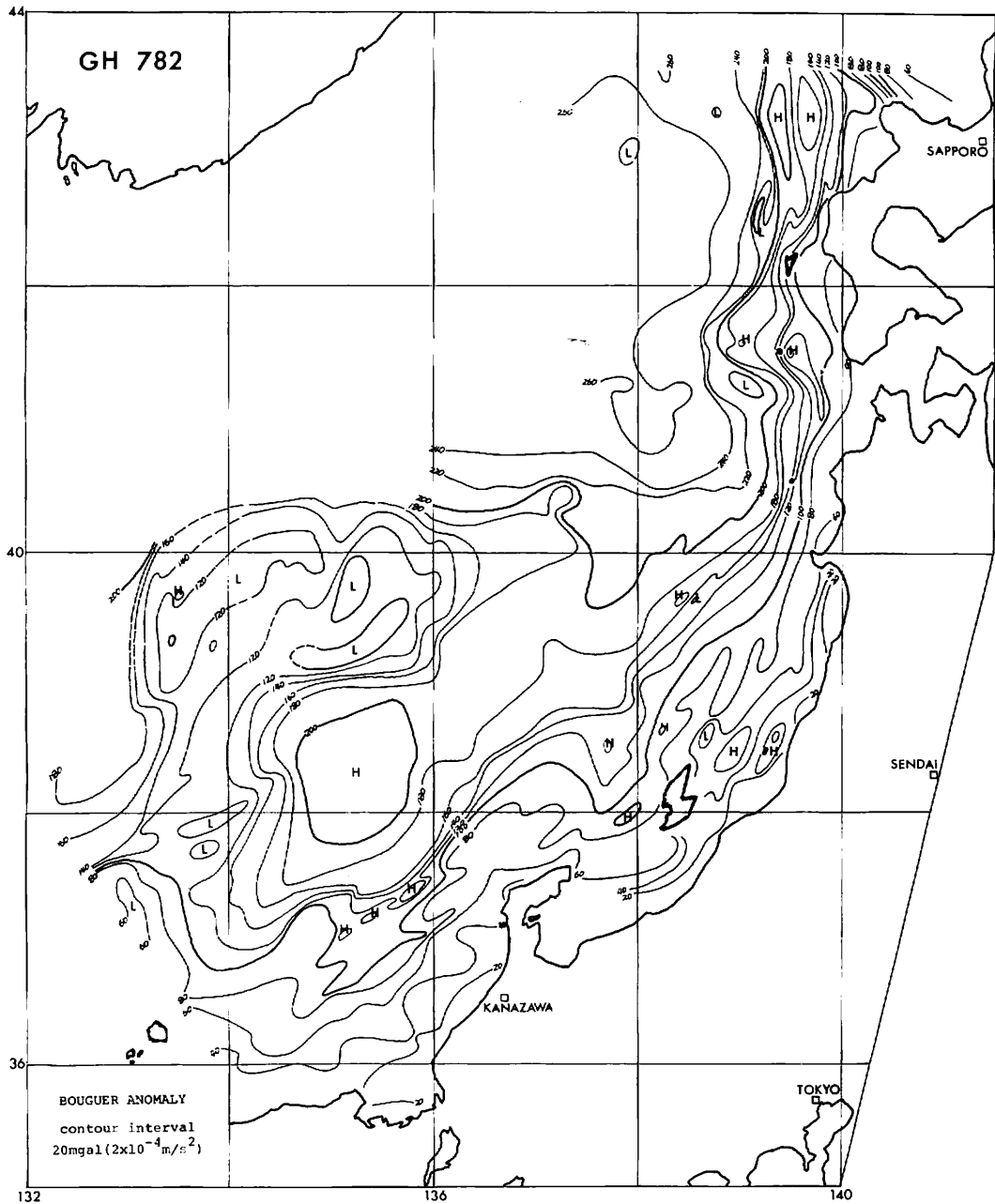
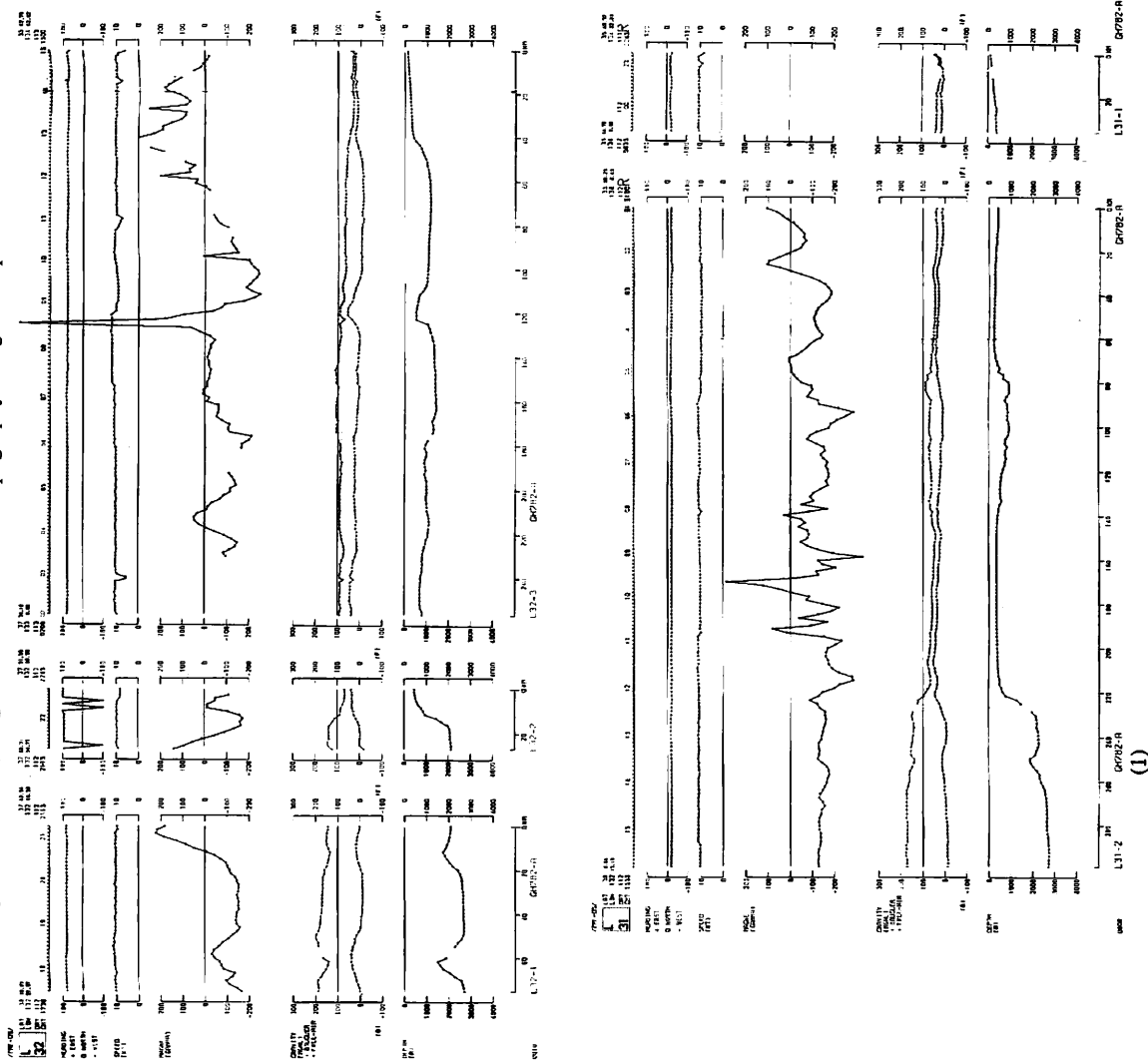
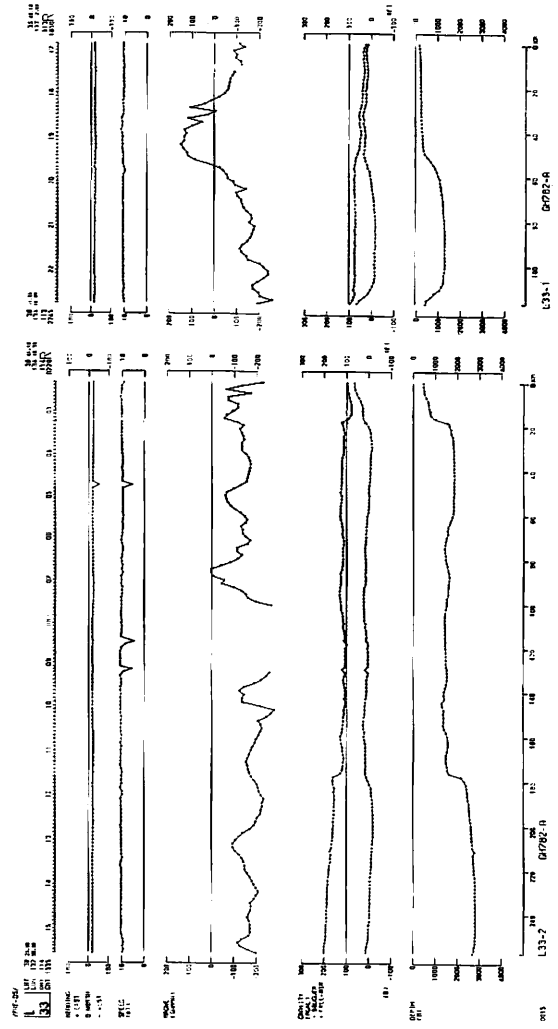
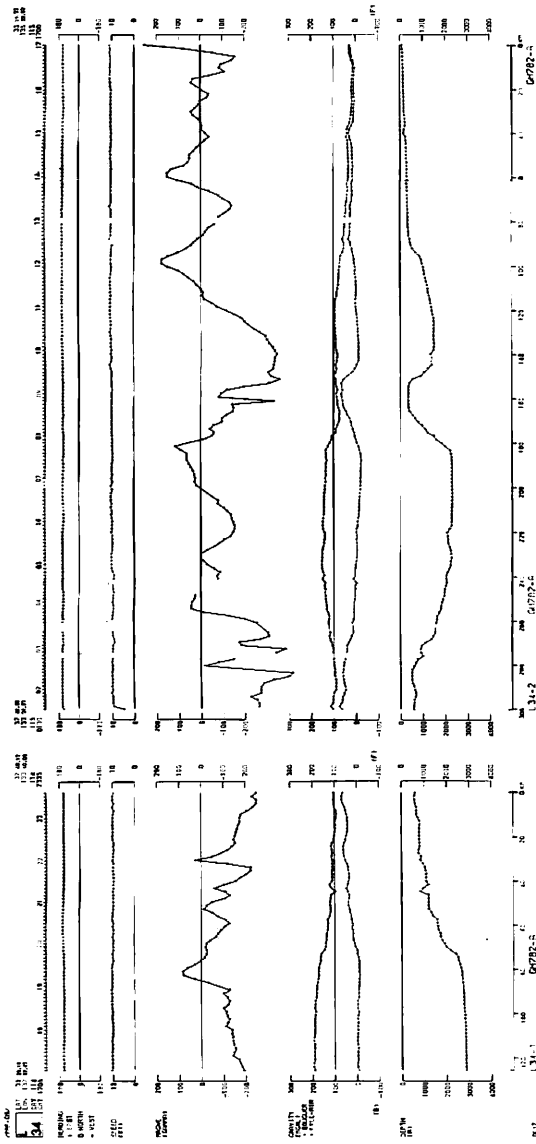


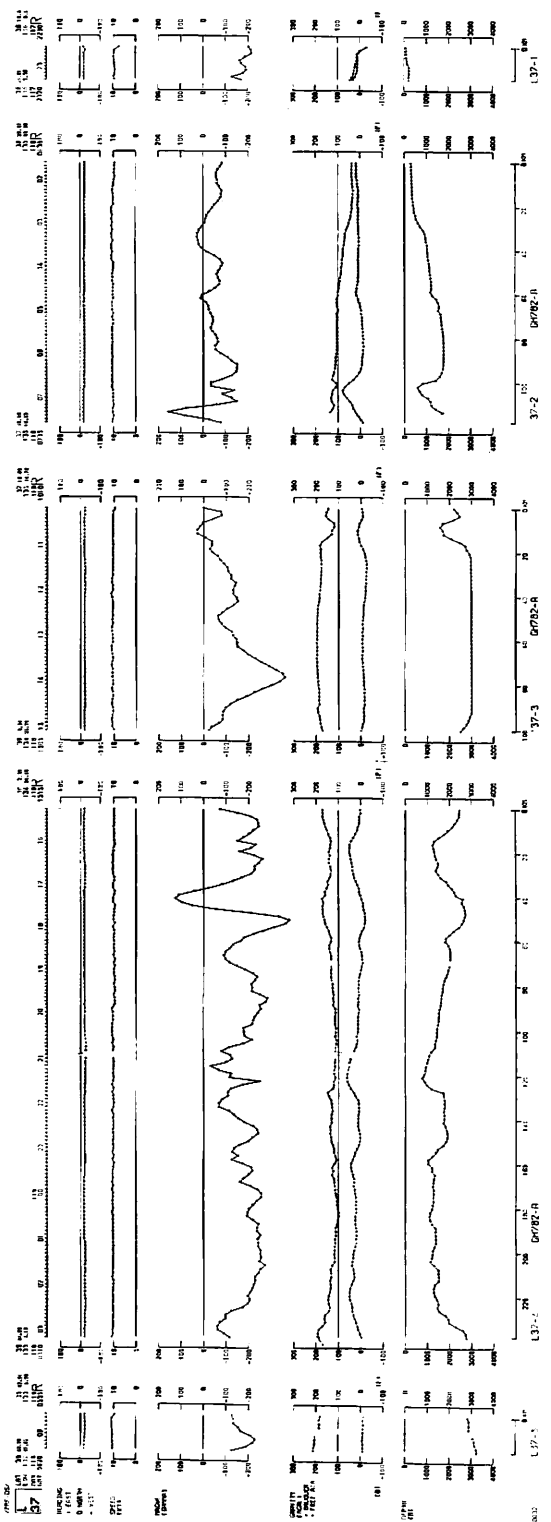
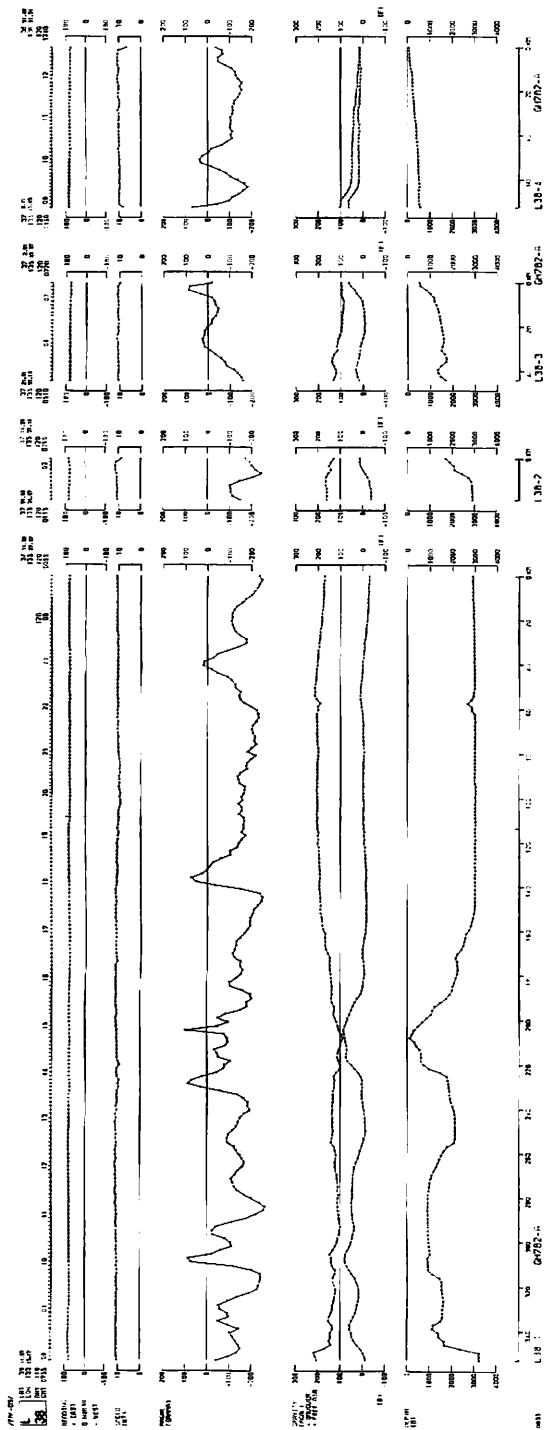
Fig. IV-2 Contour map of Bouguer anomalies. Contour interval is 10 mgal.

Fig. IV-3 (1~15) Profiles of free air, Bouguer anomalies, magnetic anomalies and topography along the ship's track.

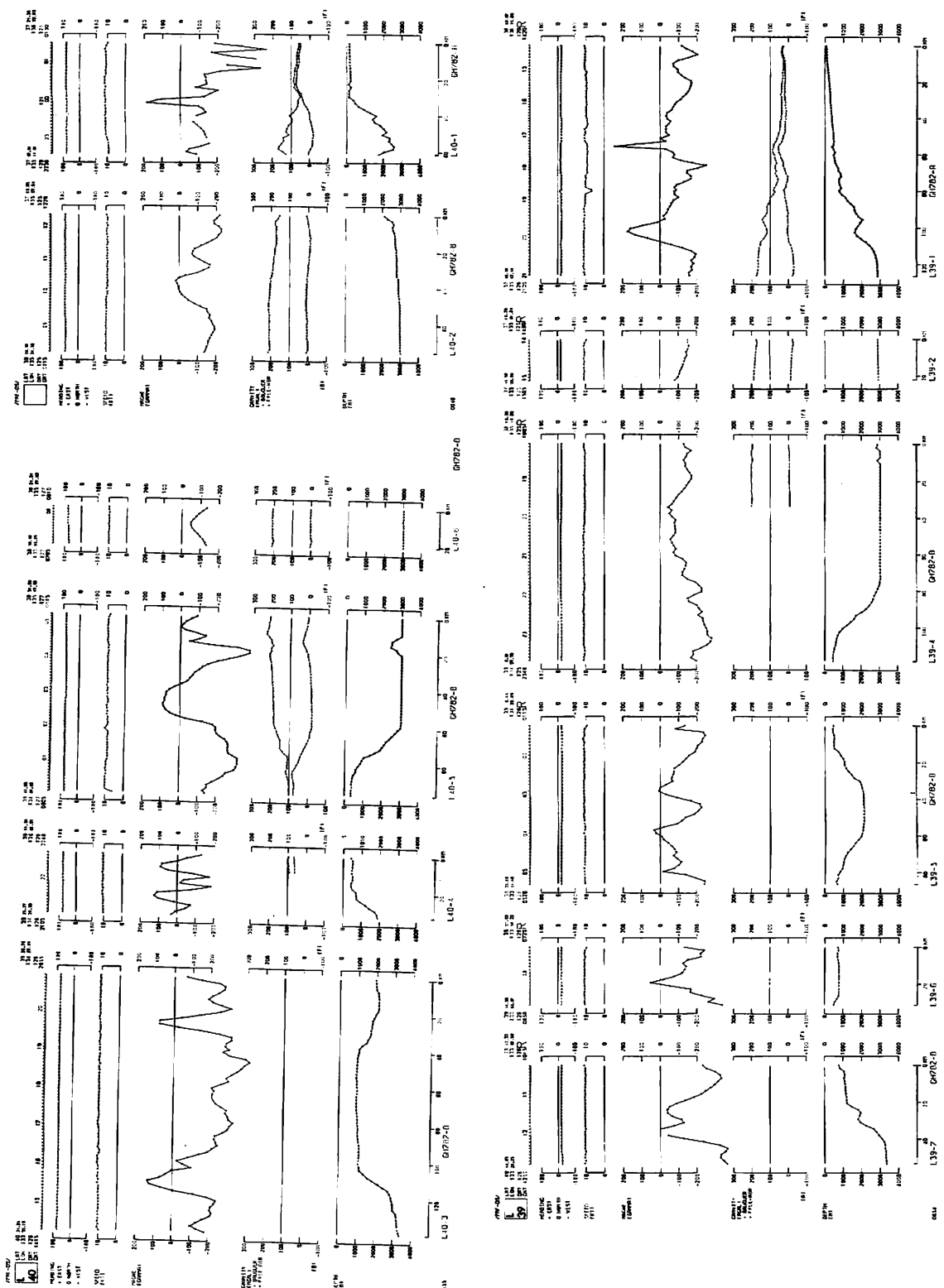




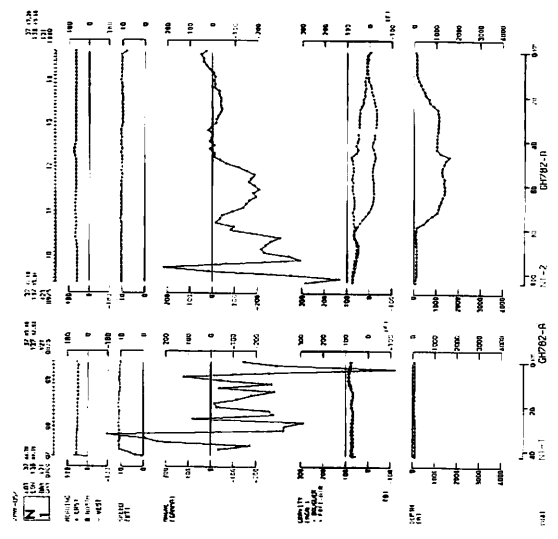
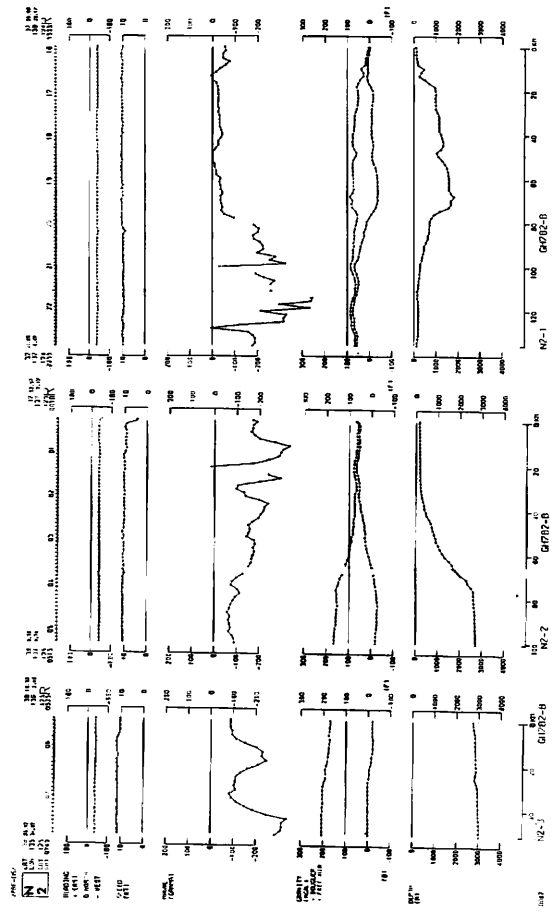
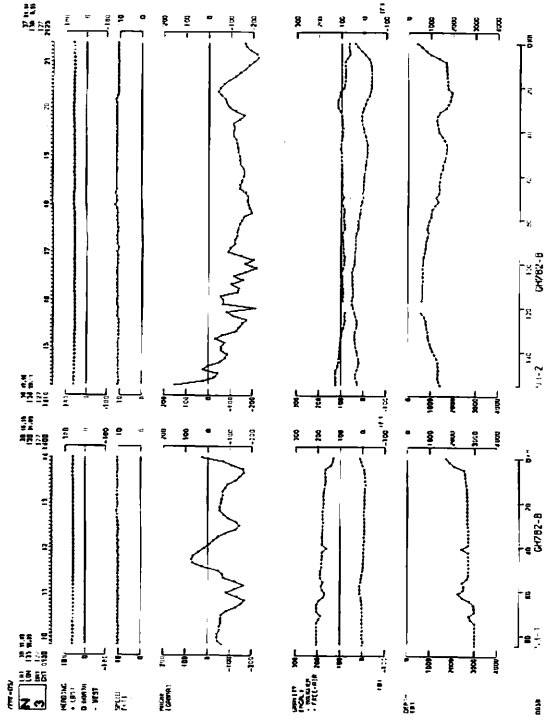
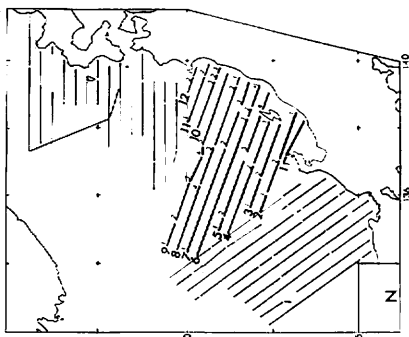
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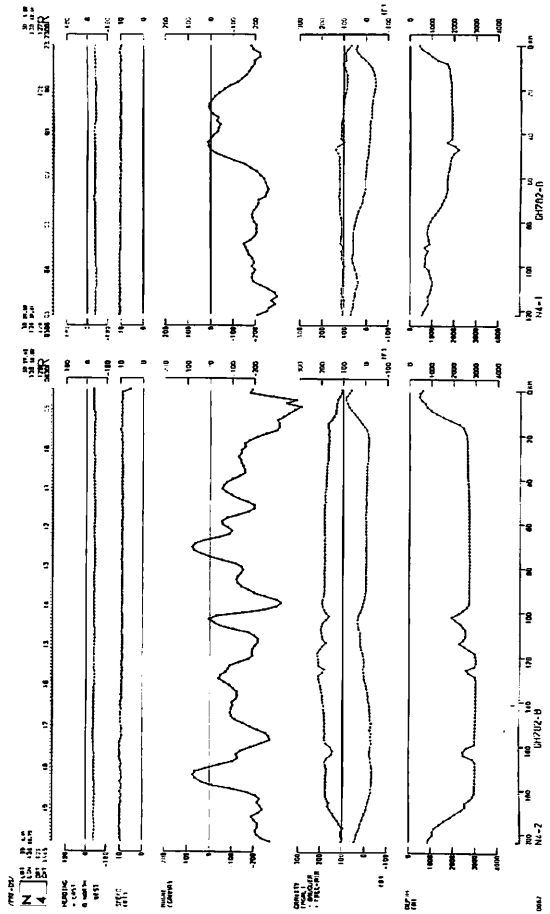
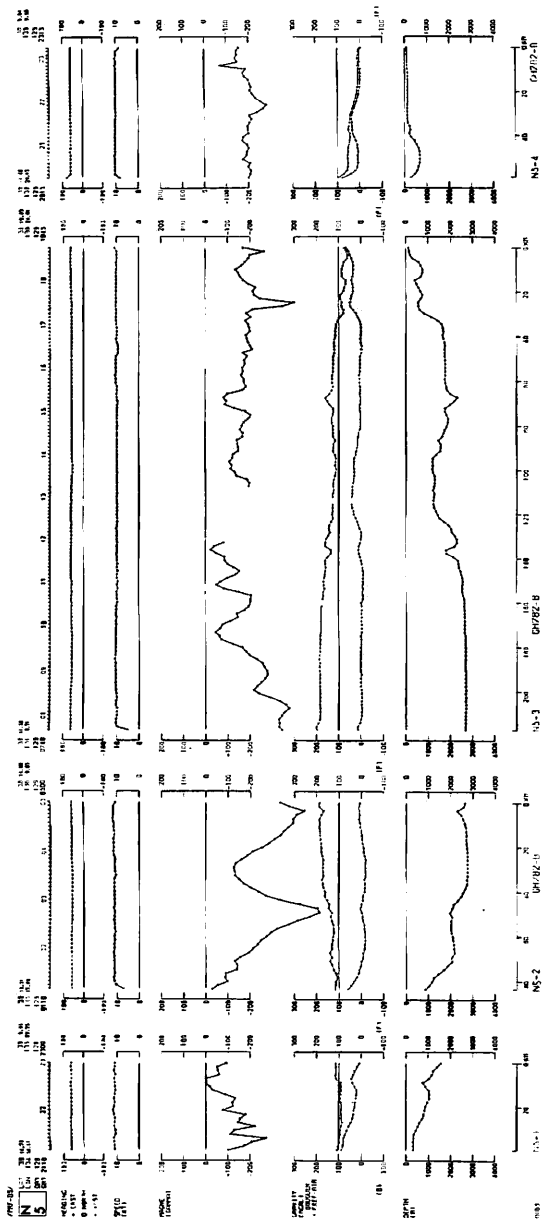
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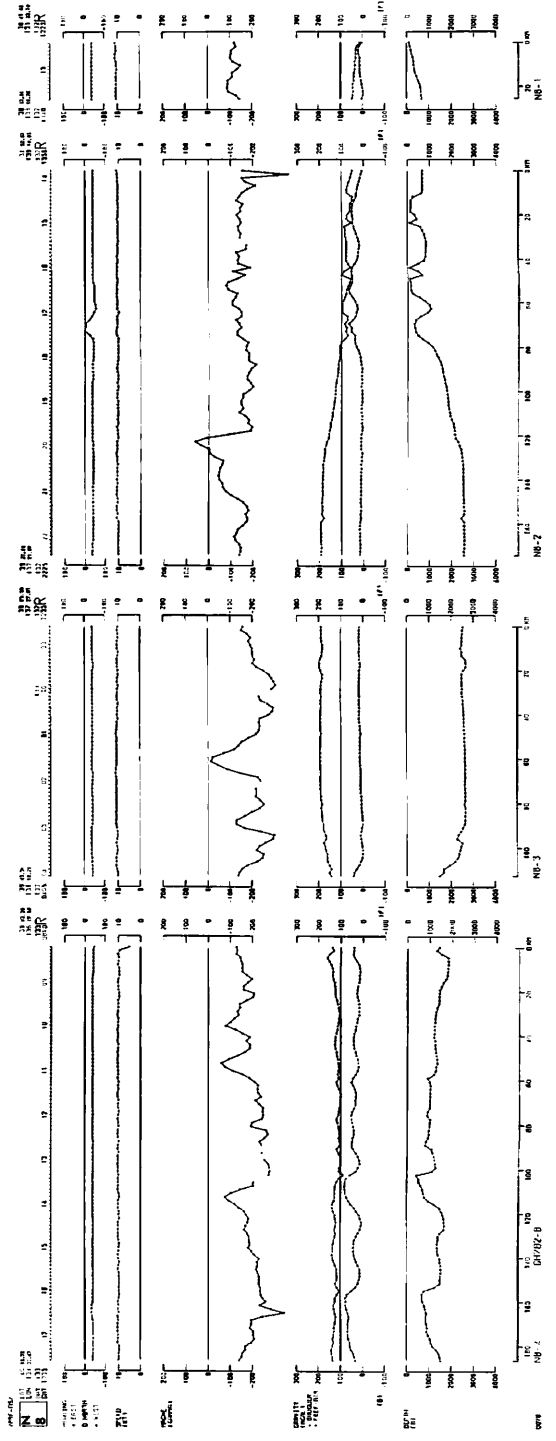
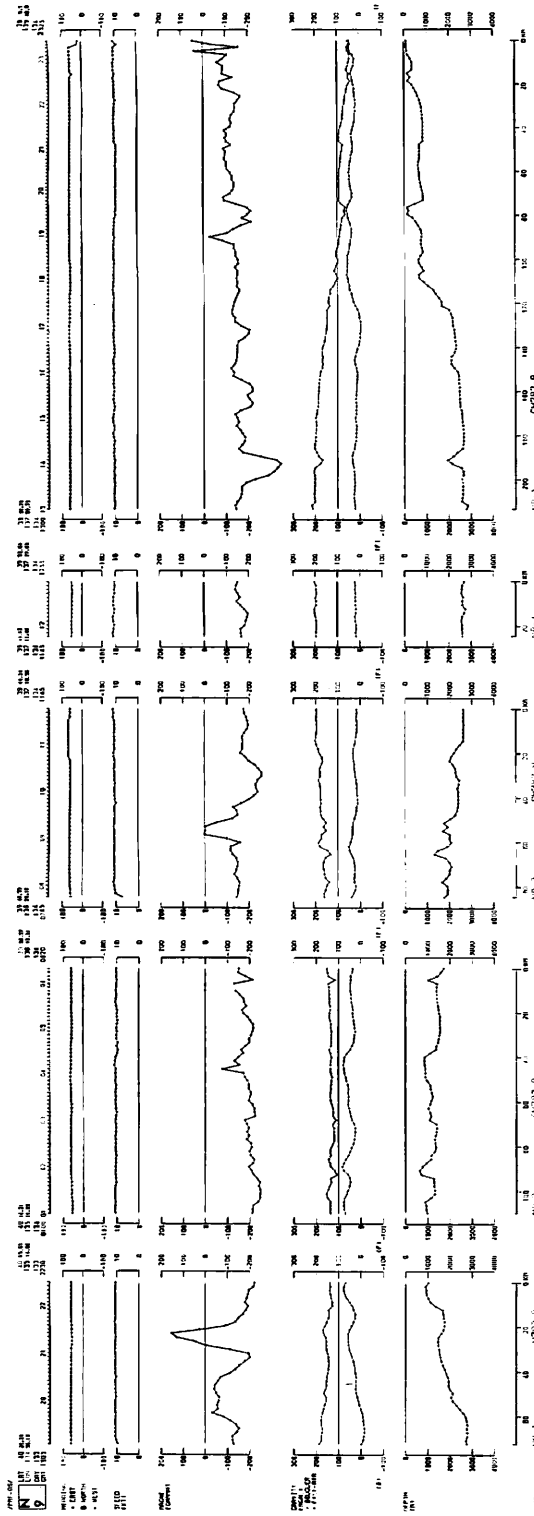
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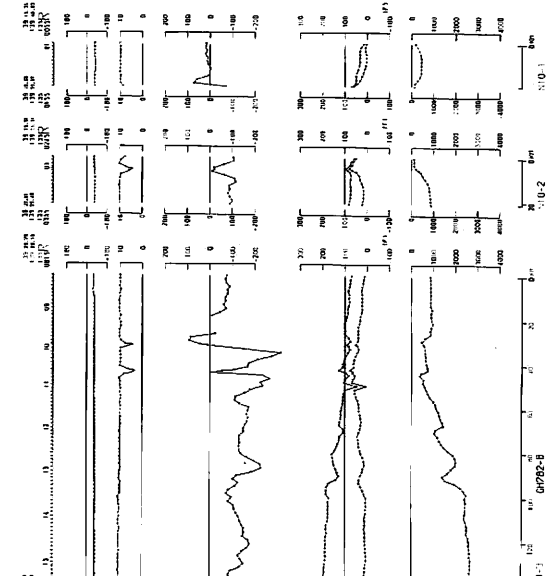
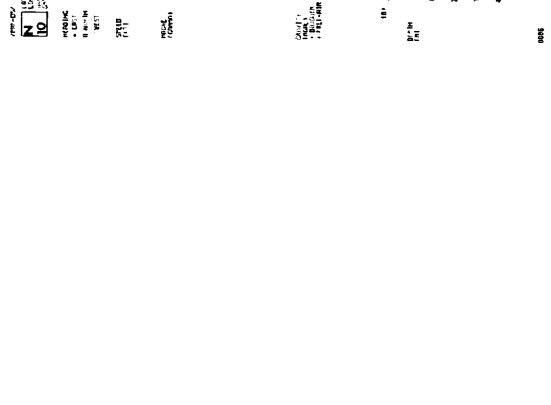
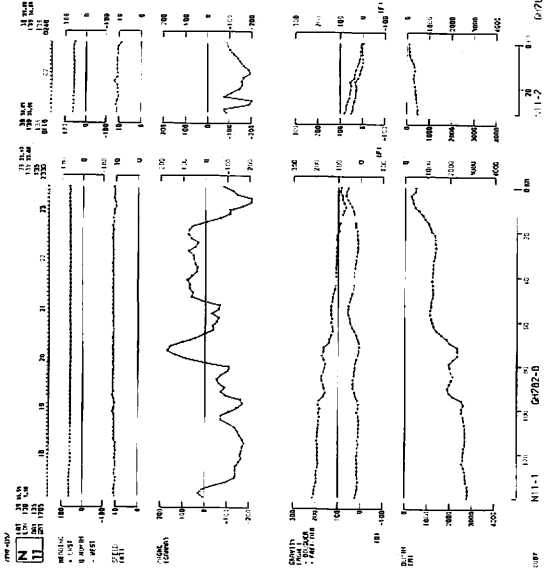
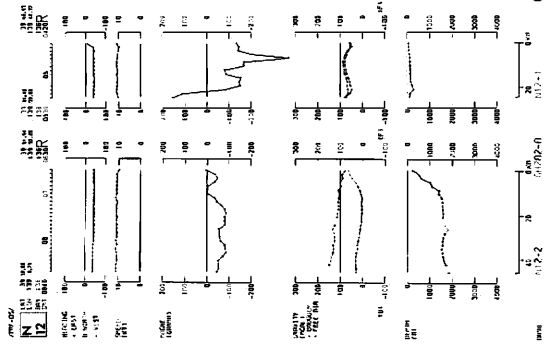


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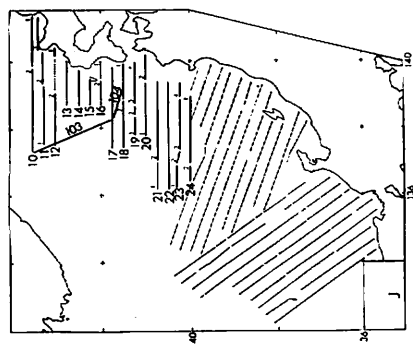
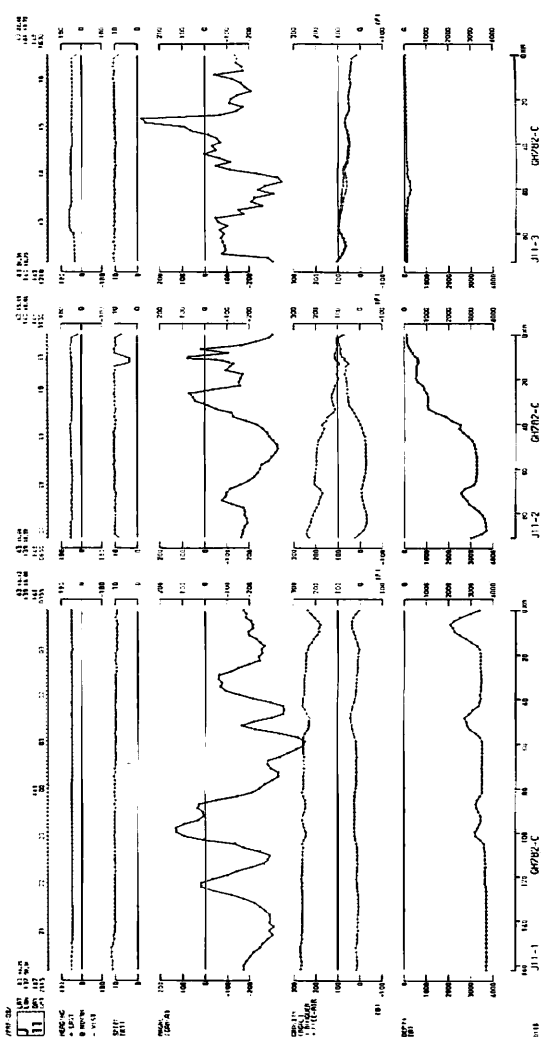
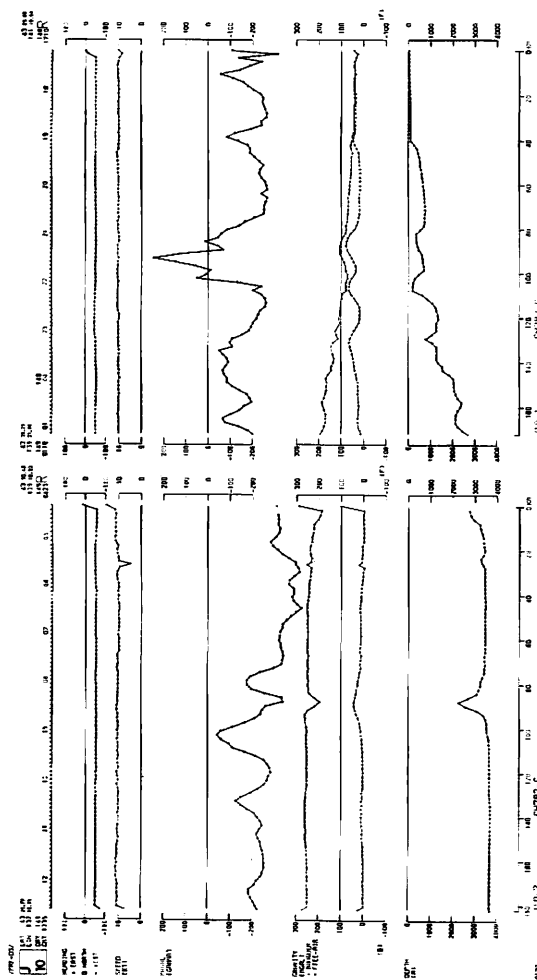


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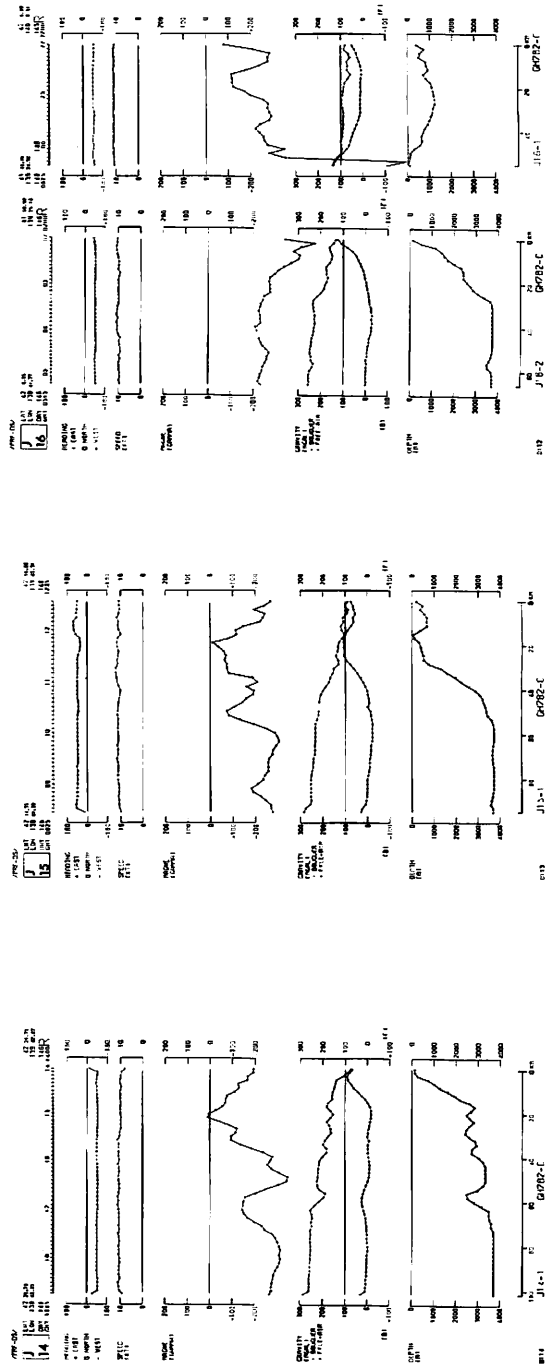
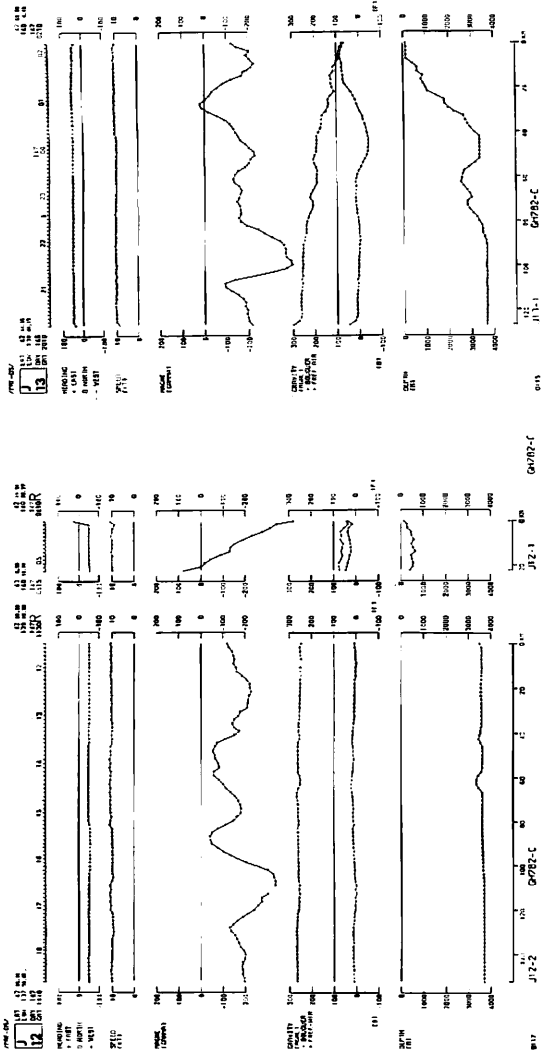




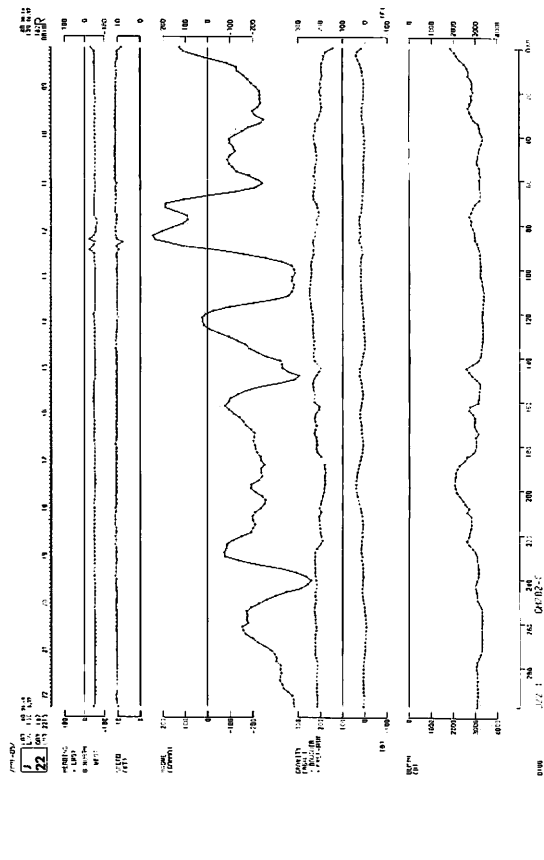
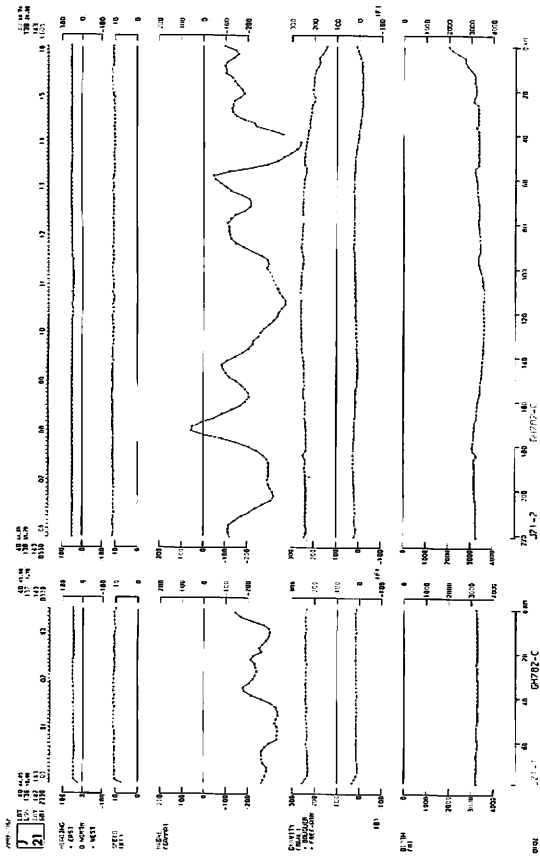
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