

V. GEOMAGNETIC SURVEY

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Method

The geomagnetic total measurement was carried out with a GeoMetrics Model G801 proton precession magnetometer. The sensor was towed about 200 meter astern in order to be free of the ship's effect. Observed total field was recorded on a chart with a pen recorder and also on magnetic tapes with a NNSS data logger system manufactured by Magnavox Co.. Magnetic anomalies were calculated by subtracting IGRF 1975.0 from the observed total field.

Results

Fig. V-1 shows the magnetic anomaly data, which are plotted as profiles perpendicular to the tracks. Positive anomalies are filled in black. Tracks L.1 to L.29 are perpendicular to the Tohoku Arc and tracks L.31 to L.43 are perpendicular to the Kurile Arc.

The magnetic anomaly data shown in Fig. V-1 are grouped in the following three areas by the features: (1) Magnetic anomalies which are lineated, have a large amplitude and a relatively long wavelength. These anomalies are obtained not only over the abyssal basin but over the landward slope of the trench: (2) Magnetic quiet zone on the continental slope, which have few variations in amplitude and negative values: (3) Continental positive anomalies along the southeast coast of Hokkaido and the east coast of the Tohoku region.

a) Off Hokkaido

The magnetic lineations reported by UYEDA and others (1976) exist in the NNE-SWW direction in the Pacific basin off Hokkaido. The trend of the magnetic lineations crosses at an angle with the trend of the Kurile Trench.

Fig. V-2 shows the magnetic anomaly profiles of L.31 to L.45 off Hokkaido. Vertical dotted lines show anomaly correlations and the vertical dotted line Q1 shows the seaward boundary of the magnetic quiet zone where the lineated magnetic anomalies disappear. The pattern of lineated magnetic anomalies is divided into the following two groups: (1) A group of L.31 to L.42; (2) A group of L.43 to L.45, which are offset between L.42 and L.43. A pattern of a typical fracture zone is recorded at the position of 07 in the continuous seismic reflection profile 43 of Fig. VI-1, where the pattern of lineated magnetic anomalies may be offset. The heavy line labeled F.Z. in Fig. V-4 shows the fracture zone traced from the data obtained and the southern extension which is traced from the one obtained by LARSON and CHASE (1972).

LARSON and CHASE (1972) calculated the model magnetic profiles for the Japanese lineation sets with the Phoenix magnetic block model. We compared our observed data with the pattern of calculated model magnetic profiles, and obtained an identification of M-5 to M-9 with the respective lineations (Fig. V-2 and Fig. V-4). The age of M-5 is 118m.y.B.P. and the age of M-9 is 121m.y.B.P. in the geomagnetic reversal time scale (LARSON and PITMAN, 1972).

There is the magnetic quiet zone on the continental slope with a water depth of about

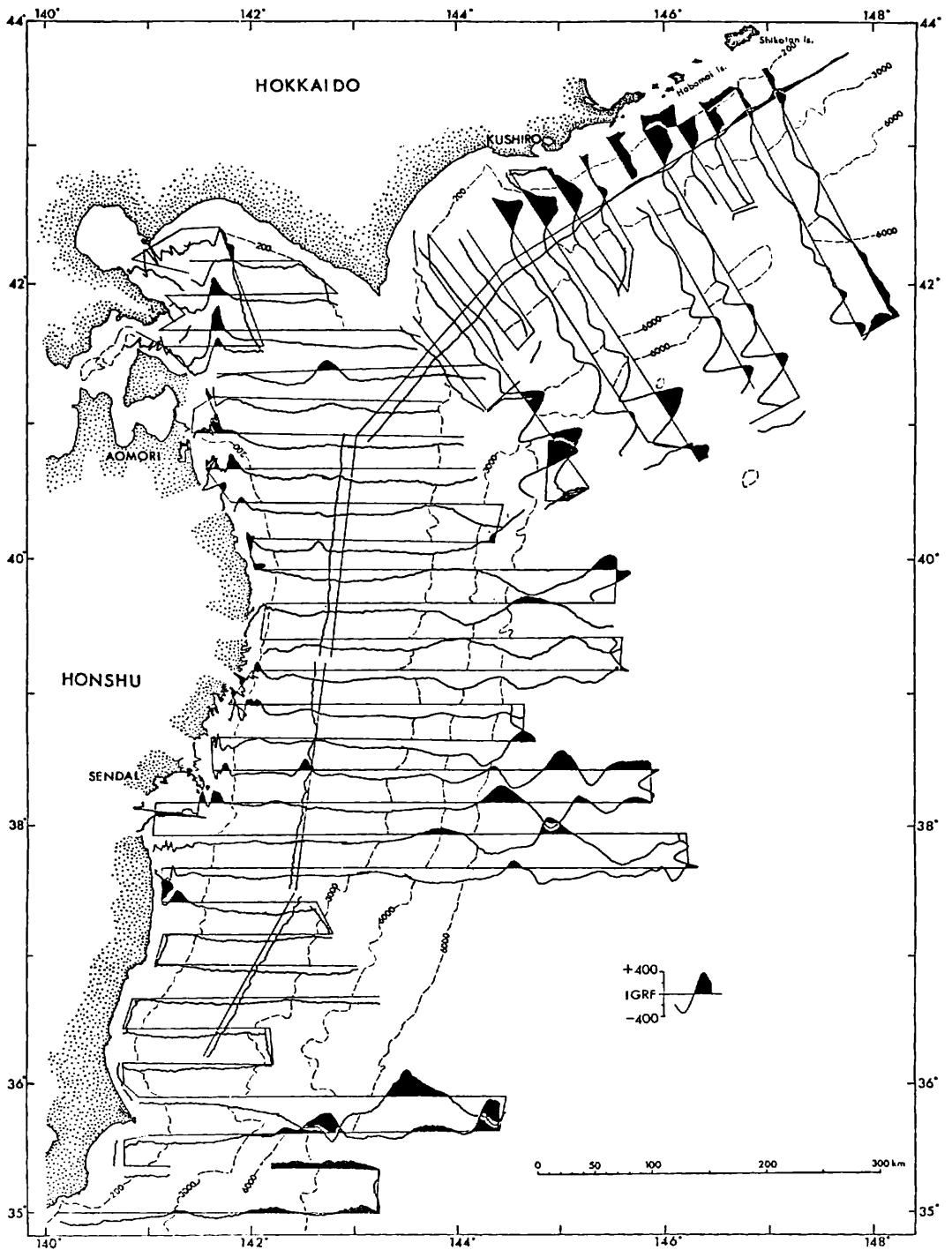


Fig. V-1 Magnetic anomaly data; Plotted as profiles perpendicular to tracks. Positive anomalies filled in black.

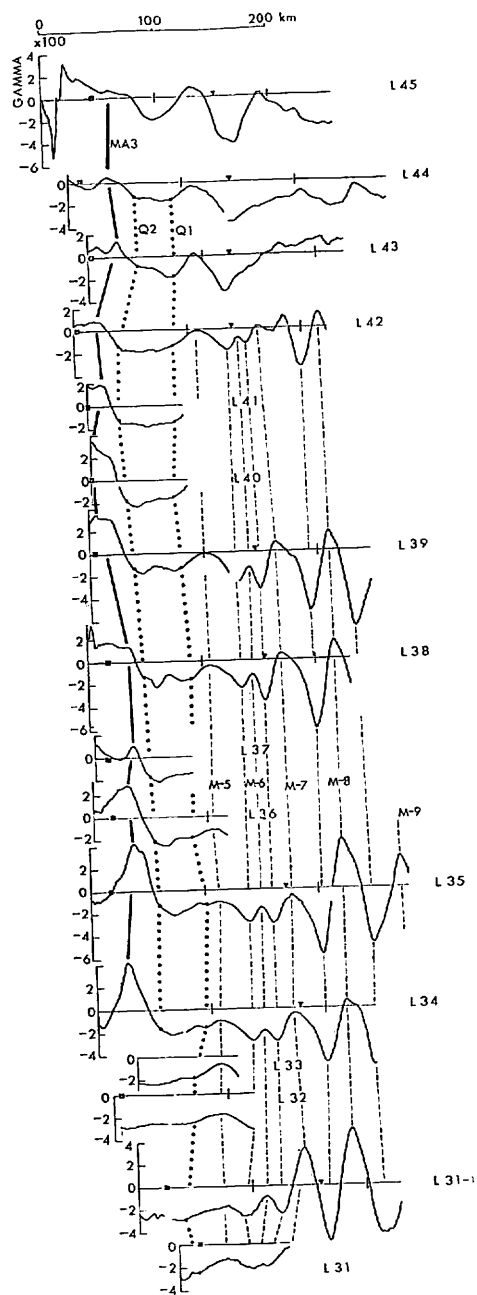


Fig. V-2 Magnetic anomaly profiles of L.31 to L.45 off Hokkaido; Vertical dashed lines are anomaly correlations. Vertical dotted line Q1 is a seaward boundary of magnetic quiet zone, where lineated magnetic anomalies disappear. Vertical dotted line Q2 is the positive magnetic anomaly trace. Heavy line labeled MA3 is the landward boundary of the magnetic quiet zone. ▼ shows the Kurile Trench axis. ■ shows the continental shelf edge.

2,000 to 4,000 meters (zone between Q1 and Q2 in Fig. V-2 and Fig. V-4). The width of the magnetic quiet zone is about 35 to 45 kilometers. The positive magnetic anomalies which have amplitude of several hundred of gammas exist landward from the magnetic quiet zone (heavy line labeled MA3 in Fig. V-3 and Fig. V-4). The seaward edge of the magnetic anomalies is located in a water depth of about 1,000 meters, and its trend is parallel to the Kurile Arc.

b) off Tohoku

Fig. V-3 shows the magnetic anomaly profiles of L.1 to L.29 from Boso Peninsula to the coast of Hokkaido. Off Tohoku, the magnetic anomalies have amplitudes of 400 to 600 gammas and a relatively long wavelength. They are observed on the abyssal basin and extend to the landward side of the Japan Trench. The magnetic anomaly correlations are shown with light dashed lines in Fig. V-3 and Fig. V-4. However, as the tracks are not perpendicular to the trend of the lineations, the anomaly correlations are rather weak.

Positive magnetic anomalies, which are traced from L.10 to L.29, exist on the continental shelf (heavy line labeled MA1 in Fig. V-3 and Fig. V-4). They have a relatively short wavelength of 10 to 15 kilometers and an amplitude of 200 to 600 gammas. The magnetic high anomalies exist on the continental slope with a water depth ranging between 1,000 to 1,500 meters (black triangular marks labeled MA2 in Fig. V-4). The magnetic high anomalies MA2 are observed in L.13 to L.17, L.21, L.23, L.25 and L.26.

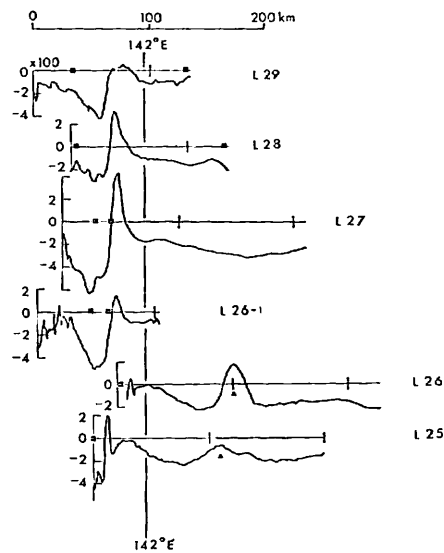


Fig. V-3a

Fig. V-3 Magnetic anomaly profiles of L.1 to L.29 off Tohoku (northeastern Japan) to the south coast of Hokkaido. Dashed lines are anomaly correlations. ▲ shows the magnetic high anomalies on the continental slope. ▼ shows the Japan Trench axis. ■ shows the continental shelf edge.

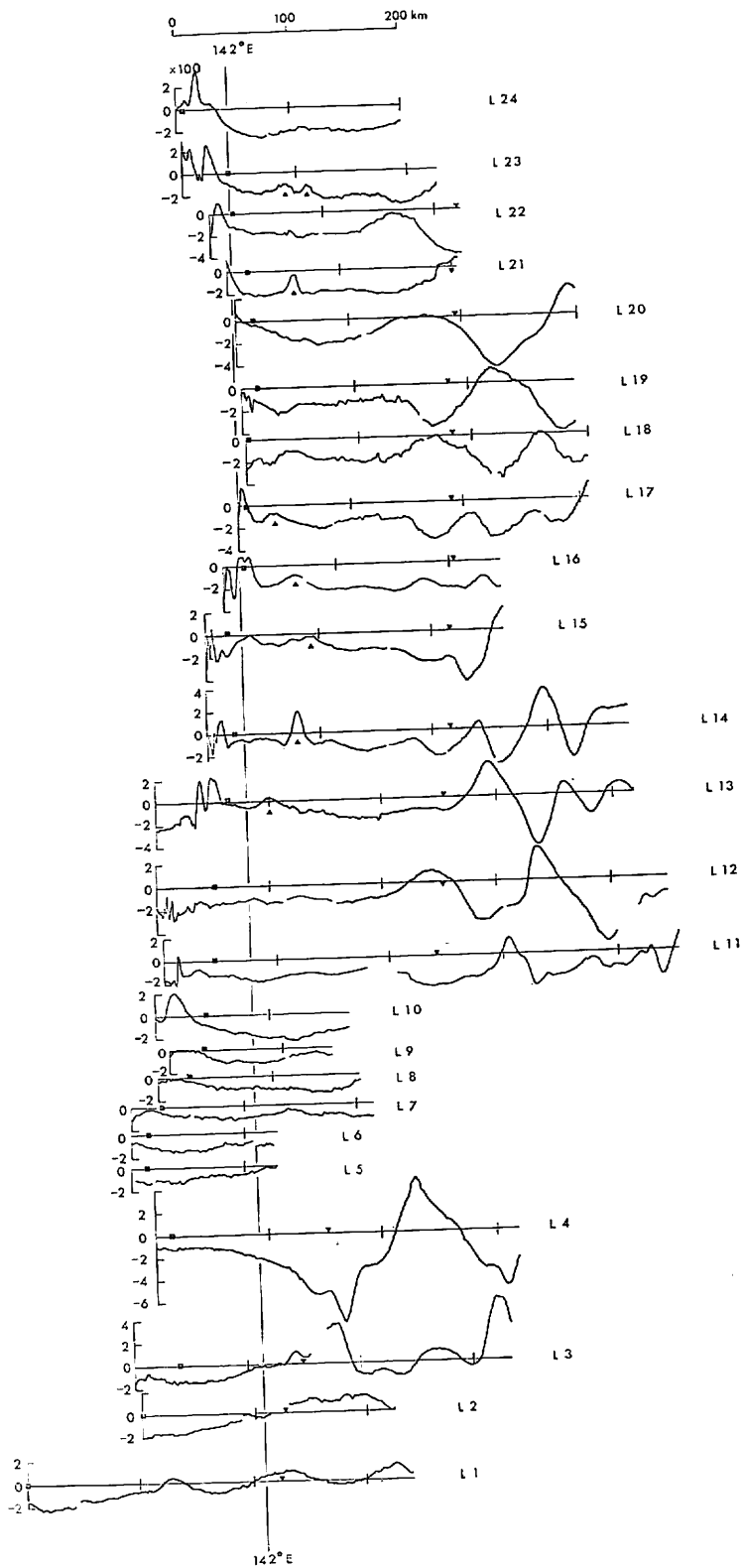


Fig. V-3b

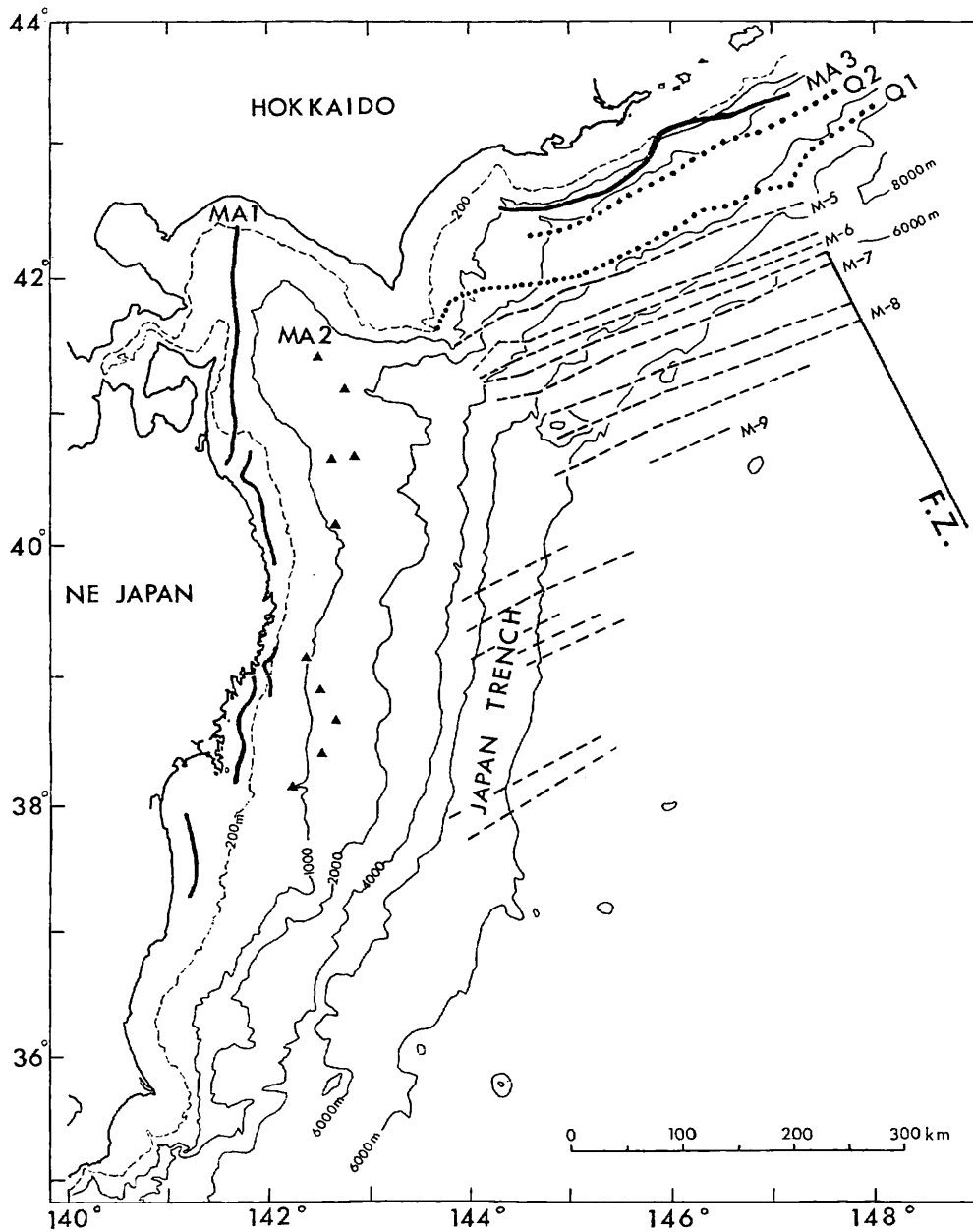


Fig. V-4 Magnetic anomaly lineations and other features; Dashed lines are magnetic anomaly lineations. • Dotted lines Q1 and Q2 show the boundary of the magnetic quiet zone. Heavy lines labeled MA1 and MA3 are the positive magnetic anomaly traces. ▲ labeled MA2 show the magnetic high anomalies on the continental slope. Heavy line labeled F.Z. is the trace of the fracture zone (Larson and Chase, 1972).

References Cited

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