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XIV. MAGNETIC ANOMALIES OF THE WESTERN PACIFIC OCEAN: UNDERWAY GEOMAGNETIC MEASUREMENTS DURING THE GH80-1, GH80-5, GH81-4, GH82-4, GH83-3 CRUISES

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Introduction

Five cruises (GH80-1, GH80-5, GH81-4, GH82-4 and GH83-3) were conducted by the Geological Survey of Japan from 1980 to 1983 as part of a special research program "Geological Study of Deep-sea Mineral Resources." In these cruises the geomagnetic total force, gravity and topography were measured not only in the study areas in the Central Pacific but also underway to and from the study areas (Fig. XIV-1). In this report we summarize the results of the underway geomagnetic measurements in the Western Pacific during the five cruises. The results of the study areas have been described in each cruise report.

Five sets of Mesozoic magnetic anomaly lineations are known in the western Pacific Ocean. They are the Japanese, Hawaiian, Phoenix, Magellan and Mid-Pacific Mountains lineation sets (e.g., Nakanishi *et al.*, 1989 and 1992). They were formed from the Pacific-Izanagi, Pacific-Farallon, Pacific-Phoenix, Phoenix-Magellan and Magellan-Farallon Ridges, respectively (Nakanishi, 1990). The age of the Mesozoic magnetic anomaly lineations corresponds with the period from Late Jurassic to Early Cretaceous (160–118 Ma). The lineations are called M-sequence.

Five cruises were carried out after 1980, but available tracks are nine because the magnetometer broke down in the first leg of the GH83-3 cruise (Fig. XIV-1, GH83-3A). Magnetic anomalies were calculated referring to the 1985 version of the International Geomagnetic Reference Field (IGRF) (IAGA, Division I Working Group 1, 1985). The Mesozoic geomagnetic reversal time scale used in this study is that proposed by Kent and Gradstein (1985) with a modification by Tamaki and Larson (1988).

Results

Magnetic anomaly profiles along all tracks are shown in Fig. XIV-2. Magnetic anomalies have various amplitudes and wavelengths. We divided the profiles into four sections (I–IV) according to the amplitude and wavelength. The following is the character of magnetic anomalies of every section.

The Japanese lineation set from chron M17 to chron M29 (143–160 Ma) was identified in the section I (Fig. XIV-3). Peak-to-peak amplitudes of the magnetic

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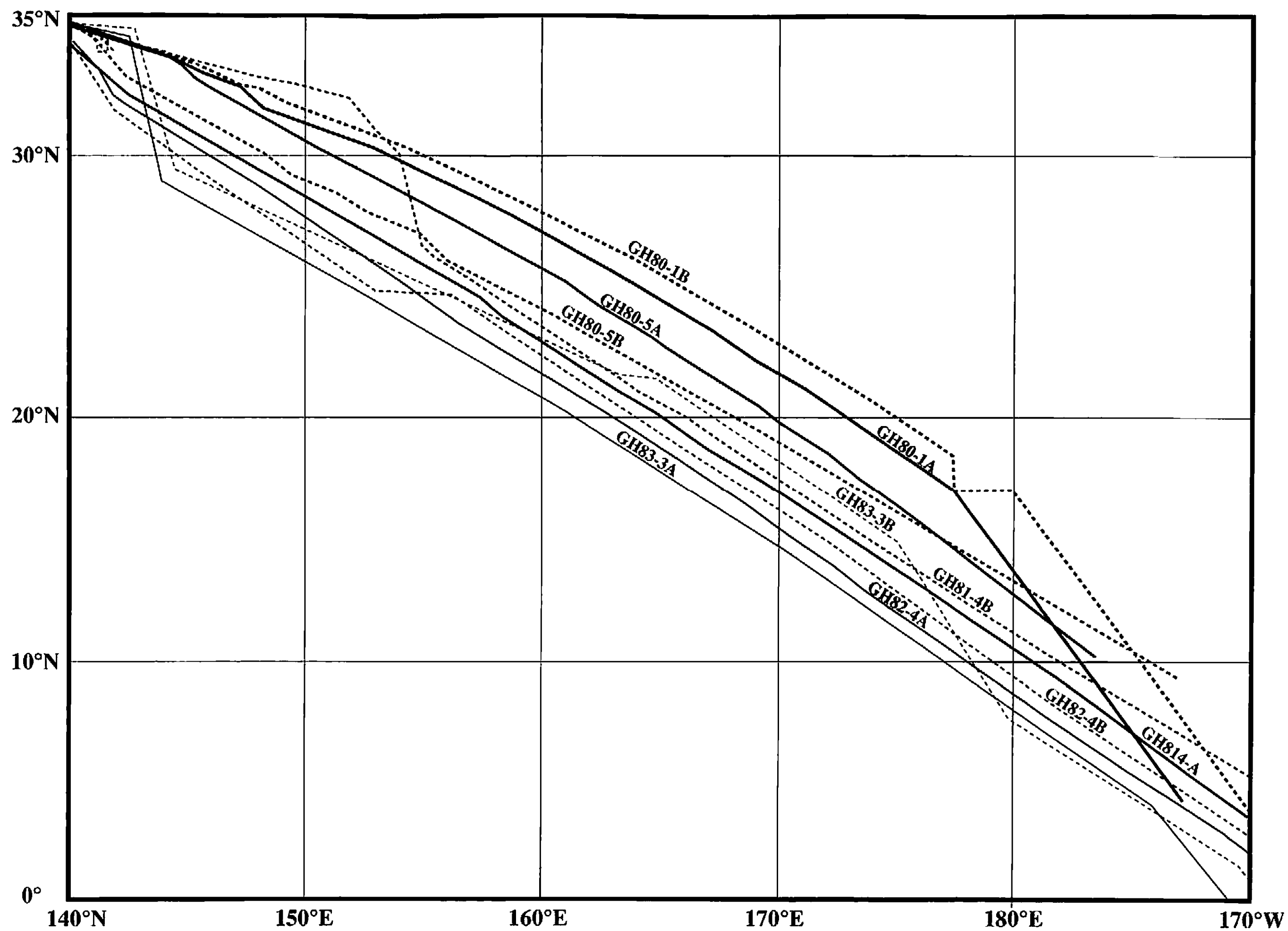

Fig. XIV-1 Ship's tracks of five cruises during transit to and from the study areas. "A" or "B" added to a cruise number represents the track to or from the study areas, respectively.

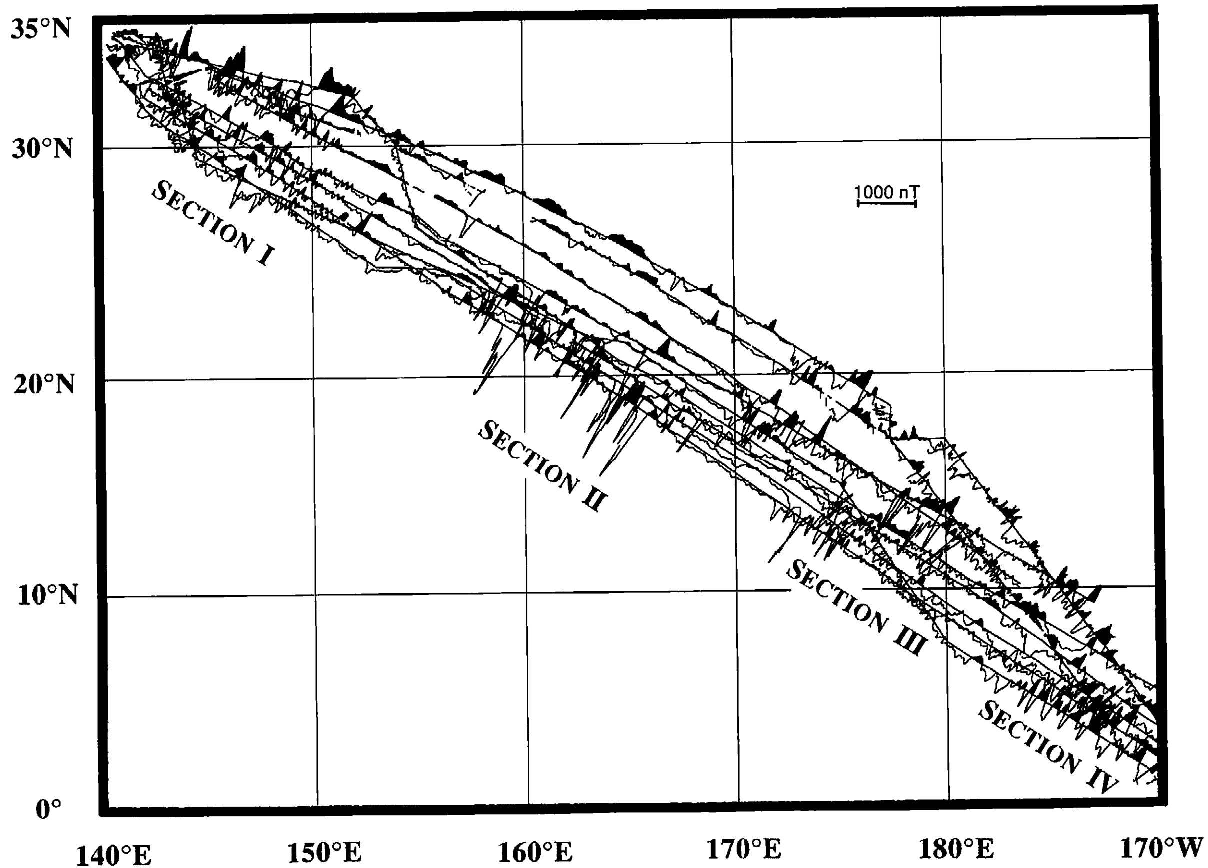

Fig. XIV-2 Magnetic anomaly profiles along the tracks of all the cruises. Scale bar indicates amplitudes of magnetic anomalies. Positive anomalies are shaded.

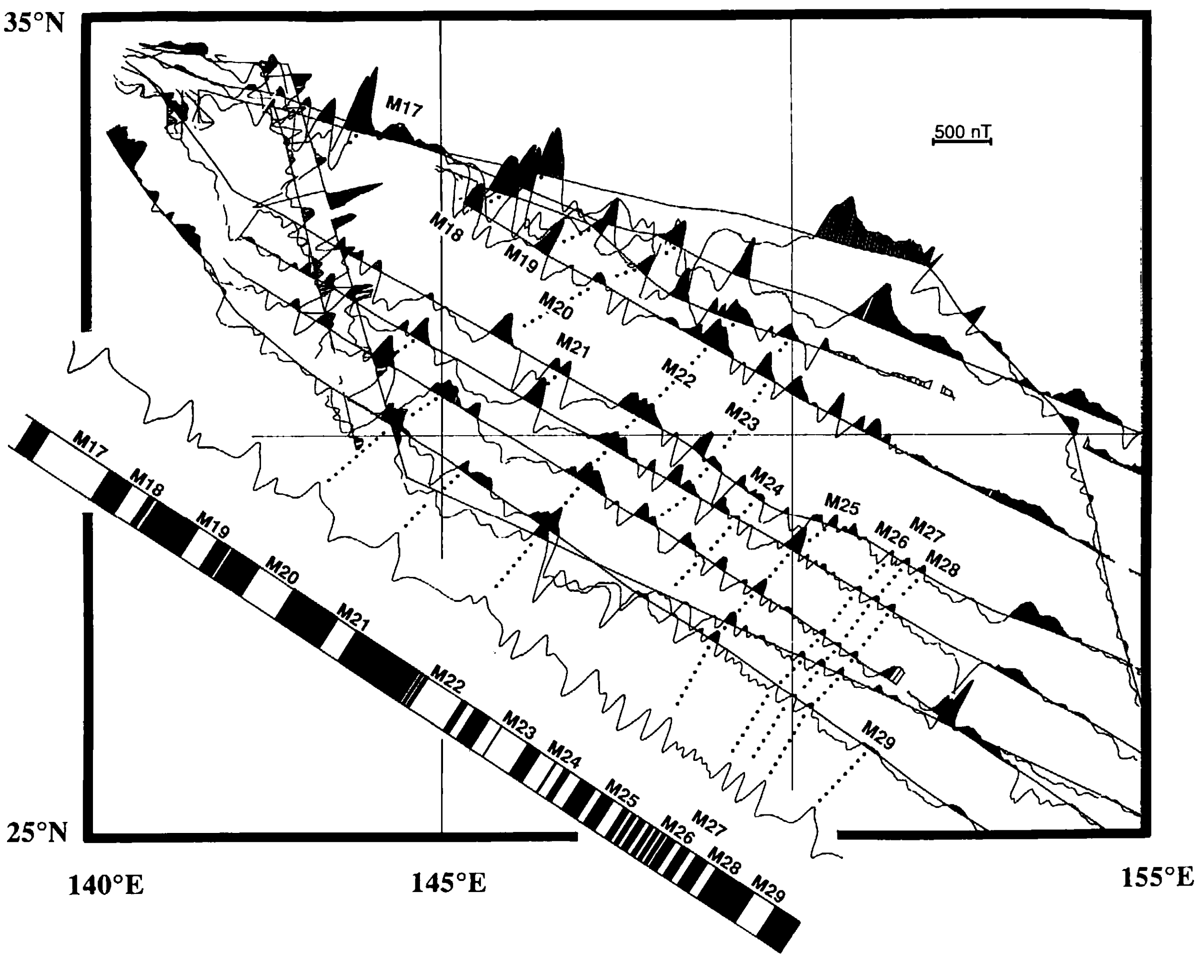

Fig. XIV-3 Magnetic anomaly profiles along ship's tracks in the section I. Scale bar indicates amplitudes of magnetic anomalies. Positive anomalies are shaded. Normally magnetized blocks are solid black. Skewness parameter for calculation of model profile is −230° (Nakanishi *et al.*, 1989).

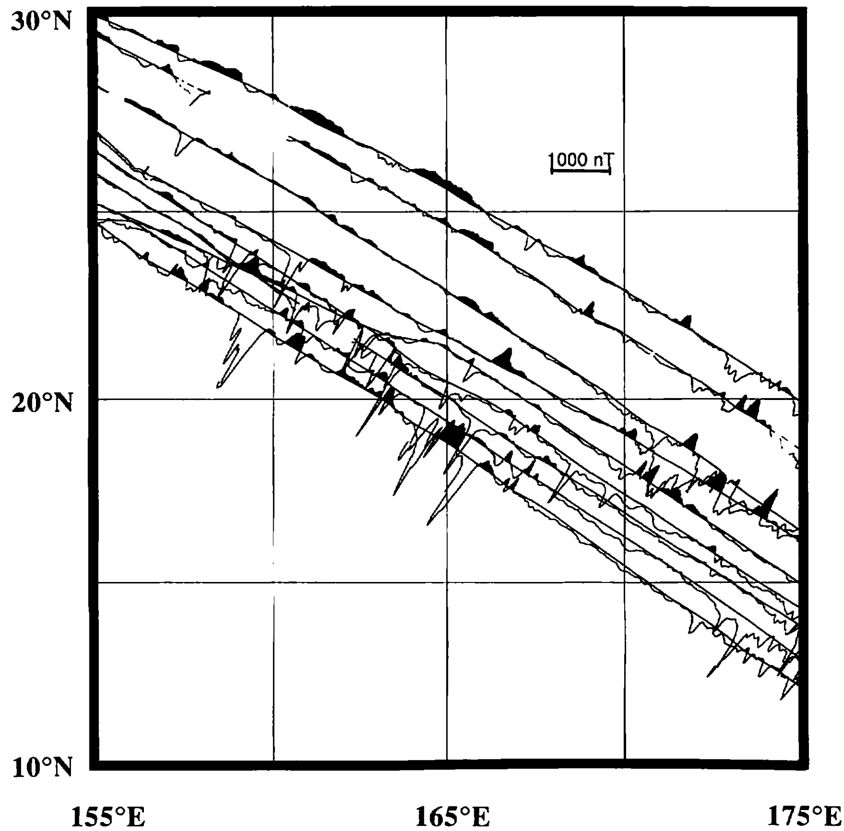

Fig. XIV-4 Magnetic anomaly profiles along ship's tracks in the section II. Scale bar indicates amplitudes of magnetic anomalies. Positive anomalies are shaded.

anomalies decrease from 800 nT to less than 100 nT as ages become older. The wavelength is less than one hundred kilometers. The strike of the lineations from M21 to M29 is N45°E. That of the lineations from M17 to M20 is N70°E. Six small events between M25 and M26 are well recognized in the tracks of the GH80-5B, GH81-4A, GH82-4A, GH82-4B and GH83-3B. The events between M28 and M29 proposed by Tamaki *et al.* (1987) are not so well confirmed in any tracks.

There are no magnetic anomaly lineations in the section II (Fig. XIV-4). Peak-to-peak amplitudes of the magnetic anomalies accompanied by seamounts are more than 1000 nT, but those of other areas are less than 100 nT. The wavelength except for the magnetic anomalies due to the seamounts is more than several hundred kilometers and is longer than those in the other sections. The lineations older than M29 proposed by Handschumacher and Gettrust (1985) were not identified in this section. The negative anomalies are prominent southeast of 18°N, 167°E. We can find a distinct change in anomaly character between the northwestern and southeastern parts of this section. The base level to the southeastern part is lower and anomalies there are predominantly

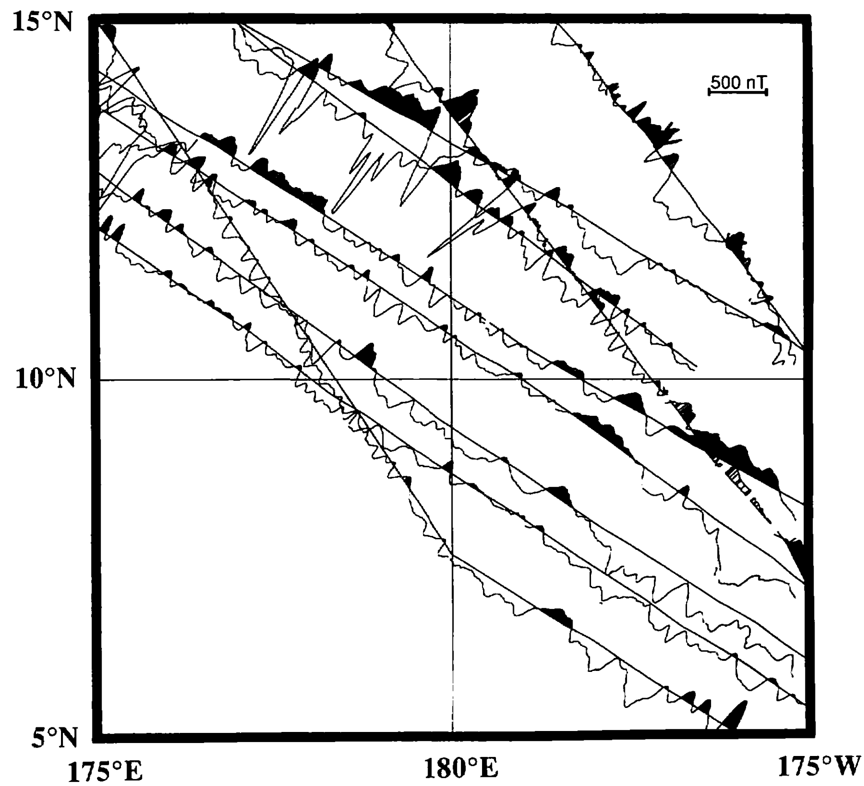

Fig. XIV-5 Magnetic anomaly profiles along ship's tracks in the section III. Scale bar indicates amplitudes of magnetic anomalies. Positive anomalies are shaded.

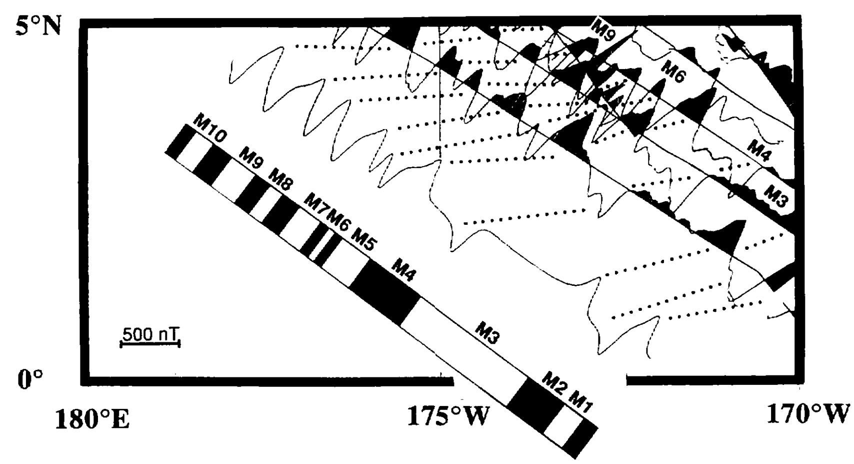

Fig. XIV-6 Magnetic anomaly profiles along ship's tracks in the section IV. Scale bar indicates amplitudes of magnetic anomalies. Positive anomalies are shaded. Normally magnetized blocks are solid black. Skewness parameter for calculation of model profile is −130° (Nakanishi *et al.*, 1992).

negative. This change is similar to that in the area southwestward of this section proposed by Handschumacher *et al.* (1988).

There seems to exist a series of short wavelength (more than several hundred kilometers) lineations in the section III, although we could not assign their ages (Fig. XIV-5). Bathymetry in this area is extremely rough. The strike of the lineations is NE–SW. Peak-to-peak amplitudes are 200-300 nT. Lineations of such strike are not known in areas adjacent to this section.

The Phoenix lineation set from chron M1 to chron M10 (120–130 Ma) was recognized in the section IV (Fig. XIV-6). Peak-to-peak amplitudes of the magnetic anomalies are 700 nT and are much larger than those of the Phoenix lineation set in other areas. The wavelength is less than one hundred kilometers. The strike of the lineation is N80°E.

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