

Characteristics and evolution of the southern part of the central Mariana Trough

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We have conducted a surface geophysical survey in the southern part of the central Mariana Trough (14N-16.5N) during KR03-13 and YK03-09 cruises in 2003. We present detailed sea-floor spreading history in this region using multi-narrow beam bathymetry, acoustic backscattering image, and vector geomagnetic field data. This area is important for understanding spreading processes of the Mariana Trough, because areas to the north and south of this region have different spreading features. The seafloor spreading in the northern and central Mariana Trough began at about 6 Ma as a slow-spreading type, while that in the southern Mariana Trough began at about 3 Ma as a fast-spreading type.

Locations of present ridge axes and segment boundaries were determined by bathymetric features and side scan images. Locations and strikes of magnetic polarity boundaries were determined by two geomagnetic inversion methods, the Genetic Algorithm in '2.5' dimensional structure (Yamamoto and Seama, 2004) and the FFT-based inversion (Parker and Huestis, 1974). The magnetization boundaries were correlated to the geomagnetic polarity timescale (Cande and Kent, 1995).

The southern part of the central Mariana Trough consists of four ridge segments; the segment-1, -2, -3, and -4 from the north. The spreading direction was estimated to be close to E-W from bathymetric lineament. The oldest magnetic isochrons identified 5.89 Ma at the segment-1, 5.23 Ma at the segment-2, 4.8 Ma at the segment-3, and 0.78 Ma at the segment-4 respectively. The half spreading rate is constant and about 23mm/yr in all segments.

The age of the initiation of the spreading was estimated by extrapolating the spreading rate. The segment -1, -2, and -3 have common features : 1) the oldest crustal ages were about 7 Ma at the segment 1 and about 6 Ma at the segment -2 and -3. 2) strikes of segmentation boundaries had changed from 30-45deg. to 90deg. at 144E, which is located at 3 Ma isochron. Except for the segment-3, segment boundaries are unstable. On the other hand, the segment-4 has begun to spread at 4 Ma. The segmentation boundary strike in the segment-4 is E-W.

We conclude that spreading processes dramatically change at the segment boundary at about 14.7N.