Vector magnetic anomalies around the East Scotia Ridge

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Seafloor spreading in back-arc basins is a characteristic phenomenon related to subduction. However, the process of initiation and evolution of back-arc spreading, and the similarities and differences between back-arc and mid-ocean spreading remain poorly known. The East Scotia Sea has been created at least the past 10 Ma, and one of the first back-arc basins in which well-developed magnetic anomalies were identified.

Vector measurements of the geomagnetic field provide more detailed information than total intensity to understand the oceanic crust's magnetic structure. A shipboard three-component magnetometer (STCM) (Isezaki, 1986) was installed onboard the British Antarctic Survey ship, RRS James Clark Ross, during cruise JR09 in 1995. Vector data of the geomagnetic anomaly field were firstly obtained around the back-arc spreading axis in the East Scotia Sea.

The geomagnetic field vectors were obtained using the twelve constants related to the ship's magnetic susceptibility and permanent distribution following Isezaki (1986). The vector geomagnetic anomalies were calculated by subtracting the IGRF model. Strikes of the two-dimensional magnetic structures at the positions of their boundaries (boundary vectors) are deduced by using vector data of the geomagnetic anomaly field (Seama et al., 1992). Crustal magnetization was also estimated using Parker and Huestis's (1974) method, assuming a constant-thickness source layer and an upper surface defined by the bathymetry.

No transform faults are observed in the back-arc spreading in the Northern East Scotia Sea. Magnetic anomaly profiles and the boundary vectors' strikes indicate that propagation rifts and overlapping spreading centers occur at each segment boundary. Southward propagating of the back-arc spreading axis is dominant in the Northern East Scotia Sea.

The Ridge axis is characterized by high magnetization and higher magnetization at each segment boundary. Asymmetric spreading patterns are found, possibly due to propagation rift.

References

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