

Magnetic properties and diagenesis of rapidly deposited anoxic sediments offshore Shimokita

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When continuously deposited sedimentary sequences maintain primary natural remanent magnetization (NRM), it will provide clues to reconstruct past geomagnetic field direction and intensity. However, rapidly accumulated sediments in coastal regions are usually characterized by high organic material content, which may cause diagenetic modification of magnetic properties under the anoxic environment. Severe intensity loss of NRM during core storage has been reported on such anoxic sediments [e.g., Richer et al., 1999; Yamazaki et al., 2000]. Understanding the diagenetic effect on magnetic properties after core recovery is important in order to confirm reliability of NRM. In paleomagnetic study of hydraulic piston-core samples recovered by D/V Chikyu shakedown cruise (CK05-04 Leg2) off Shimokita in November, 2005, we observed that magnetic susceptibility and NRM intensity suffered significant loss during 24 months after the core recovery. We investigate magnetic properties of these samples and discuss the effects of storage diagenesis.

After the core samples were split into working and archive halves, NRM of the archive halves were measured onboard the Chikyu using a 2G Enterprises cryogenic magnetometer (760R) at about 4.5 cm interval with alternating field demagnetization (AFD) up to 25 mT. Magnetic susceptibility was also measured with an onboard multi sensor core logger (MSCL) at about 2 cm interval. Our samples in 7 cc cubes (N = 695) were sampled from working halves at about 10 cm intervals 8 months after the cruise. We measured initial susceptibility on an AGICO KLY-3S Kappabridge 16 months after the sampling. Then NRM and anhysteretic remanent magnetization (ARM) were measured using a 2G Enterprises cryogenic magnetometer (760R) at Center for Advanced Marine Core Research, Kochi University. Hysteresis parameters were obtained from selected samples (N = 484) using a vibrating sample magnetometer (Princeton Measurement Corporation).

Initial susceptibility variation of the 7cc cubes shows good correlation with their ARM intensity, indicating that concentration variations of ferrimagnetic minerals dominate the susceptibility after the storage diagenesis. On the Day-plot, almost all samples are plotted in the region slightly under the theoretical mixing curves of single domain (SD) and superparamagnetism (SP) for magnetite particles [Dunlop, 2002]. Studies on sediments from the South Atlantic off the western coast of Africa (ODP Leg 175) indicated that storage diagenesis results in the increase in an average magnetic grain size after core recovery due to rapid dissolution of fine magnetic grains [Yamazaki et al., 2000]. Our hysteresis results may suggest that grain size distribution undergoes change as a result of storage diagenesis.