Inter-core correlation of Okhotsk Sea sediment cores using geomagnetic paleointensity and paleoenvironmental implications

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We conducted a paleomagnetic and environmental magnetic study of three piston cores (MR0604-PC5, 6, and 7) taken from the central part of the Okhotsk Sea. Age estimation and inter-core correlation were carried out using relative paleointensity. Then, regional difference of environmental changes was examined based on magnetic properties. Water depths of the coring sites range from about 800 to 1200m. The cores are about 20m long, and composed of diatom bearing silty clay of dark olive gray in color. Oxygen-isotope ratios measured on core PC7 show the average sedimentation rate of about 5 cm/kyr.

Paleomagnetic and rock magnetic measurements were done on discrete samples. Magnetic overprint could be removed by alternating field demagnetization of up to 20mT in general. The average inclination of each core is close to the value expected from the geocentric axial dipole at the coring site. Magnetic properties show no sign of magnetite dissolution in reductive diagenesis. These facts indicate that these cores are suitable for relative paleointensity estimation. In this study, ARM was used as a normalizer of relative paleointensity estimation, because normalization with ARM showed smaller coherence between normalized intensity and normalizer than normalization with SIRM. This is probably because relatively large magnetic grain size of these sediments; In the Day plot, data points locate in the lower right part of a PSD region. Depths of the three cores were converted to ages by correlating the normalized intensities with that of ODP Site 983 (Channel et al., 1998). The record of ODP Site 983 was selected as a target curve because its resolution is higher than the Sint-800 stack. The ages of core PC7 derived from relative paleointensity are consistent with the oxygen-isotope stratigraphy. The ages of the bottom of the cores are estimated to be 360 to 540 ka.

Inter-core correlation using paleointensity revealed that magnetic property variations are in anti-phase between the northernmost site and other two southern sites. In interglacials, magnetic concentration increases, magnetic grain size increases, and relative abundance of high-coercivity minerals increases at the northernmost site, whereas the opposite occurs at the southern two sites. This contrast could be explained by the idea that the northernmost site was covered with perennial ice in glacial periods, which thawed and provided IRD in interglacials. At the southern two sites, on the other hand, IRD was provided mainly in glacial periods.