Downcore change in rock magnetic parameters below iron redox boundary in marine sediments: a case study from the Okhotsk Sea

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Precise evaluation of various rock magnetic parameters is crucial to understand either paleomagnetic and paleoenvironmental records. Low-field susceptibility (k), anhysteretic remanent magnetization (ARM), and saturated or unsaturated isothermal remanent magnetization (IRM) are all concentration dependent. Thus they are useful to estimate contribution by magnetic minerals in sediments. IRM ratio such as S-0.3T is widely accepted to indicate bulk magnetic mineralogy based on the coercivity distribution. The ratio ARM to k is regarded to advocate a granulometric parameter of magnetic minerals.

In this study a gravity core (GH00-1004: N44.66, 144.45E, water depth=1443 m) recovered from the Okhotsk Sea, off Hokkaido was analyzed. The core is 440 cm in length and consists of massive silty clay with some volcanic ash layers. As shown in the figure, most magnetic minerals are rapidly depleted by 200 cm below sea floor. This rapid reduction is commonly observed in the marine sediments from this area and is regarded as a rock magnetic transition zone (Kawamura et al. submitted). The iron redox boundary should be found in this zone. Below 200 cm, the concentration dependent parameters are all subdued as shown in the figure. However S-0.3T shows significant increase from 0.92 to 0.95. kARM/k also shows a slight increase. To understand these downcore increases, we applied further rock magnetic analyses; thermal demagnetization of composite IRMs and low-temperature IRM, hysteresis loop and FORC diagram, and analysis of IRM acquisition curve. We found that contribution by hematite is significant in the rock magnetic transition zone, and becomes less pronounced below 200 cm. This could be a main reason to increase S-0.3T below 200 cm.