Sub-millimeter scale magnetostratigraphy of ferromanganese crust from north western Pacific: High fidelity estimate of growth rate

*Atushi Noguchi[1], Yuhji Yamamoto[2], Hirokuni Oda[3], Masahiko Sato[3], Akira Usui[4], Jun Kawai[5]

1.Graduate School of Integrated Arts and Sciences, 2.Center for Advanced Marine Core Research, Kochi University, 3.Institute of Geology and Geoinformation, Geological Survey of Japan, AIST, 4.Dept, Natural Science, 5.Applied Electronics Laboratory, Kanazawa Institute of Technology

Ferromanganese crusts are chemical sedimentary rock composed mainly of iron-manganese oxide. Because the ferromanganese crusts grow very slowly on the sea floor at rate 3–10 mm/Ma, long-term deep-sea environmental changes can be obtained from the ferromanganese crusts. It is important to provide reliable age model and growth rate of the reconstructed from, while there are few studies on sub-millimeter scale age dating. To obtain sub-millimeter scale age dating, we conduct magnetic study on a ferromanganese crust sample using scanning SQUID (superconducting quantum interference device) microscopy (SSM). The ferromanganese crust was sampled from Takuyo-Daigo Seamount where there are few supply of dust and sediment from continents. Methods of magnetic measurements were adapted from Oda et al. (2011), which pioneered the investigation that estimate sub-millimeter growth rate using SSM. The vertical component of the magnetic field above a thin section sample of the ferromanganese crust was measured using SSM. As the result, sub millimeter scale magnetic stripes originating from approximately magnetized regions oriented parallel to bedding were obtained. In addition, we attempted to remove spike noises using median filter while retaining resolution of raw measurement data and extracted data from uniform thickness. After these image analyses, magnetic stripes could be recognized on the magnetic image. By correlating the boundaries of magnetic stripes with known geomagnetic reversals, we estimated that average growth rate of the ferromanganese crust sample from this seamount is 3.1 ±0.1 mm/Ma, which is consistent with that deduced from the $^{10}Be/^{9}Be$ dating method (3.5 ±0.3 mm/Ma).

Keywords: scanning SQUID microscope, ferromanganese crust, growth rate, remanent magnetization

