Growth rates and microscopic stratigraphy of the Northwestern Pacific ferromanganese crusts

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Hydrogenetic ferromanganese crusts are iron-manganese (Fe-Mn) oxides chemically precipitated on the seafloor throughout tens of millions of years. The marine environmental changes and events of a long range had been possibly recorded in the microstructure (Sorem and Foster, 1972; Nishimura, 1993; Usui, 1998). For example, the crust (D96-m4) dredged from the Shotoku Seamount, northern Philippine Sea, shows periodical lamination. The lamination is alternation between Fe-Mn oxides layer and the fossil layer of the benthic foraminifera. This kind of structures was common in the crusts from other near seamounts (Takahashi et al., 2015). The sample D96-m4 had been measured growth rate by two techniques of $^{10}Be/^{9}Be$ method (6.0 mm/m.y.: Usui et al., 2007) and magnetometry technique called scanning SQUID (superconducting quantum interference device) microscopy (5.1 mm/m.y.: Oda et al., 2011). In this study, we observed in detail the structure of Fe-Mn crusts (six samples) from the northern Philippine Sea using micro X-rays CT in addition to measurement by scanning SQUID microscopy. In micro X-rays CT, the structures of benthic foraminifera were observed in all samples, and lamination of Fe-Mn oxides and benthic foraminifera layers was also confirmed. The periodical lamination might be characteristic structures in this area. Based on the SQUID scanning, the magnetic anomaly of the Brunhes–Matuyama boundary was detected at 3.5 mm of D96 in depth and the starting age of the alternation between Fe-Mn oxides and the fossil layers was also estimated (1 My). This suggests that some sort of marine environment fitted benthic foraminifera breeding was generated four times during 780 thousand years in around the Shotoku Seamount.

Keywords: ferromanganese crust, northwestern pacific, magnetostratigraphy, X-rays CT, growth layer

