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拓洋第 5 海山に分布するマンガンクラストの Os 同位体比を用いた成長速度決定
Growth rate determination of ferromanganese crusts from the Takuyo Daigo Seamount using an osmium isotope stratigraphy

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A ferromanganese crust (Fe-Mn crust) is widely distributed on the seamount slopes and is recognized on the ocean floor at various depths throughout the world. Since a Fe-Mn crust precipitates from ambient seawater at an extremely slow rate, one thick Fe-Mn crust sample solely records paleocean environmental changes through the Cenozoic period. In order to unravel paleocean environmental changes using a Fe-Mn crust, the sedimentary age of a Fe-Mn crust is required. Previous studies proposed that the Os isotope stratigraphy is a reliable dating method for a Fe-Mn crust throughout the Cenozoic period (e.g., Klemm et al., 2005, 2008). In this study, we determined the Os isotope profile of Fe-Mn crusts from the Takuyo Daigo Seamount (#5 Takuyo Smt) to estimate its growth rate. Our samples were systematically collected from the seamount outcrops using ROV Hyper Dolphin / RV Natsushima during the NT09-02 Leg.2 Cruise.

The Os isotope compositions of three Fe-Mn crusts collected from different depths (1424, 1440 and 2987 mbsl) show a similar trend and coincide very well with that of marine Os isotope record from present ($^{187}Os/^{188}Os$ ~1.02) to 12 Ma ($^{187}Os/^{188}Os$ ~0.77). These results indicate that the growth rates of Fe-Mn crusts in the #5 Takuyo Smt are uniform (ca. 3 mm/My) regardless of water depths which is consistent with the age constraints of the Be-10 dating method. However, in the older part (bottom part near the basement rock) of the two Fe-Mn crusts collected from 1424 and 1440 mbsl, the Os isotope compositions have large deviations from the seawater Os isotope record reconstructed from metalliferous sediment cores (Ravizza & Peucker-Ehrenbrink 2003). Moreover, the Fe-Mn crust collected from 2987 mbsl totally lacks the section older than 12 Ma. These large deviations can be explained either by the occurrence of growth hiatus or secondary geochemical modifications by phosphatization.

It is turned out that Fe-Mn crusts of the #5 Takuyo Smt. are appropriate material to reconstruct the paleocean environmental changes continuously from present to 12 Ma. In this presentation, we also discuss the secular and temporal variations in the major and trace element geochemical compositions of the Fe-Mn crusts together with the Os isotope compositions.

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