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Osmium isotope stratigraphy age and elemental composition of ferromanganese crusts from Iwaki seamount

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Hydrogenetic ferromanganese (Fe-Mn) crusts are chemical sedimentary rock from seawater that grow slowly on the surface of seamounts (Hein et al., 2000) ï¼ŽDue to the slow growth rate, Fe-Mn crusts have been used as archives for monitoring long-term evolution of seawater chemistry. For such purposes, dating methods of each layer are essential. However, one of the most difficult problems of Fe–Mn crust dating is the determination of accurate ages for sections older than ~10 Ma. The Os age model allowed for long-term age determination by fitting the obtained Os isotope trend of sublayers collected from the Fe-Mn crust with the seawater Os isotope curve (e.g., Klemm et al., 2005; Goto et al., 2014, 2017). It has been reported that the growth rate of Fe-Mn crusts varies among the Os age model and other dating methods (Usui et al., 2007). Also, only a few studies have focused on the difference in growth rate with water depth.

We provide the Os isotope data and chemical compositions of four samples collected at different depths (5193 m, 3316 m, 1860 m, 1697 m) in the iwaki seamount located offshore of northeast Japan, and examined the correlation of Fe-Mn crust growth rate and chemical composition variations. We found Fe-Mn crusts grow fast with increasing water depth. The average growth rates are 3 mm/My on the flat top of the seamount, while that is 6 mm/My on the base. Furthermore, two samples collected from the flat top of the seamount also showed significant changes in growth rate. The typical elements concentrated in the Fe-Mn crust, such as Co, Ni, Te, REE, were correlated with the growth rate. In particular, Al (detrital component) in Fe-Mn crust shows a positive correlation with changes in growth rate. The incorporation of detrital particles is likely to have a significant effect on the growth rate. We also found that there is a difference in the concentration of each element depending on the water depth and sedimentary environment and also on the growth rate of the Fe-Mn crust even in the same seamount.