Temporal and depth variation of Os isotope composition in ferromanganese crusts from the Takuyo Daigo Seamount (#5 Takuyo Smt), northwestern Pacific Ocean

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Introduction

Fe-Mn crusts were collected by *ROV Hyper Dolphin / RV Natsushima* (NT09-02 Leg.2 cruise) at the depth interval between 2,990 and 950 mbsl of the #5 Takuyo Smt directly from the outcrops using manipulator and underwater diamond saw. These samples allowed us to investigate systematically the temporal and depth variations of the geochemical compositions in the Fe-Mn crusts.

Os isotope compositions

Os isotope compositions in the surface layer (<3 mm) of the Fe-Mn crust coincide very well with those of present seawater values (^{187}Os/^{188}Os ~1.06) regardless of the water depth. This result indicates that Fe-Mn crusts in the #5 Takuyo Smt are formed hydrogenetically and have a potential to provide paleoceanographic information. So, we measured Os isotope compositions perpendicular to the growth layer and applied the Os isotope stratigraphy (e.g., [1, 2]) to estimate the growth rate of the Fe-Mn crust. From the upper section of the sample, we found similar Os isotope profile with that of marine Os isotope evolution curve established from seafloor sediments. A negative Os isotope excursion (^{187}Os/^{188}Os ~0.73) was also found around 36 mm depth from the surface layer. Given that this excursion reflects eruption of the Columbia River flood basalts during the middle Miocene [2], the growth rate of our Fe-Mn crust is estimated to be 3 mm/My. This is nearly consistent with the results of ^{10}Be dating method (ca. 4 mm/My). In the lower section, we found large deviation of Os isotope compositions from that of marine Os isotope evolution. This deviation can be explained either by the occurrence of growth hiatus (~34 Ma) or effects of phosphatization. Previous studies have reported hiatus [2-4]. Growth hiatus may record some global event, such as marine redox change. Alternatively, pronounce phosphatization of the older crust may cause the deviation [5]. Our result suggests that secondary phosphatization effects have to be taken into account when using the Os isotope stratigraphy.

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Noble gases as proxies for the transport of deep pore fluids in the Lake Van (Turkey) sediments

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The accumulation of non-atmospheric noble-gas isotopes allows tracing the geochemical origin and transport processes of the pore fluids in unconsolidated sediments [e.g. 1]. For instance, the abundance of terrigenic helium (He) isotopes reflects the residence time and transport dynamics of the dissolved species in the pore space. The ^{3}He/^{4}He ratio of terrigenic He can be used to constrain the geochemical origin of the pore fluids [1,2].

Lake Van (Turkey) is one of the largest terminal lakes and the largest soda lake on Earth. The lake basin is situated in a tectonically active region characterized by the presence of major faults and volcanoes and is known to accumulate mantle fluids [1,2,3]. Helium isotopes are therefore expected to yield insights into the origin and transport processes of terrigenic fluids in the sediment pore space and their release into the water body of Lake Van.

In summer 2010 the ICDP PaleoVan drilling project collected 220 m long sediment cores from Lake Van with the aim to study the past climate conditions in eastern Anatolia [4,5]. Within the frame of this deep-drilling project we collected bulk sediment samples for noble-gas analysis [6,7].

In this work we present He concentrations measured in the pore water of the ICDP PaleoVan sediment samples. These results are compared with He concentration profiles from short cores (< 2 m) taken at different sites throughout the lake basin [1] and discussed in terms the deep fluid transport in the Lake Van sediments.

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