Origin of deep-sea sediments within the Minamitorishima EEZ based on downhole variation of bulk chemical composition and neodymium isotopic ratios

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In 2011, the deep-sea sediments containing a high concentration of rare-earth elements and yttrium (REY) were discovered in the Pacific Ocean [1]. Moreover, the presence of "highly/extremely REY-rich mud" was confirmed within the Japanese exclusive economic zone (EEZ) surrounding Minamitorishima Island in 2013 [2].
On the basis of geochemical characteristics in major- and trace-elemental composition, it was reported that the deep-sea sediment layers within the Minamitorishima EEZ can be classified into several distinct groups including the highly/extremely REY-rich mud, although they are apparently very similar pelagic brown clay [3]. However, the origin and formation mechanism of the highly/extremely REY-rich mud has not been completely unraveled yet.
To elucidate the origin of deep-sea sediment including REY-rich mud within the Minamitorishima EEZ, isotopic composition of neodymium (one of the rare-earth elements), together with major and trace element compositions, can provide an important constraint. We aim to decipher geochemical end-members characterized by distinctive chemical compositions and isotopic ratios that enable us to specify their sources, fluxes and processes of supply [4, 5]. Here, we investigated (1) bulk chemical compositions by XRF and ICP-MS analyses and (2) bulk Nd isotopic ratios using Thermal Ionization Mass Spectrometry (TIMS) throughout a piston core, KR13-02 PC05 of 11.45 m in length, which contains the Extremely REY-rich mud and the other several characteristic layers. We report the downhole variations of bulk chemical composition and neodymium isotopic ratios, and discuss the origin of the highly/extremely REY-rich mud on the basis of their geochemical features.

References

[1] Kato et al. (2011) Nature Geoscience 4, 535-539.
[2] Iijima et al. (2016) Geochemical Journal 50, 557-573.
[3] Nakamura et al. (2016) JpGU2016
[4] Goldstein, O’ Nion and Hamilton (1984) Earth and Planetary Science Letters 70,221-236.
[5] Grousset and Biscaye (2005) Chemical Geology 222, 149-167.

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