The origin of deep-sea sediments within the Minamitorishima EEZ inferred from elemental composition and isotopic ratios

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Recently, the deep-sea sediments containing a high concentration of rare-earth elements and yttrium (REY) were discovered in the Pacific Ocean [1]. In 2013, the presence of "extremely REY-rich mud" was confirmed within the Japanese exclusive economic zone (EEZ) surrounding Minamitorishima Island [2]. The downhole variations of total REY content of the bulk sediments demonstrate that a few specific layers constitute distinct peaks of REY content. Such an extraordinary concentration implies a possible link between an episodic environmental change and formation of marine mineral resources, which strongly attracts our attention from both paleoceanographic and resource-geologic view points. However, the origin of deep sea sediments including REY-rich mud within the Minamitorishima EEZ has not been completely elucidated yet.
In order to unravel the origin of these sediments, it is necessary to decipher geochemical end-members characterized by distinctive compositions and to specify their sources, fluxes and processes of supply. The most powerful tool for this approach is isotopic compositions such as Nd, Sr, Pb and so on. [3, 4].
Here, as the first step for the comprehensive elucidation of the origin of the deep sea sediments in the Minamitorishima EEZ, we analyzed the modern, uppermost sediment samples collected from the southern part of the Minamitorishima EEZ. We investigated (1) mineralogical compositions by smear slide observation and XRD analysis and (2) bulk chemical compositions by XRF and ICP-MS analyses, in addition to (3) bulk Nd isotopic ratios using Thermal Ionization Mass Spectrometry (TIMS). We report the results and interpretation of the analysis, and discuss the origin of the uppermost sediments in the study area.

References
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