

Chemostratigraphic correlation of deep-sea sediments in the western North Pacific Ocean: Insight into the origin of REY-rich mud

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REY-rich mud, a deep-sea sediment containing high concentrations of rare-earth elements and yttrium (REY), is expected to be a new resource for the critical elements due to its multiple advantages such as huge resource potential and paucity of radioactive elements [1]. It has been confirmed that REY-rich mud also exists in the Japanese exclusive economic zone (EEZ) around Minamitorishima Island [2], followed by the discovery of "extremely REY-rich mud" that contains more than 6000 ppm of total REY from the Minamitorishima EEZ [3].

Due to detailed investigation by subbottom profiling and piston core sampling, the surficial distribution of REY-rich mud within the Minamitorishima EEZ has been almost revealed recently [Nakamura et al., in revision]. However, piston coring cannot obtain sediment samples from the deeper part of the sediment layer (at most ~13 m below sea floor (mbsf)). This hampers detailed discussion of sediment stratigraphy in the Minamitorishima EEZ that is an important key to elucidate the genesis and distribution of the new resource.

In order to overcome this problem, we focused on the Ocean Drilling Program (ODP) Hole 1149 located in the Japanese EEZ, 600 km to the south-southeast from Tokyo. The sediment layer of ODP Hole 1149 was almost continuously cored from the seafloor surface to ~180 mbsf (~97% of recovery) [4]. The sediments were classified into three units: ash- and biogenic silica-bearing clay of Unit I (from the core top to 118.2 mbsf), pelagic brown clay of Unit II (118.2 to 179.1 mbsf), and chert layer of Unit III [4].

Chemical analyses of 210 bulk sediment samples show that REY-rich mud is presented only in lower part of the Unit II, whereas sediments in upper part of the Unit II and Unit I are all non-REY-rich mud. Moreover, we found extremely REY-rich mud containing 7500 ppm of total REY in the Unit II. This is the first report of extremely REY-rich mud from outside the Minamitorishima EEZ. By comparing the newly analyzed data of ODP Hole 1149 and those from the Minamitorishima EEZ [5], the sediment stratigraphy in the Minamitorishima EEZ has been well reconstructed.

References

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Keywords: deep-sea sediment, REY-rich mud, whole-rock chemical analyses, ODP Hole 1149, Minamitorishima EEZ