

The Renaissance of the oldest oceanic plate: Perspective of REY-rich mud as a paleoceanographic archive in a pelagic realm of the Pacific Ocean

*Erika Tanaka¹, Kazutaka Yasukawa^{2,1,3}, Kentaro Nakamura¹, Junichiro Ohta^{2,3}, Tatsuo Nozaki^{4,2,5,3}, Yoichi Usui⁴, Koichiro Fujinaga^{3,2}, Koichi Iijima⁴, Yasuhiro Kato^{2,1,3}

1. Department of Systems Innovation, School of Engineering, The University of Tokyo, 2. Frontier Research Center for Energy and Resources, School of Engineering, The University of Tokyo, 3. Ocean Resources Research Center for Next Generation, Chiba Institute of Technology, 4. Submarine Resources Research Center, Japan Agency for Marine-Earth Science and Technology, 5. Department of Planetology, Faculty of Science, Kobe University

Deep-sea sediments showing a high concentration of rare-earth elements and yttrium (REY) are widely distributed in the Pacific Ocean [1]. Recently, the REY-rich mud extremely enriched in REY (up to 8,000 ppm of total REY) was discovered around Minamitorishima Island in the western North Pacific Ocean, and its spatial distribution has been investigated diligently based on 71 piston cores collected by seven research cruises since 2013 [2–7]. These REY-rich muds are composed of pelagic clay, which have characteristic chemical compositions and isotopic ratios reflecting transition of constituents and oceanic environments [1]. In addition, the extremely REY-rich mud is characterized by a significant accumulation of ichthyolith (fish teeth and bones) [2,4]. This suggests that REY-rich mud contains remarkable fluctuations of sedimentary components, implying an important aspect of pelagic clay as an efficient medium for recording some biological and/or sedimentological events in a pelagic realm. We have recently established a method to correlate the apparently homogenous pelagic clay layers based on multi-elemental geochemical features [8], which can provide a key to reveal various (paleo-)environmental information latent in the deep-sea sediments.

However, the piston cores do not cover all the sedimentary history of REY-rich mud because of the short length (~12 m each) [4]. Meanwhile, previous DSDP and ODP cores drilled in the Minamitorishima area (e.g. DSDP Site 198, ODP Sites 800 and 801) captured no sedimentary layer comparable to the extremely REY-rich mud, which is most likely due to poor recovery of the sediment column [9,10].

Here we propose a new scientific drilling of pelagic clay in the western North Pacific Ocean. The purpose of the drilling is (1) to obtain the complete sedimentary sequence of pelagic clay from the late Cretaceous to the present day, (2) to complete the ichthyolith- and REY-enrichment layers lying in the area and (3) to elucidate environmental and ecological factors that related to the formation of REY-rich mud.

References

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