Downhole variation of REY-rich mud in the western North Pacific Ocean based on bulk chemical composition and Nd-Sr isotopic ratios

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"REY-rich mud" is deep-sea sediment containing high concentration of rare-earth elements and yttrium (REY) [1]. Recently, the presence of an "extremely REY-rich mud" with almost 7,000 ppm of total REY content was confirmed in the western North Pacific Ocean [2]. The mud showing the remarkable concentration of REY strongly attracts our attention as an unconventional and highly promising mineral resource for the critical elements in the modern society.

However, the origin(s) and the depositional history of the sediment column containing the extremely REY-rich mud are still poorly constrained. To clarify the origin(s) of the sediments, bulk chemical compositions and isotopic ratios can provide key information, because each possible geochemical end-member has characteristic elemental contents and isotopic ratios reflecting source materials and genetic processes [3].

Here, we show (1) the classification of REY-rich mud in the western North Pacific based on bulk chemical compositions, (2) the downhole variations in bulk Nd and Sr isotopic ratios, and (3) the quantification of contributions of representative geochemical end-members by using our new data. Our results indicate a transition of end-members through the sediment column, along with the change of geological settings due to the motion of the Pacific plate.

[1] Kato et al. (2011) Nature Geoscience 4, 535-539.
[2] Iijima et al. (2016) Geochemical Journal 50, 557-573.
[3] Capo et al. (1998) Geoderma 82, 197 – 225.