

## **A quantitative constraint on the distribution of extremely REY-rich mud based on mass balance calculations of Nd in the ocean**

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Recently, the presence of “extremely REY-rich mud”, deep-sea sediment containing an extraordinarily high content of rare-earth elements and yttrium (REY), was confirmed in the western North Pacific Ocean [1]. The maximum bulk total REY content in the mud reaches almost 7,000 ppm, which is higher than that of any other deep-sea sediment ever reported from the world ocean. However, geochemical data of the highly promising deep-sea mineral resource are still limited and thus the oceanwide distribution of the mud remain uncertain.

A controlling factor of the distribution of the extremely REY-rich mud should be closely related to its formation mechanism. We demonstrated that moderately REY-rich mud (up to 3,000 ppm of total REY in bulk sediment) occurs under circumstances with a sufficiently low sedimentation rate that enables the mud to accumulate REY from ambient seawater [2]. In addition, some regional or local oceanographic process(es) might have contributed to the formation of the extremely REY-rich mud [3].

Here, we implemented simple mass balance calculations of REY between seawater and sediments. We use neodymium (Nd) as a representative element of REY, because this element has long been studied as a tracer of ocean circulation, and thus its residence time in the ocean appears to be the most reliable. Based on the calculated results, we discuss a quantitative constraint on the formation mechanism and the spatial distribution of the extremely REY-rich mud in the Pacific Ocean.

### References:

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