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独立成分分析に基づく南鳥島 EEZ 内の深海底堆積物の統計的特徴
Statistical characterization of deep-sea sediments within the Minamitorishima EEZ by Independent Component Analysis

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Rare-earth elements and yttrium (REY) play an essential role in state-of-the-art technologies. Recently, the presence of REY-rich mud, deep-sea sediments containing high concentrations of REY, was confirmed within the Japanese exclusive economic zone (EEZ) surrounding Minamitorishima Island (Kato et al., 2013; Fujinaga et al., 2013; Suzuki et al., 2013). The maximum total REY content in the REY-rich mud within the Minamitorishima EEZ reaches almost 7000 ppm, which strongly attracts our attention as a highly promising new resource for REY of great economic value.

The extremely REY-rich mud has been probably produced by a combination of some processes that functioned in the abyssal ocean, and signatures of them could be preserved as characteristic geochemical compositions of the sediments. Therefore, as a first step to elucidate the REY-enrichment processes, it is quite important to decode geochemical signals derived from the sediments. To this end, multivariate statistical analyses are very useful because they can treat multi-elemental information concurrently and comprehensively.

Here we applied Independent Component Analysis (ICA) to the data set composed of elemental contents of the deep-sea sediments collected from the Minamitorishima EEZ. ICA is a relatively new computational statistical technique established in the past quarter century, which can extract original independent source signals or factors from observed signals on the basis of a fundamental assumption that the observed data consist of mutually independent source signals but do not constitute a joint Gaussian distribution (Hyvärinen et al., 2001). We report the results and interpretation of our new analysis, and statistically characterize the deep-sea sediments within the Minamitorishima EEZ.

– References –
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