Isotope analysis of Neogene marine sediment from Maldives

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The South Asian Monsoon (SAM) is one of the most intense climatic elements mainly affecting around India. Betzler et al. (2016) suggested that the SAM was established around 12 Ma from the presence of drift sediment, but it has not yet been clarified in detail when and how it developed. In this study, we analyzed Pb and Sr isotope ratios in marine sediments from the Maldives in order to understand the variation of wind direction and its relation to the development of the SAM. Lead has four naturally occurring stable isotopes, and when the lead mineral is formed, the lead isotope is sequestered from the parent nuclide, at which point the change in the lead isotope ratio stops. Lead is not subject to significant physical and chemical isotope fractionation, making lead isotope a potential tool to determine the origin of lead bearing minerals. In addition, since the ocean tends to have a uniform Sr isotope composition in terms of dissolved Sr, it is possible to estimate the input balance of the region such as inflow of Sr from the continent based on the measurements of Sr isotope ratios.
In this study, the core of Site U-1468 (4 ˚56′N, 73 ˚4′E) drilled during the cruise of the International Ocean Discovery Program Exp.359, which has an age from ~25 to 10 Ma, was used for the analysis of Pb and Sr isotope ratios. The core is characterized by coral reefs around it with dead bodies piled up and rich in carbonate components. Therefore, the sample was chemically separated into carbonate and non-carbonate components and Pb and Sr were purified on each type of sample. The isotope ratios were analyzed using TIMS (Finnigan MAT262) for both Pb and Sr and MC-ICP-MS (NEPTUNE) for Pb, and the contents of Pb and Sr in 5% of the sample were measured by ICP-MS (Aglient 7700x).
As a result of the measurement of Pb isotope ratio of Maldives sediment, both carbonate component and non-carbonate component show a trend in which the ^{206}Pb / ^{204}Pb increases from around 13 Ma when the drift sediment was developed. In this study, the carbonate component has a systematically higher Pb isotope ratio than that of the non-carbonate component which is similar to that reported from the Himalayas (Wilson et al., 2015). For the Sr isotope ratios, $^{87}Sr/^{86}Sr$ in the carbonate components has a value close to that of seawater, that may reflect the influence of the surrounding seawater. On the other hand, variation of $^{87}Sr/^{86}Sr$ in the non-carbonate components behaves differently from that in seawater before 13 Ma, suggesting another input of Sr around this age.

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