Anaerobic methane-oxidizing archaea associated with seep carbonate in the Upper Cretaceous of northern Hokkaido, Japan

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Macro-organisms in a chemosynthetic community depend on microbial product for their major food source. Recognition of microbial activities is very important to reveal the material circulation system in the chemosynthetic-based ecosystem. In fossil chemosynthetic assemblages, it has been very difficult to reveal such microbial activities. In this study, carbonate rocks yielding fossil chemosynthetic assemblages from the Upper Cretaceous (Santonian to Campanian) fore-arc basin deposits (Yezo Super Group) in Hokkaido, Japan were analyzed using biological markers and carbon and oxygen isotopes. The results of biomarker analysis show the abundance of PME (pentamethyleicosane) and crocetane. These organic conpounds are biological markers of Archaea, particularly anaerobic methane oxidation archaea. Extremely negative values in carbon isotope ratios (- 40 ~ - 48 ‰) of the carbonate rocks suggests the presence of methane and abundant anaerobic methane oxidizing Archaea. These results allow us to reconstruct a part of the Cretaceous marine paleo-ecosystem associating with fossil chemosynethetic community.

The distribution, fractionation and ecological impact for rare earth elements in its high background regions, Southern Jiangxi Province, China

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Chemical weathering of rocks is a major geological process, which modifies the Earth's surface and controls geological cycling of elements, thereby controlling rare earth element (REE) distribution and fractionation in various natural settings as well. The REE mobility during weathering processes has been documented in studies of present soil formation. However, the environmental behaviors and potential ecological impacts of REE have attracted little attention. Based on the comprehensive study of REE from subtropical REE-rich background regions, southern Jiangxi Province, the following conclusions have been suggested: (1) the REE distributions in four weathering profiles are mainly determined by REE minerals in their underlying granites and strong negative Eu-anomalies are inherited from those of the bedrocks respectively, (2) Ce is less mobilized in the whole profiles than other REE, (3) the solid speciation of REE in soil horizons at the top of the profiles as revealed by sequential extraction are chiefly affected by parent rocks and the distribution patterns of plant availability of REE are similar to those of REE at soil samples,(4) the unusually high REE concentrations of waters are found in the study areas, especially in the artificial mining location, (5) the characteristics of REE distribution in naturally grown fern hyperaccumulator *dicranopteris dichotoma* are concentration decrease in the order lamina>root>stem>petiole; the accumulation ratios among the sequence from soil, root, stem, petiole to lamina are similar to those in light and heavy REE-rich backgrounds respectively and they reflect the plant adsorption is determined by itself features; (6) it is worthy of attention for long-term environmental hazard of intake REE from food-chains in the study areas. Through the above researches, we can believe that negative Ce-anomalies in some waters maybe directly related to Ce behaviors in supergenic geological processes and we can make the further deduction that all REE maybe enter into cytoplast membrane, for example, La substitutes for Mg in chlorophylls.