Corals at volcanic island of Satsuma iwo-jima: Implication for a new proxy of hydrothermal events and biological adaptation

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Coral cores from massive corals could record marine environmental and ecological changes in their annual bands with monthly temporal resolution in the present and/or the past. We discovered large massive Porites corals living at active volcanic island of Satsuma Io-Jima, located 50 km south from Kyushu area, southern part of Japan. Satsuma Io-Jima provides a unique opportunity to observe marine organism living under extreme environments of volcanic gases emission and different types of hydrothermal activities from sea flower. We collected eleven coral cores from four different conditions around the island to test if corals could record volcanic and hydrothermal activities and how corals could survive in extreme environments such as very low pH condition with CO2 gasses emission. Coral extension rate for the site near hydrothermal vent was significantly small (1-2mm/year) relative to that for general condition of Porites corals (ca. 10-20 mm/year), suggesting that coral growth was influenced by hydrothermal activity. We will demonstrate our preliminary results of geochemical approaches of δ18O, δ13C, Sr/Ca, Mg/Ca, Ba/Ca, and F/Ca in coral skeletons and in surrounding seawater and discuss the possibility for reconstructing the past hydrothermal events and relationship between marine ecosystem and extreme environments at volcanic activity as the analogues for coral adaptation to future ocean acidification.

Applications of neutron beam analysis to study the origins of carboneceous matter in terrestrial and planetary rocks: A new approach

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Some of the most fundamental and and important questions in the fields of Earth Sciences, Biology and Astrobiology are when, where and how life originated and different species evolved from the common ancestor during the 4.5 billion years history of the Earth. For exmple, we do not know whether carbonaceous matter in a particular Archean sedimentary rock represents a product of inorganic processes (e.g., Fisher Trophsch reactions) or a remnants of organisms. Similarly, the origins of carbonacerous matter in meteorites, Mars, and other planetary rocks have been debated.

The origins of carbonaceous matter in terrestrial and planetary materials have been investigated primarily from its chemical, isotopic, and physical characteristics, such as the H/C/N/P ratios, H, C, N, and S isotope ratios, crystal structure, and crystalinity. Here we introduce a new method, an application of neutron beam analysis, to determine the chemical composition and crystal structure of solid carbonacerous matter. Compared to the other techniques using x-ray, such as XRD, an advantage of neturon beam analysis is that it will identify the positions of light elements, particularly hydrogen, in the structure.

We will present the results of our preliminary investigations using neutron scatter analysis, XRD, and Raman spectroscopy on simple organic compounds (e.g., glycin steroid), micro-organism (e.g., cyanobacteria), and kerogens of various geologic age.

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