Oceanography Seminar

Tsuyoshi Wantanabe

Senior Lecturer
Graduate School of Science
Hokkaido University, Japan

" Coral Sclerochronology: High-temporal resolution windows for palaeoclimatology, paleoceanography, and paleoecology "

The daily and annual growth bands formed in biogenic carbonates such as coral skeletons and molluscan shells could serve as the high-temporal resolution archives for the environmental and/or physiological changes during their life span. We use skeletological and geochemical approaches to investigate the histories recorded in living and fossil specimens. Understanding the past climate variability and oceanographic events in the tropical ocean is a high priority as long-term observation is very limited in these area. Tropical shallow water corals could live up to several hundreds years and the decadal to century-scale of climate and oceanic signals such as global warming, ocean acidification, El ño-Southern Oscillation (ENSO), anthropogenic CO2 uptake, atmosphere, marine pollution, river discharge, and ocean circulation dynamics could be detected via reconstructing temperature, salinity, pH, nutrient, and chemical composition in seawater by using isotopic (e.g. oxygen, carbon, boron, lead, and nitrogen isotopes) and elemental (e.g. Sr/Ca, Mg/Ca, and Ba/Ca ratios) analysis along growth direction.

Ocean acidification and rising atmospheric CO2 with global warming are also predicted to severely damage the calcification processes of marine organisms and, thus, the sustainability of marine ecosystems in the near future. The skeletal density, extension rate, and calcification rate deduced from coral cores could be useful to estimate the response and acclimatization against such environmental changes during last few hundred years, and to predict the future of coral reefs and ecosystems exhibiting coral acclimation to warmer, more acidified, and polluted conditions.

On the other hand, such recent advance of microanalytical techniques also revealed large heterogeneity of these isotopic and elemental composition in nano to sub-micrometer scale of skeletal microstructures, which are difficult to explain simply by surrounding environmental changes, suggesting understanding biomineralization processes in cellular level with more complexity and plasticity are important to establish more reliable proxy for past environmental changes. I would like to introduce our recent and on-going researches applied on modern and fossil specimens in western pacific, Indian Ocean, and Caribbean Sea and also recent efforts to understand biomineralization process of coral reef dweller

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