Japan Geoscience Union Meeting 2012
(May 20-25 2012 at Makuhari, Chiba, Japan)

BBG22-01 Room:103 Time:May 25 15:45-16:00

Growth-rate influences on coral geochemical proxies tested by a long-term culture experiment

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Corals are rich archives of climatic changes in tropical seas covering from the recent to distant past. The isotope and elemental compositions of coral skeletons reflect physicochemical parameters of the ambient seawater. Because the long-lived colony of hermatypic coral can live several hundred years with clear annual growth-bands, the coral skeletons have great potential to provide environmental archives. From previous calibration researches, the skeletal oxygen and carbon isotope ratios depend on factors such as the temperature, isotope ratios and light intensity of the ambient water, making coral skeletons useful for palaeoenvironmental reconstruction. Although many studies have utilized oxygen and carbon isotope ratios in corals for proxy calibration, there has been much debate over its controlling factors. In this study, we examine the magnitude of growth-rate influence on coral oxygen and carbon isotope and Sr/Ca ratios in a long-term common-garden culture experiment of Porites australiensis corals. The aim of this study is to evaluate the intraspecific variability of the skeletal isotope signals, the usability of the carbon isotope ratio as an environmental proxy, and accuracy of reconstructed seawater temperature.

Keywords: Coral, Climate, Oxygen isotope ratio, Sr/Ca ratio

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BBG22-02 Room:103 Time:May 25 16:00-16:15

A coral internal model on photosynthesis and calcification processes incorporating trans-calcification mechanism

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Coral reef ecosystem has been exposed and affected to some environmental changes, such as global warming, ocean acidification, eutrophication, etc., and it has been responded to these environmental changes on community level, colony level and organism level. However, prediction of the responses of coral reef ecosystem is not easy because of complexity of coral internal processes. One of the effective approaches for understanding the responses of corals to multiple environmental changes is to develop a coral internal model and to obtain the solutions of the model by computer simulation.

In this study, a coral internal model for photosynthesis and calcification has been developed. This model is based on a conceptual model of trans-calcification by McConnaughey (1994). The model consists of three parts (ambient seawater, coelenteron and calcifying fluid), and fluxes of total alkalinity (TA) and total dissolved inorganic carbon (DIC) between each part by metabolic and physical effects are calculated, then TA and DIC are calculated to determine the photosynthesis rate, respiration rate and calcification rate, which are the functions of CO_2 system parameters. Simulation results of the model well reconstructed some coral internal conditions (i.e. internal pH, photosynthesis, respiration and calcification responses). The response of calcification rate against ambient aragonite saturation state was nonlinear in this model simulation, and the response agreed with the experimental responses observed in some previous studies (Gattuso et al. 1998; Marubini et al., 2008; Anthony et al., 2011; Inoue et al., 2011).

Keywords: hermatypic coral, coral internal model, photosynthesis, trans-calcification, ocean acidification

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BBG22-03 Room:103 Time:May 25 16:15-16:30

THE RELATIONSHIP OF OCEANOGRAPHIC PARAMETERS AND CORALS CONDITION IN WAKATOBI ISLANDS

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This research aims to evaluate the relation of some oceanographic parameters to coral conditions in Wakatobi Islands. The evaluated parameters are temperature and salinity in water surface and in 30 m depth, and also chlorophyll-a concentration in surface. The correlation of those parameters with hard coral cover area is evaluated using correlation matrix. The data of hard coral cover area was acquired from COREMAP-LIPI program in 2001, 2005, 2006, 2007, and 2009, and from TNC-WWF joint-program in 2003. Parameter oceanographic data used here was obtained from NOAA-AVHHR satellite from 1990 to 2009, while chlorophyll-a data was obtained from Seawifs satellite from 2000 to 2009. Temperature and salinity data in 30 m depth and surface salinity are from Hycom model in 1992-2010.

Observation shows that surface temperature rises 1.80 degree Celcius while surface salinity rises 0.108 psu. There is negative correlation of hard coral cover with temperature and chlorophyll-a, which means that the higher the temperature or chlorophyll-a the lower the hard coral cover in that area. The change of temperature more that normal coral temperature (25 - 30 degree Celcius), makes zooxanthelae stress and makes the coral can not live. Whereas when chlorophyll-a have a high number, the sunlight will be partly blocked. The distribution of surface temperature and chlorophyll-a gives the indication of upwelling phenomenon on east monsoon session that acts as refuge for the coral to be in their normal temperature.

Keywords: hard coral cover, surface temperature, salinity, upwelling, wakatobi islands

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BBG22-04 Room:103 Time:May 25 16:30-16:45

Behavior of coral observed by Fluorescence Monitoring System camera and application to deep sea biological research

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The purpose of this presentation is to describe the intensity of fluorescence images that we got using a coral Fluorescence Monitoring System camera and its relationship with environmental fluctuations, and feeding damage from a snail. Moreover, we describe applications to deep sea biological research of the fluorescence photographing technique. Then, in this Japan Geoscience Union Meeting 2012 (Coral Reefs: Life, the Earth and Human Beings), we present a paper about the following results.

Development of coral Fluorescence Monitoring System camera. (FMS_Camera)
Relationship between light intensity of coral fluorescence image and environmental fluctuations.
Apparatus-photographed influence of feeding damage by a snail (*Drupella* spp.) .
Application to deep sea biological research of photographing technique.

We developed a time-lapse camera that makes fluorescence photographing of coral possible using a Blue Block filter and fluorescence excitation filter. In-situ observations with the FMS Camera were accomplished in Sekisei lagoon three times. By *in-situ* experimentation, we succeeded in taking time series photographs of coral fluorescence. Regardless of night or day, we were able to produce fluorescence and normal images hourly for 26 days (620 images). The numerical information provided from an image must be correlated with environmental data. We consider the strength and weakness of light intensity to be an indicator of a coral's health. Consequently, we will first extract the light intensity from a part of the fluorescence image. Then we will compare the value with environmental data (for example, water temperature and current velocity).

Recently, we used the filter set from this apparatus and carried out photography of deep sea organisms in the laboratory. Fluorescence photographing was possible with many organisms. Consequently we considered that this photographing technique could be applied to investigation of deep sea organisms.

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Keywords: coral Fluorescence Monitoring System camera, coral fluorescence image, intensity of fluorescent image, feeding damage, deep sea organisms