Factors controlling calcification in coral reefs

Atsushi Watanabe[1]; Hajime Kayanne[2]; Hiroshi Hata[3]; Ken Nozaki[4]; Ken Kato[4]; Akira Negishi[4]; Setsuko Kudo[5]; Yutaka Ikeda[6]

[1] Environ. Stud.., Nagoya Univ.; [2] Earth & Planetary Sci., Univ. Tokyo; [3] Japan Science and Technology Corporation; [4] AIST; [5] Tokyo Nat. College Tech.; [6] Hazama Co.

Increasing atmospheric CO_2 and the resultant ocean acidification lead to decrease in the saturation state of aragonite (omega-aragonite) and in turn decrease in coral calcification. But we still have little knowledge obtained from natural environments on the relation between calcification and environmental factors such as omega-aragonite. Here we report the factors controlling calcification rates in the field. We measured calcification rates at Shiraho and Palau reefs using slack water method and flow respirometry method, respectively. At Shiraho reef, calcification rate (G)correlated with irradiance (I), and omega-aragonite correlated positively with calcification rate (G) during daytime. Water temperature did not show significant effect on G. More than half of the nighttime date supported dissolution of calcium carbonate. At Palau reef, omega-aragonite and G did not show positive correlation, although omega-aragonite and I showed positive correlation. No clear dissolution was observed at Palau. This difference is most probably due to small variations in omega-aragonite at Palau (3.5-4.2) compared with Shiraho (2.7-5.5), which is attributable to smaller water residence time on reef flat at Palau than at Shiraho. Net calcification becomes 0 when omega-aragonite is 3.3, despite over-saturation.