BPO02-P01 Room:Convention Hall Time:May 25 17:15-18:30

The effect of high pCO_2 seawater on foraminiferal oxygen and carbon isotopes

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Ocean acidification in response to rising atmospheric pCO_2 is generally expected to reduce rates of calcification by reef calcifying organisms, with potentially severe implications for coral reef ecosystems. Various studies have revealed potentially dramatic responses in a variety of calcareous organisms to the range of pCO_2 values projected to occur over this century. In our previous culture experiment with two algal symbiont bearing, reef dwelling foraminifers, *Amphisorus kudakajimensis*, which hosts dinoflagellate symbionts, and *Calcarina gaudichaudii*, which host diatom symbionts, in seawater under five different pCO_2 conditions, net calcification of *A. kudakajimensis* was reduced under higher pCO_2 , whereas calcification of *C. gaudichaudii* generally increased with increased pCO_2 . These different responses among the two species are possibly due to differences in calcification mechanisms (in particular, the specific carbonate species used for calcification), and to links between calcification by the foraminiferal hosts and photosynthesis by the algal endosymbionts. However, knowledge about the factors of different calcification responses is poorly understood. To shed light on the factors leading to different calcification response to ocean acidification between perforate and imperforate, we analyzed the stable isotope composition of reef-dwelling foraminifers: *Amphosorus hemprichii*, belong to imperforate species, *Baculogypsina sphaerulata* and *C. gaudichaudii* belong to perforate species, subjected to five varied acid seawater for twelve weeks almost same as above-mentioned culture experiment. Oxygen isotope ratio value of cultured foraminiferal tests under five varied pCO_2 seawater, which temperature and intensity of light was adjusted constantly for experimental period, indicated no significant correlation to pCO_2 . The results show that oxygen isotope ratio stay constant within narrower range from CO_3^{2-} concentration (111 to 264 umol/ kg). On the other hand, carbon isotope ratio of foraminirferal tests indicated heavy trend with increasing pCO_2 . Alteration of carbonate chemistry result from ocean acidification may be effect strongly on carbon isotope composition relate to metabolic system (i.e. photosynthesis and respiration). In perforate species, both of oxygen isotope ratio and carbon isotope ratio was lighter than that in imperforate. For oxygen isotope ratio variation possibility among species would be caused by their Mg-content concentration in calcite shells. The distinct difference in the level of carbon isotope ratio values between imperforate and perforate foraminifera indicates different amounts of metabolic CO_2 used for shell construction. Therefore, oxygen and carbon isotopes ratio of foraminiferal test have the potential to reveal calcification mechanism of two species.

Keywords: ocean acidification, reef-dwelling foraminifera, culture experiment, oxygen and carbon isotopes, calcification

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Differing utilization of nitrate nitrogen in shallow-water benthic foraminiferal cells under oxic/anoxic conditions

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Some benthic foraminiferal species have been reported to respire nitrate under dysoxic conditions. However, it is still unknown whether they can actually respire nitrate or symbiotic bacteria contribute to the nitrate respiration. We incubated a shallow water benthic foraminifera, Ammonia beccarii, under oxic or anoxic conditions to see their nitrate utilizations. We added nitrate intermittently to the cultured bottles and incubated them for 1 month. After the incubation, we measured the d15N of amino acids from cytoplasm and organic matters embedded in carbonate test. The measured nitrogen isotopic ratios indicated that enhanced utilization of nitrate under anoxic conditions. Trophic levels of A. beccarii under anoxic conditions suggest large contribution of prokaryotes to the observed nitrate utilizations.

Keywords: Sediment-water interface, Benthic foraminifera, Nitrate, isotope tracer, Amino acid itostopes

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Element profile and chemical environment of sulfur in clam shell: insights from micro-XRF and XANES

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Element profiles of sulfur and strontium in the inner layer of a clam shell (*Hippopus hippopus*) were investigated by means of micro X-ray fluorescence, and sulfur K-edge X-ray absorption near-edge structure (XANES) were used to evaluate the local environment of sulfur in aragonitic and calcitic bivalve shells. The spectra of S K-edge XANES collected from bivalve shells and S-bearing organic and inorganic reference materials indicated that inorganic sulfate was present in calcitic bivalve shells. However, XANES results did not permit us to discriminate between organic and inorganic sulfate in aragonitic shells. Strontium fluctuations and thin section observations suggested that Sr was incorporated into the shells at high growth rates during warm seasons. The first-order fluctuations of sulfur in the inner shell layer showed clear annual fluctuations, with sulfur concentrations being lower during periods of faster growth. Bivalve shells consist of well-crystallized $CaCO_3$ and amorphous $CaCO_3$ containing organic matter, and the proportion of crystalline $CaCO_3$ increases during the high growth season. Our results suggest that trace sulfur profiles in aragonitic shells could be the result of cyclic changes of shell crystallization related to bivalve physiology and environmental factors.

Keywords: Sulfur, micro-XRF, Synchrotron radiation, XANES, Strontium