Geophysical Research Abstracts
Vol. 18, EGU2016-11760-1, 2016
EGU General Assembly 2016

Combined δ^{11}B, δ^{13}C, and δ^{18}O analyses of coccolithophore calcite constrains the response of coccolith vesicle carbonate chemistry to CO_2-induced ocean acidification

Yi-Wei Liu (1,2), Robert Tripati (1,3), Sarah Aciego (2), Rosaleen Gilmore (3), and Justin Ries (4)

(1) European Institute for Marine Studies (IUEM), University of Western Brittany (UBO), Brest, France, (2) Department of Earth and Environmental Sciences, University of Michigan, Ann Arbor, USA, (3) Institute of the Environment and Sustainability, Department of Atmospheric and Oceanic Sciences, University of California, Los Angeles, Los Angeles, USA, (4) Department of Marine and Environmental Sciences, Marine Science Center, Northeastern University, Nahant, USA

Coccolithophorid algae play a central role in the biological carbon pump, oceanic carbon sequestration, and in marine food webs. It is therefore important to understand the potential impacts of CO_2-induced ocean acidification on these organisms. Differences in the regulation of carbonate chemistry, pH, and carbon sources of the intracellular compartments where coccolith formation occurs may underlie the diverse calcification and growth responses to acidified seawater observed in prior experiments. Here we measured stable isotopes of boron (δ^{11}B), carbon (δ^{13}C) and oxygen (δ^{18}O) within coccolith calcite, and δ^{13}C of algal tissue to constrain carbonate system parameters in two strains of *Pleurochrysis carterae* (*P. carterae*). The two strains were cultured under variable pCO_2, with water temperature, salinity, dissolved inorganic carbon (DIC), and alkalinity monitored. Notably, PIC, POC, and PIC/POC ratio did not vary across treatments, indicating that *P. carterae* is able to calcify and photosynthesize at relatively constant rates irrespective of pCO_2 treatment. The δ^{11}B data indicate that mean pH at the site of coccolith formation did not vary significantly in response to elevated CO_2. These results suggest that *P. carterae* regulates calcifying vesicle pH, even amidst changes in external seawater pH. Furthermore, δ^{13}C and δ^{18}O data suggest that *P. carterae* may utilize carbon from a single internal DIC pool for both calcification and photosynthesis, and that a greater proportion of dissolved CO_2 relative to HCO_3^- enters the internal DIC pool under acidified conditions. These results suggest that P. carterae is able to calcifyand photosynthesize at relatively constant rates across pCO_2 treatments by maintaining pH homeostasis at their site of calcification and utilizing a greater proportion of aqueous CO_2.