

### **Biomineralisation and ocean acidification: insights based on boron isotopes**

Daniela N. Schmidt<sup>1</sup>, Armin Form<sup>2</sup>, Frédéric Gazeau<sup>3</sup> and Simone A. Kasemann<sup>4</sup>

<sup>1</sup>Department of Earth Sciences, University of Bristol, Bristol, UK

IFM-Geomar, Kiel, Germany

<sup>3</sup>Laboratoire d'Océanographie, CNRS, Villefranche-sur-mer Cedex, France

<sup>4</sup>Department of Geosciences, University of Bremen, Bremen, Germany

The decrease in seawater *pH* due to ocean acidification may impact on marine organisms by affecting the calcification of their shells and skeletons. Marine calcifiers with different life histories and physiologies are expected to react differently to changes in carbonate chemistry. Laboratory experiments suggest that decreasing carbonate levels will make it increasingly difficult for many organisms to make and/or maintain their shells, with highly species specific sensitivity to changing seawater chemistry [e.g., Iglesias-Rodriguez *et al.* 2008; Langer *et al.* 2006].

Here we use in-situ analysis of spatially resolved boron isotopes and elemental ratios using secondary ionisation mass spectrometry to provide constraints on possible influences of changes in ambient *pH* on biomineralisation of planktic and benthic foraminifers, bryozoans, the bivalve *Mytilus edulis* and the deep sea coral *Lophelia pertusa*. Physiological (e.g. photosynthesis, respiration, and calcification) and ecological processes (e.g. ambient *pH*, habitat depth in sediments) modify the micro-environmental *pH* of the calcifiers and thus exert an important influence on the  $\delta^{11}\text{B}$  of their shells.

Planktic foraminifers display a large change in  $\delta^{11}\text{B}$  within a specimen. The difference is too large to be explained by ecological *pH* changes during the life of the specimen, i.e. depth migration, alone. Benthic foraminifers, in contrast, show no variation in  $\delta^{11}\text{B}$  within the test. An elevation of the *pH* up to 0.8 to 1 *pH* unit above ambient is suggested for bryozoans and deep sea corals. In contrast, bivalves are reducing the *pH* in their extrapallial fluid by 0.3 to 0.5 *pH* below ambient. Most of these species display very high internal variability in  $\delta^{11}\text{B}$  and hence a strong control on biomineralisation.