Biology of boron iotopes in planktic foraminifers: new understanding based on *in-situ* analysis (SIMS)

D.N. SCHMIDT[1] AND S.A. KASEMANN[2]

[1] Department of Earth Science, University of Bristol, Bristol UK; d.schmidt@bristol.ac.uk
[2] Grant Institute of Earth Science, University of Edinburgh, Edinburgh UK; simone.kasemann@ed.ac.uk

Boron isotopes in foraminiferal carbonates are a widely used proxy to assess past CO_2. The applicability of the proxy and the precision of the CO_2 assessments will depend on our understanding of the incorporation of boron into foraminiferal carbonate. Recently more attention has been paid to influences other than oceanic pH on the boron isotope ratio of foraminiferal calcite. Physiological (e.g. photosynthesis, respiration, calcification) and ecological processes (e.g. depth migration) modify the micro-environmental *p*H of the foraminifera and thus exert an important influence on the $\delta^{11}B$ of their shells.

In-situ analysis of spatially resolved isotopes and elemental ratios improve our understanding of proxies in foraminifers and hence their reliably and interpretability. To this end, we have performed boron isotope analysis using secondary ionisation mass spectrometry (SIMS) on single specimens of 5 different species of planktic foraminifers with a wide range of ecological adaptations. We tested for the influences of developmental history of the organism, growth rates, depth habitat and symbiont activity on boron incorporation. To put the data into an environmental framework, we analysed Mg/Ca, Ba/Ca, U/Ca and Sr/Ca ratios.

Several spots were measured per chamber of the foraminifers to assess the variability of the measurement. Average $\delta^{11}B$ values of *Globorotalia truncatulinoides* tests do not vary significantly over a size range from 460 to 670 µm and, hence, $\delta^{11}B$ is independent of the final size of the foraminifer and overall growth rates. The change in $\delta^{11}B$ from chamber to chamber within a specimen is significant though with lower values in the last chambers of the specimen and higher values in the older part of the test. The highest $\delta^{11}B$ and boron concentrations can be found in the earlier chambers, whereas the gametogenetic crust has lower $\delta^{11}B$ values. The difference in $\delta^{11}B$ is too large to be explained by ecological pH changes during the life of the specimen, i.e. depth migration, alone.