Probing the internal calcification chemistry of *O. universa* using B/Ca

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B/Ca ratios of calcitic foraminifer shells are influenced by seawater carbonate chemistry (seawater $[B(OH)_4^-/HCO_3^-]$, $[CO_3^{2-}]$, and pH), and as such are increasingly being used as a proxy to reconstruct past changes in ocean pH, inorganic carbon content, and saturation state. However, the behavior of this proxy is subject to modification by the combined effects of metabolic processes (i.e., respiration, photosynthesis) and the foraminifers' efforts to regulate the chemical microenvironment in which they grow their shells.

We have cultured *Orbulina universa* across a range of seawater [DIC], pH and [Ca] compositions in an effort to deconvolve biological and environmental influences of seawater carbonate chemistry and saturation state on shell B/Ca. Experiments were specifically designed to determine the extent to which foraminifers modify the chemical composition of their calcification fluid, and to assess the influence of growth rate effects on B/Ca incorporation into foraminiferal calcite.

Our B/Ca and calcification rate results were obtained by LA-ICPMS profiling and thus provide high-resolution insight into the biological boron incorporation process. While our data agree with previous culture experiments, comparison with inorganic calcite precipitation experiments [1] highlights disagreement with regard to [DIC] and [Ca] controls. The B/Ca composition of calcite precipitated by *Orbulina universa* is sensitive to [DIC] but the observed trend is opposite to that observed in inorganic calcite. Furthermore, precipitation rate does affect B/Ca in synthetic calcite but not in foraminifer shells. Our results have important implications for the interpretation of B/Ca as a proxy for seawater carbonate system parameters, particulary for past seawaters with DIC and [Ca] different to the modern ocean.

[1] Uchikawa *et al* (2015) *Geochimica et Cosmochimica Acta* **150**, 171-191.