

Understanding calcification in foraminifera to improve proxy relationships

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The element composition and stable isotope ratios in foraminiferal calcite reflect environmental conditions, but at the same time are influenced by biological processes. This results in proxy-relationships that are a) prone to species-specific offsets, b) display chemical variability within and between specimens and c) are notably different from what is expected based on inorganic precipitation experiments. A prominent consequence of the biological controls during calcification is the heterogeneous distribution of elements within chamber walls: the so-called 'element banding'. Alterations between high- and low-concentration bands (in e.g. Mg) may be explained by 1) changes over time in the El/Ca at the site of calcification, 2) an in- or decreasing rate of calcification over the course of chamber formation and/or 3) temporal variability in pH regulation. An overview of recent observations using pulse-chase experiments, fluorescent microscopy imaging and micro-electrode measurements is presented and utilized to test their ability in explaining foraminiferal El/Ca alongside existing explanations for element banding.