Proxy development and application

Early diagenesis and its effect on planktonic foraminiferal Me/Ca

Motivation: A persistent problem in paleoceanographic studies is the potential diagenetic alteration of geochemical proxies in foraminiferal tests. The geochemical composition may be altered by reprecipitation of calcite from sediment pore fluid. Inorganic (diagenetic) calcite in terms of overgrowth may mask the primary oceanographic signal of foraminiferal tests.

Main conclusion:
A case study from the Caribbean reveals anomalously high foraminiferal Mg/Ca and lowered Sr/Ca in downcore records close to carbonate platforms (Fig. 1). The foraminiferal tests show microcrystalline overgrowths (Fig. 2) enriched in Mg/Ca (Fig. 3). It is speculated that dissolution of aragonite and high-Mg-calcite, and subsequent reprecipitation of low-Mg-calcite cause the microcrystalline overgrowths.

Fig. 1. Sediment cores close to Caribbean carbonate platforms show distinct foraminiferal Mg/Ca anomalies, presumably due to early diagenetic alteration.

Fig. 2. Scanning electron microscope images of planktonic foraminiferal tests showing overgrowths of micro-scale euhydral crystallites of inorganic precipitates.

Fig. 3. Laser ablation ICP-MS Mg/Ca profile across a foraminiferal chamber showing diagenetic overgrowths.