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The effect of calcium carbonate saturation state on Mg-incorporation in foraminiferal calcite by controlled growth experiments

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Incorporation of Mg in benthic foraminiferal calcite has become one of the most commonly used proxies for the reconstruction of bottom-water temperatures (BWT) and in combination with foraminiferal δ^{18}O it can potentially be used as a proxy for paleosalinity. The relation between Mg-partitioning and temperature in planktonic foraminifera has been analyzed in earlier studies using both field data and culturing experiments. Although temperature showed to be the most important parameter controlling the incorporation of Mg, also variations in seawater CO_3^{2-} concentration play an important role. This is particularly important for benthic foraminifera since they precipitate their shells according to the environmental conditions that correspond to their highly variable infaunal habitats. Ongoing diagenesis causes strong gradients in pore water carbonate chemistry already in the top few centimeters of the sediment. Therefore, the trace metal test composition of benthic foraminiferal species potentially reflects, either pore or bottom water composition.. To quantify the effect of different habitats, benthic species with different infaunal habitats were grown in chemostats, where calcification takes place under controlled carbonate chemistry conditions. Variations in Mg-incorporation during growth were analyzed in newly formed calcite. Culturing results will be compared to core top calibrations from different areas to separate the effect of bottom water temperature from other environmental changes.