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Mg/Ca ratios from benthic foraminiferal shells as a recorder of bottom water temperature: New core top calibration data

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Core top samples from different parts of the South Atlantic Ocean were used to augment calibration data of benthic foraminiferal Mg/Ca ratios which are commonly used as a bottom water temperature proxy. For this study, shells of the epibenthic species *C. wuellerstorfi* and *C. kullenbergi* were laser-ablated (LA), and measured by an inductively coupled plasma mass spectrometer (ICP-MS). Although the LA-method is probably less accurate (mean standard error between shells within one sample is 6%) than the liquid solution method, it is a useful tool for collecting data from little sample material without time-consuming cleaning procedures. Furthermore, investigations on the great variability of trace element/Ca ratios within single shells are possible. The relationship between Mg/Ca and bottom water temperatures yields an empirical exponential curve with the resulting equation Mg/Ca = 0.888*e$^{0.117*BWT}$ for *C. wuellerstorfi*, and Mg/Ca = 0.552*e$^{0.157*BWT}$ for *C. kullenbergi*, respectively. These equations are similar to previous calibration studies. However, Mg/Ca ratios show an overall anomaly for the South Atlantic with increased values between ∼2500 m and ∼4000 m water depth. This finding corroborates the assumption that factors others than temperature may control the Mg uptake into foraminiferal shells. Preliminary results suggest that the carbonate ion concentration influences the Mg uptake in a way that higher CO_3^{2-} concentrations appear to result in increased Mg/Ca ratios. Probably, the 2500-4000 m anomaly can be related to the occurrence of the North Atlantic Deep Water (NADW) which is slightly oversaturated in CO_3^{2-}, in comparison to the surrounding water masses. Nevertheless, temperature remains most likely the overriding control on benthic foraminiferal Mg/Ca.