Planktonic foraminiferal Na/Ca as a proxy for salinity

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Sea surface salinity is one of the most wanted parameters in paleoceanography, reflecting past climate states and providing important boundary conditions for past ocean circulation. At present, paleo-salinity reconstructions primarily rely on interpretation of stable oxygen isotope signals in conjunction with an independent (in-)organic paleo-temperature proxy. However, due to error propagation, such an indirect approach is inherently associated with large uncertainties. Recent culture studies on benthic and planktonic foraminifera have shown that incorporation of Na in foraminiferal calcite depends on salinity and thus provides a direct proxy for salinity [1,2]. Applicability of this novel proxy is confirmed by analyses of living planktonic foraminifera from the Red Sea, although absolute Na/Ca values are higher than those found in culturing studies [3]. Here, we compare a suite of measurements to understand differences in Na/Ca within and between specimens and species. Alteration of the primary Na-signal through the water column upon burial in the sediment is studied by comparing living specimens from different depths within the water column of *G. ruber* and *T. sacculifer* with those from core-tops covering a large natural salinity gradient (Red Sea). It was found that Na values decrease with increasing water depth, which can be explained by loss of spines, highly enriched in Na. Furthermore, the internal distribution of Na within the foraminiferal shell wall is studied using Electron Probe Micro Analysis and used to make independent calibrations for different parts of the foraminiferal carbonate to salinity.

[1] Wit *et al.* (2013b) *BG* **10**, 6375-6387. [2] Allen *et al.* (2016) *GCA* **193**, 197-221. [3] Mezger *et al.* (2016) *PalOc* **31**, 1562–1582.