A direct proxy for salinity?

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Seawater salinity is one of the most important parameters in paleoceanography, reflecting past climate states, the hydrological cycle and providing important boundary conditions for oceanic circulation patterns. Reconstructing paleo-salinity is so far largely based on combining independent (in-)organic temperature proxies with foraminiferal stable oxygen isotopes. The relatively large uncertainties associated with these methods could be circumvented if a more direct salinity proxy would be available. Cultured benthic and planktonic foraminifera showed that Na incorporation in the carbonate of their shell provides a potential independent proxy for salinity [1,2]. This relation was also confirmed in a field study on living planktonic foraminifera collected in the Red Sea [3], albeit that absolute values were higher compared to culturing studies for the same species [2,3]. Here, we report the alteration of a primary Na-signal through the water column by comparing specimens of *G. ruber* and *G. sacculifer* from plankton pump samples with those from core-tops and multinets from the Red Sea. Results show that Na in these planktonic species decreases with increasing water depth and that this explains the observed smoothing of the salinity signal recorded in the Na composition of the shells. EPMA and laser-ablation-ICP-Q-MS measurements show that for both species, Na is concentrated in the (base of the) spines, providing an explanation for the decrease in Na with depth: as foraminifera grow and sink, they gradually loose their spines which are relatively enriched in sodium. This implies that although Na is still a potential proxy for salinity, either specimens with spines still well-preserved or non-spinose species should be used. [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.