Boron chemistry of planktonic foraminifera from surface sediments

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The boron chemistry of foraminiferal shells provides valuable information on the carbonate chemistry of the ambient seawater at the time of calcification. While the isotopic composition of boron in biogenic carbonates ($\delta^{11}B$) is a relatively reliable recorder of seawater pH [1], the B/Ca ratio is a far less established tool for reconstructing seawater carbonate chemistry. Recent studies suggest that the boron incorporation into the calcite lattice of planktonic foraminifera does not simply follow chemical equilibrium reactions, but is additionally influenced by symbiont photosynthesis [2], salinity [3,4], and may be even predominantly controlled by [PO_4^{3-}] [4].

Here we will present new B/Ca and $\delta^{11}B$ data of the planktonic foraminifer species *Globigerina bulloides*, *Globigerinoides ruber*, *Globigerinoides sacculifer* and *Orbulina universa* collected from widely distributed surface sediments in the Atlantic and Indian Oceans, and the Red Sea. First results suggest that the best correlations are found between B/Ca and the ratio between borate and bicarbonate ([$B(OH)_4^-$]/[HCO_3^-]) and dissolved inorganic carbon ([$B(OH)_4^-$]/DIC), respectively. This is in close agreement with observations from culture studies [5,6], suggesting that the borate species compete with [HCO_3^-] and DIC, respectively, for inclusion into the calcite lattice. On the contrary, our preliminary data show a negative trend of B/Ca with [PO_4^{3-}], contrasting recent observations made for *G. ruber* also based on field samples [4]. Understanding the mechanisms controlling boron incorporation into planktonic foraminiferal calcite remains a challenging task.

[1] Hemming and Hanson (1992), Geochim. Cosmochim. Acta 56, 537-543. [2] Babila et al. (2014), EPSL 404, 67-76. Allen et al. (2011), EPSL 309, 291-301. [4] Henehan et al. (2015), G-cubed 16, 1052-1069. [5] Allen et al. (2012), EPSL 351-352, 270-280. [6] Kaczmarek et al. (2015), Biogeosciences 12, 1753-1763.