Calcification control in *L. pertusa*: insights from boron mapping

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Boron isotopes in marine biogenic carbonates have been established as geochemical proxies to reconstruct seawater paleo-pH. While the underlying concepts of boron isotope fractionation based on pH-dependent seawater boron speciation are well understood, there is still a lively debate on how this environmental parameter is converted into specific chemical signatures during calcification. For the application as paleo-pH proxy, thus far species-specific empirical calibrations of skeletal δ11B vs. ambient seawater pH are needed.

Alternatively, the combination of boron isotopic composition and concentration in marine biogenic carbonates can be used as a tool to reconstruct the calcifying fluid's (cf) chemistry and allow for interpretation of the accompanying changes in the carbonate system of the cf and the physiological control of calcification i.e. how the organism elevates pH or supplies DIC and Ca ions to the cf.

We use LA-MC-ICPMS to acquire high-resolution 2D maps of boron concentration as well as isotopic composition in a sectioned L. pertusa specimen collected at it's natural Norwegian habitat. The degree of small-scale variability in those maps exceeds the range of values reported in published studies. The variations can be linked clearly to particular features of skeletal growth (septum, theca) which lead us to the interpretation of differing modes of calcification control in those particular parts of the skeleton.

Using our results we tested established concepts of cf control for their potential to explain our findings. In the theca wall region the boron data are in accord with the concept of pH-upregulation in the cf by proton pumping. The same mechanistic concept fails to explain the boron data in the septa and more generally in early-mineralization zones (OMZ). The modifications needed to align concept and empirical data will be presented.