Trace element (Mg, Sr, Ba and U) incorporation in culture high Mg-calcite benthic foraminifera under controlled pCO_2: a multi-elemental perspective

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Trace elements ratio in foraminifer shells has been widely used to reconstruct environmental conditions, as temperature, salinity, carbonate chemistry (CO_3^{2-}, pCO_2, pH), etc. These reconstructions are based on emperical data of specific trace element to environmenal parameter. However uncertainties on the incorporation mechanims on these trace elements in formainifera shells exist. Experimental dataset on the incorporation processes of trace elements in foraminifers focus on the incorporation of Mg and Sr [1,2] although other trace element ratios (Ba/Ca, U/Ca, B/Ca, etc.) are often described in foraminifer shells. Most of the studies focus on one or two trace elements separately and only a limited number of studies try to asses simoultanously the incorporation processes of several trace elements in foraminifer shells.

Here, we investigated the influence of variable pCO_2 level on the incorporation of Mg/Ca, Sr/Ca, Ba/Ca and U/Ca into the tests of two different species of algal symbiont-bearing, reef dwelling foraminifers. The measurements of Mg/Ca, Sr/Ca, Ba/Ca and U/Ca are reported for the two benthic foraminifer species *Baculogypsina sphaerulata* and *Amphisorus hemprichii* at five pCO_2 (260, 360, 580, 770 and 970 μatm).

Despite their different calcification process, the two foraminifera species have the same Mg/Ca and Ba/Ca whereas they have distinct Sr/Ca (~20% difference) and U/Ca (~75% difference). The difference in pCO_2 during the culture of the foraminifera have no significant influence on the incorporation of Mg/Ca, Sr/Ca and U/Ca in both *Baculogypsina sphaerulata* and *Amphisorus hemprichii* species. However, Ba/Ca in both species responds negatively to increase pCO_2.

[1] Erez (2003), *Review in mineralogy and geochemstry*, 115-149. [2] Nooijer et al. (2014) *Earth-Science Review*, 48-58.