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Sr heterogeneity in \textit{Arctica islandica} shells and the potential use of Sr/Ca ratios as paleotemperature proxies

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Quantifiable paleotemperature data can help to verify predictions made by numerical climate models. Traditionally, paleotemperature estimates are based on δ^{18}O values of biogenic hard parts. However, oxygen isotope values not only reflect changes in ambient temperature, but also changes in $\delta^{18}O_{water}$, i.e. driven by freshwater influx, evaporation etc. Information regarding the $\delta^{18}O_{water}$ value of past environments is limited for the geological past. The validity of published δ^{18}O paleotemperature data can be tested using element-to-calcium ratios of bivalve shells such as the long-lived ocean quahog, *Arctica islandica*. Preliminary investigations suggest that Sr/Ca ratios of this species may provide more reliable paleotemperature data. However, contemporaneously deposited shell portions within the outer shell layer demonstrate at least a 30% variability in the Sr/Ca value. This study presents Sr/Ca ratios measured by ICP-OES wet-chemical analyses. Significantly different distributions of Sr/Ca ratios were recorded from the shell surface (over 1330 ppm), through the interior (850 ppm) and to the inner shell surface (1860 ppm). Furthermore, this study showed that different shell crystal fabrics incorporate different amounts of Sr into the $CaCO_3$ lattice of the *A. islandica* shell. Disparate Sr distribution could potentially be explained either by postdepositional diagenetic processes or syndepositional processes during biomineralization (i.e. different amounts of Sr incorporated into the shell). Understanding the mechanism of the observed Sr heterogeneity is essential if Sr/Ca ratios are to be used confidently in paleotemperature reconstructions.