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Lithium in Brachiopods – proxy for seawater evolution?

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Marine biogenic carbonates have the potential to serve as a proxy for evolution of seawater chemistry. In order to compile a record of the past and recent δ7Li in the oceans, foraminifera shells, scleractinian corals and belemnites have been used. However, only a foraminifera-based record appears to more accurately reflect the Li isotope composition of ocean water. At present, this record is available for the Cenozoic with implications for major events during this period of time, including K/T event [1]. A record for the entire Phanerozoic has not yet been obtained. In order to extend this record to the more distant past, Li elemental/isotope systematics of brachiopods were investigated because these marine animals were already present in Early Cambrian oceans and because they are less sensitive to diagenesis-induced modifications due to their shell mineralogy (low-Mg calcite). The preliminary data indicates a species-, temperature- and salinity-independent behavior of Li isotopes in brachiopod shells. Also, no vital effects have been observed for different shell parts. The consistent offset of $\sim -4‰$ relative to modern seawater is in accordance with experimental data [2]. Further data are now being collected for Cenozoic specimens to more rigorously test brachiopods as possible archives of past seawater in comparison to the existing foraminiferal records.

[1] Misra & Froelich (2012) Science 335, 818-823
[2] Marriott et al. (2004) Chem Geol 212, 5-15