Accurate and precise determination of Li isotopes in Foraminiferal Carbonate

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The rate of continental weathering plays a central role in regulating atmospheric carbon dioxide concentration, and hence global climate, on both long and short timescales. However, there are only a few methods available that allow a reconstruction of the amount of weathering in the past. Weathering intensity has been shown to be the primary control on the flux of Li and the Li isotopic composition of rivers draining continental rocks, and is largely independent of rock composition. The Li isotopic composition of seawater is therefore potentially a sensitive measure of global weathering rates. In this contribution we examine how well planktic foraminifers record the Li isotopic composition of seawater.

We have analysed a number of species from the Holocene and Last Glacial Maximum in several sites in the Atlantic and Pacific Oceans. The sensitivity of our multicollector inductively coupled mass spectrometric approach ensures that as little as ~1 mg of foraminiferal carbonate is required for each analysis (~1 ng of Li) allowing mono-specific analysis (including benthic foraminifera). We find that in the equatorial Atlantic planktic species G. *sacculifer* and G. *ruber* accurately record modern seawater within our analytical precision of 0.2 ‰ (2sd). At the same site deeper dwelling species record decreasing lithium isotope ratios with increasing habitat depth. This is indicative of a secondary control on the Li isotopic composition of foraminifera. This conclusion is supported by analyses of G. *sacculifer* and G. *ruber* from the equatorial Pacific that record heavier values (~2 ‰) than those observed in the Atlantic. Notably, we have found no depth dependence or site variation in the Li isotopic composition of seawater itself, consistent with its long residence time (~1.5 Ma). A comparison of three additional core tops suggest that the observed site and habitat depth dependence may be caused by ambient seawater temperature and/or carbonate ion concentration.

The identification of these secondary effects severely complicates the iterpretation of down core records. Quantifying the core top Li isotope variation and sampling pristine down core records is the focus of our ongoing work.