

Li Isotopic Composition of Foraminiferal Tests and their Host Sediments

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Isotopic composition of Li is potentially a powerful tracer of geochemical processes such as high-temperature magmatic differentiation, alteration of oceanic crust or fluid-rock interactions. The Li mass balance in the ocean is only poorly understood: the two major sources of oceanic Li (expressed as $\delta^6\text{Li}$ values calculated relative to $6\text{Li}/7\text{LiL-SVEC} = 0.0832$) are river input from the continents (-6 to -32.2‰) and high-temperature alteration of oceanic basalts (-9‰). Given the average sea water Li isotopic composition of -32‰, additional inputs or sinks that fractionate Li isotopes are required to maintain a steady state of Li isotopes in the oceans. An outstanding issue is whether the Li composition of biogenic carbonate, such as tests of planktonic foraminifera, can be used as a proxy for the composition of the present and past ocean water.

We have successfully analysed 5–10 mg samples of planktonic foraminiferal tests (*Orbulina universa*, *Pulleniatina obliquiloculata*, *Globigerinoides sacculifer*, *Globogadria venezuelana*) collected from the sea water-sediment interface in the North Sea in Europe and from the ODP 926A hole in western equatorial Atlantic. The ODP samples were taken from 32.5 to

304.5 mbsf corresponding to an age of 1.8 to 15.8 Ma. To avoid contamination by the host sediment, the samples were crushed to break open the chambers and ultrasonically and chemically cleaned prior to dissolution and analysis by ICPMS.

Li isotopic composition of the studied tests and their host sediments from ODP 926A varies from ca -30 to -15‰ and from 0 to +5‰, respectively. The data suggest that over a period of ca 14 Ma there was no significant isotopic equilibration of Li isotopes between the foraminifera tests and their host sediments. Provided that the Li composition of planktonic foraminifera tests reflects the composition of Li in the sea water, the isotopic variation in the foraminifera that are preserved in the marine sediments can provide us with invaluable information about the Li isotopic composition of the past oceans. Comparison of the Li isotopic composition of recent foraminifera tests from the North Sea with previously published results from the equatorial Atlantic and Pacific oceans was used to evaluate a potential role of temperature on the Li isotopic fractionation between the sea water and the foraminifera carbonate.