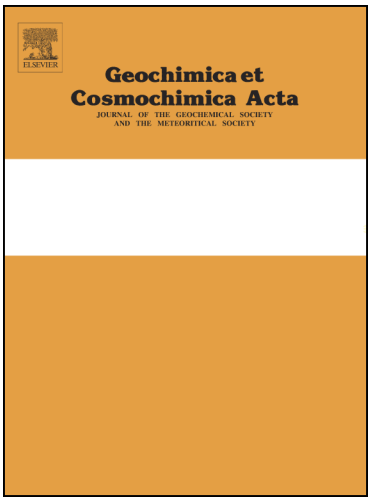

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Lithium isotopic composition of benthic foraminifera: A new proxy for paleo-pH reconstruction

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Abstract

The lithium isotopic composition of foraminifera is an established tracer of long-term changes in the global silicate weathering cycle, following the assumption that foraminifera faithfully record the lithium isotopic composition (δ^7Li) of seawater. In this study, we demonstrate by utilizing benthic foraminifera (*Amphistegina lessonii)* that were cultured under decoupled pH-[CO_3^{2-}] conditions, that foraminifera δ^7Li is strongly dependent on pH. This is reinforced with δ^7Li data from globally distributed core-top samples of *Cibicidoides mundulus* and *Cibicidoides wuellerstorfi*, which show the same negative correlation with pH. The dependency of δ^7Li on pH is perhaps a surprising result given that lithium speciation in seawater is independent of both pH and carbonate ion speciation. The dependence of lithium incorporation on growth rate was assessed by measuring the calcium isotopic composition; no growth rate dependent incorporation was observed. Instead, we propose that the strength of the ^6Li and ^7Li hydration spheres (and hence their respective desolvation energy) is pH-dependent, resulting in a significant isotopic