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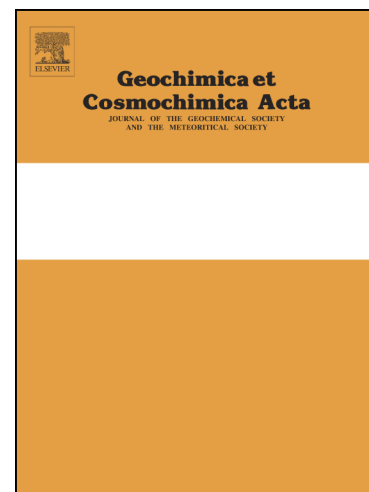
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Lithium isotopic composition of benthic foraminifera: A new proxy for paleo-pH reconstruction

J. Roberts¹, K. Kaczmarek¹, G. Langer³, L.C. Skinner², J. Bijma¹, H. Bradbury², A.V. Turchyn², F. Lamy¹, S. Misra^{2,4*}

¹ Alfred-Wegener-Institut Helmholtz-Zentrum für Polar- und Meeresforschung, 27570 Bremerhaven, Germany

² The Godwin Laboratory for Paleoclimate Research, Department of Earth Sciences, University of Cambridge, UK

³ The Marine Biological Association of the United Kingdom, The Laboratory, Citadel Hill, Plymouth, Devon, PL1 2PB, UK

⁴ Centre for Earth Sciences, Indian Institute of Science, Bangalore, India

*Corresponding author: sambuddha@iisc.ac.in; +91-9830959955

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 ($\delta^7\text{Li}$) of seawater. In this study, we demonstrate by utilizing benthic foraminifera (*Amphistegina lessonii*) that were cultured under decoupled pH- $[\text{CO}_3^{2-}]$ conditions, that foraminifera $\delta^7\text{Li}$ is strongly dependent on pH. This is reinforced with $\delta^7\text{Li}$ data from globally distributed core-top samples of *Cibicides mundulus* and *Cibicides wuellerstorfi*, which show the same negative correlation with pH. The dependency of $\delta^7\text{Li}$ 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

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