

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. This technique is based on the assumption that foraminifera faithfully record the lithium isotopic composition ($\delta^7\text{Li}$) of seawater and that no environmental variables impact the fractionation of lithium during incorporation into foraminiferal calcite. Here, we show that this is not the case. Using a combination of cultured, core-top and downcore samples, we demonstrate for the first time evidence that changes in seawater pH have a significant effect on foraminifera $\delta^7\text{Li}$. There is a strong negative correlation between $\delta^7\text{Li}$ and seawater pH, which is true for both benthic and planktonic foraminifera. Our findings have implications for reconstructions of Cenozoic seawater $\delta^7\text{Li}$ based on planktonic foraminifera $\delta^7\text{Li}$, and suggest, rather remarkably, that the long-term increase in seawater $\delta^7\text{Li}$ observed over the Cenozoic must have been significantly greater than previously inferred.