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Lithium isotopic constraints on widespread clay authigenesis after the Marinoan glaciation

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The Marinoan glaciation stands for the second Snowball Earth glaciation during the late Neoproterozoic. A widespread geological record of cap carbonate marks a transition from an extreme icehouse to greenhouse climate following raised atmospheric CO_2. However, the consequence for such extreme climatic transition remains debated. Here with a sequential extraction approach, we determine the lithium isotope composition (δ^7Li) of the carbonate and silicate fractions in cap carbonates. We find that carbonate-hosted silicate is dominated by marine authigenic clays with minor contributions from terrestrial materials. Reconstruction of seawater δ^7Li from carbonate-hosted silicates suggests a heterogeneous marine Li reservoir in a highly stratified post-glacial ocean, and then rapid mixing of seawater after the Marinoan glaciation. By modelling the δ^7Li data, we find that low silicate weathering intensity and high denudation rates (detailed information about weathering regime see [1]) likely characterized the post-glacial environment. In addition, the δ^7Li of carbonate minerals resembles that of carbonate-hosted silicate, showing specific effects of silicate component on bulk carbonate δ^7Li values, and then emphasizing the significance of component-selective analysis of ancient carbonates for paleo-weathering reconstruction.

Reference

[1] Pogge Von Strandmann et al., 2020, Lithium and Lithium Isotopes in Earth’s Surface Cycles. Elements 2020; 16 (4): 253–258.