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 CO2. However, the consequence for such extreme climatic transition remains debated. Here with a sequential extraction approach, we determine the lithium isotope composition (δ7Li) 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 δ7Li 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 δ7Li 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 δ7Li of carbonate minerals resembles that of carbonate-hosted silicate, showing specific effects of silicate component on bulk carbonate δ7Li values, and then emphasizing the significance of component-selective analysis of ancient carbonates for paleo-weathering reconstruction.

Reference