

Insights into the genesis of post-Marinoan Barite using Ba isotopes

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BaSO₄ (barite) deposited in the aftermath of the Marinoan glaciation bear some of the most important evidence in support of a Neoproterozoic Snowball Earth. While many studies have focused on the origins and interpretations of isotopic data within SO₄ (sulfate), few have focused on the source of Ba (barium) into these enigmatic BaSO₄ horizons, and thus have not ascertained why these deposits are unique to this second Cryogenian Snowball Earth glaciation. Recent developments in the understanding of the Ba cycle through its isotopes are now allowing such an exploration to occur. We explore the genesis of enigmatic post-Marinoan BaSO₄ through a new Ba ($\delta^{138/134}\text{Ba}$) isotopic data set. As relatively few studies utilize this tool, we bolster this data set with a Ba isotopic survey of modern BaSO₄ from hydrothermal, cold seep, marine-particulate and terrestrial settings. We suggest that new Ba, and existing SO₄ ($\Delta^{17}\text{O}$, $\delta^{34}\text{S}$) isotopic results are best explained by a marine source of Ba to post-Marinoan BaSO₄ in support of a stratified post-glacial ocean and go further to speculate on the temporal significance of these horizons.