

## **Preliminary temperature records from Marinoan-age low latitude carbonates**

ADAM B. JOST<sup>1</sup>, TYLER J. MACKEY<sup>1</sup>, KRISTIN D.  
BERGMANN<sup>1</sup>

<sup>1</sup>Department of Earth, Atmospheric, and Planetary Science,  
Massachusetts Institute of Technology, Cambridge, MA  
02139, USA; correspondence: abjost@mit.edu

The Marinoan glaciation (ca. 639–635 Ma) occurred soon after the emergence of early complex multicellular eukaryotes and before the diversification of large Ediacaran fauna. However, our understanding of how habitability and climate changed during this Snowball Earth event is limited by a lack of paleo-surface temperature data. To better characterize the climate of this interval, and to further understand the impact of post-depositional processes on existing geochemical proxies, we measured carbonate clumped isotopes ( $\Delta_{47}$ ) in rocks from the Wilsonbreen Formation from northeast Spitsbergen. This sequence of well-preserved end-Marinoan synglacial sediments was deposited near the paleo-subtropics and includes primary lacustrine or marginal marine carbonate facies and diagenetic cements now preserved as limestone or dolomite. We sampled carbonate microfacies within samples throughout the sequence to determine  $\delta^{13}\text{C}$ , mineral  $\delta^{18}\text{O}$ , fluid  $\delta^{18}\text{O}$  and  $\Delta_{47}$ -derived crystallization temperature. Preliminary data demonstrate that different microfacies within a single sample can yield precipitation temperatures varying up to 100°C, emphasizing the importance of fabric selective recrystallization and the need for careful characterization of carbonate microfacies. Strong linear covariation between fluid  $\delta^{18}\text{O}$  and temperature suggests that any temperature resetting likely occurred in a closed (low water/rock) system. Minimum temperatures are exceptionally low (<10°C), consistent with near-freezing conditions at low paleo-latitude, suggesting that primary depositional temperatures may be preserved in certain carbonate textures.