Carbonate clumped isotope temperatures from the onset of the Cryogenian

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Earth surface conditions dramatically changed at the onset of the Cryogenian, and global temperature shifts would have affected the habitats available for early animals. Well-preserved pre- and syn-Sturtian carbonates of the Elbobreen Formation are exposed on nunataks and sea cliffs across NE Spitsbergen and W Nordaustlandet and may retain evidence of changing depositional temperatures in carbonate clumped isotope (Δ_{47}) values. Carbonates have a range of mineralogies (calcite and dolomite), origins (in situ precipitates, detrital grains, burial cements), and facies, providing a test for diagenetic and depositional control on Δ_{47} values. Δ_{47} values vary with carbonate phases; calcites and burial cements in the pre-Sturtian Russøya Member record temperatures >140°C, whereas dolomite temperatures are lower and vary stratigraphically, with most samples being 50–80°C. The Russøya Member also contains a negative carbon isotope excursion, which provides a means of pinpointing the source of intraformational carbonate clasts in the overlying glacial Petrovbreen Member. Comparing paired clast $\delta^{13}C$ and Δ_{47} values to the underlying stratigraphy offers a test for diagenetic control on Δ_{47}-temperature. Preliminary results indicate that the magnitude of differences in Δ_{47} between isotopically distinct carbonate clasts may reflect changing depositional temperatures in the Russøya Member rather than selective diagenesis of stratigraphic horizons.