

Clumped isotope compositions of Paleozoic carbonate rocks

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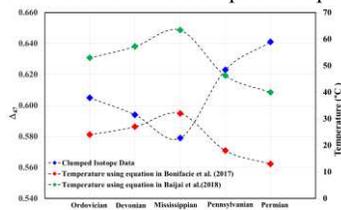
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Validation of records of sea surface temperatures in the distant past using a variety of geochemical tools is a key component of paleoclimate studies to better understand the dynamics of the climate system. We report clumped isotope, oxygen and carbon isotope data of marine-origin carbonate fossils from late Ordovician to early Permian sedimentary sequences that were originally deposited in ocean basins located in tropical settings during their respective geologic times. The results are grouped into geologic periods to decipher the long term evolutionary trajectory of carbonate clumped isotope signatures, showing a transition from slightly lower values (0.605, 0.594 and 0.579) for late Ordovician, Devonian and Mississippian periods to higher values (0.623 and 0.641) for Pennsylvanian and early Permian periods. The data presented in this study are consistent with the observation of a general increasing trend of oxygen and carbon isotopes in sedimentary carbonates throughout the Paleozoic [1].

The clumped isotope data are transformed using the calibrated equations on the basis of analyses of synthetic [2] and biogenic [3] carbonates to constrain formation temperatures. The derived temperatures broadly reflect the late Paleozoic ice age spanning from late Devonian to middle Permian as seen from observations of widespread glacial deposits at that time. Ongoing work will explore the implications of oxygen isotope compositions of seawater, derived from the clumped isotope record.



[1] Veizer et al. (1999) *Chem Geol* 161, 59-88. [2] Bonifacie et al. (2017) *GCA* 200, 255-279. [3] Bajnai et al. (2018) *Scientific Reports* 8, 533-545.