New Re-Os ages for the Ediacaran Period: an update on constraining global environmental change

ALAN D. ROONEY[1], JAMES F. BUSCH[2], MARJORIE CANTINE[3], KRISTIN D. BERGMANN[3], FRANCIS A. MACDONALD[4], JUSTIN V. STRAUSS[2], MAOYAN ZHU[5]

[1]Yale University, alan.rooney@yale.edu
[2]Dartmouth College, james.f.busch.gr@dartmouth.edu; justin.v.strauss@dartmouth.edu
[3]MIT, mcantine@mit.edu; kdberg@mit.edu
[4]UC Santa Barbara, francism@ucsb.edu
[5]Chinese Academy of Sciences, Nanjing, myzhu@nigpas.ac.cn

Following termination of the Marinoan snowball Earth glaciation, the Ediacaran Period (635-540 Ma) was a time of unprecedented change in the Earth system with evidence for a dynamic marine redox landscape, continental reorganization, the radiation of early animals, and large perturbations to major biogeochemical cycles. In particular, the Ediacaran carbonate carbon isotope record reveals multiple negative excursions that may be connected to biological transitions in the lead up to the Ediacaran-Cambrian transition.

The Ediacaran Shuram carbon isotope excursion (CIE) represents the largest perturbation to the global carbon cycle in Earth's history. Despite several decades of intense study, efforts to subdivide the Ediacaran Period has faltered, primarily due to a lack of robust radiometric age constraints. This paucity of ages has hampered attempts to correlate stratigraphic sections from different margins and evaluate links between the evolution of complex life and perturbations to the global carbon cycle. Further, there is no consensus with regards to the primary nature of the CIEs, their duration, or causal mechanism(s) capable of disturbing the carbon cycle to such a degree.

Here we present new Re-Os age constraints and geochemical datasets from multiple Ediacaran basins worldwide in an effort to determine the onset, duration and synchroneity of the Shuram CIE. Our results facilitate the construction and refinement of a temporal framework for the Ediacaran Period, which will play a central role in solidifying global chemostratigraphic correlation schemes. These ages provide necessary context to test proposed driving mechanisms for the largest CIEs in the geological record and their possible links to the Ediacaran emergence of animals.