Geochronologic constraints on the onset of the Shuram excursion in Oman

MARJORIE D. CANTINE[1 *], KRISTIN D. BERGMANN[1], ALAN D. ROONEY[2], ULF-GERHARD LINNEMAN[3], MANDY HOFMANN[3], RICHARD ALBERT [4], IRENE GOMEZ PEREZ[5], BADAR BALOUSHI[5], AXEL GERDES[4]

[1]Massachusetts Institute of Technology, *correspondence: mcantine@mit.edu
[2]Yale University
[3]Senckenberg Natural History Collections Dresden
[4]Goethe-Universität Frankfurt
[5]Petroleum Development Oman

The Ediacaran Period (635-538 Ma) saw recovery from the Marinoan Snowball Earth episode; the appearance and diversificiation of macroscopic, complex life forms; transient, regional glaciation; and the most extreme negative carbon isotope excursion in Earth history, the Shuram excursion. The causal relationships between these events remain unclear, in part because of limited age constraints.

Here, we apply multiple methods, including Re-Os on black shales and U-Pb LA-ICP-MS dating on carbonates, to well-preserved Ediacaran stratigraphy from Oman, deriving new age controls. Depositional ages using U-Pb ID-TIMS on zircons in Oman has led to high resolution age constraints on the latest Ediacaran Ara Group [1]. The older Ediacaran Nafun Group, which contains the Shuram excursion, has proved more challenging, with detrital zircons providing only minimum depositional ages. The exceptional preservation of Nafun Group rocks has permitted the development of multiple diagenetically sensitive records, including biomarker data, $\delta^{34}S_{CAS}$ and clumped isotope thermometry, yet the global applicability of these datasets has been limited by a lack of age control.

These new data show that paired Re-Os shale and U-Pb carbonate analyses constrain the onset of the Shuram excursion in Oman. The results demonstrate the utlity of leveraging multiple geochronological techniques within a single basin to constrain deposition in deep to shallow depositional environments. The results also provide a key absolute age constraint on the onset of the Shuram excursion in the stratigraphy where it was first defined, critical for testing global correlation schemes, constructing a temporal framework for the Ediacaran period, and identifying causal mechanisms during this biologically and geochemically dynamic interval.

[1] Bowring et al. "Geochronologic constraints on the chronostratigraphic framework of the Neoproterozoic Huqf Supergroup, Sultanate of Oman." *American Journal of Science* 307.10 (2007): 1097-1145.