

Ca, Mg, and Li isotope records leading into the Sturtian Glaciation

PETER W. CROCKFORD¹ MARCUS KUNZMANN¹,
CLARA L. BLATTLER², NOAH J. PLANAVSKY³,
JOHN A. HIGGINS², GALEN P. HALVERSON¹
AND BOSWELL A. WING¹

¹McGill University Dept of Earth and Planetary
Sciences, 3450 University Street Montreal QC.
H3A 0E8 peter.crockford@mail.mcgill.ca

²Department of Geosciences, Princeton University,
Princeton NJ, 08544

³Department of Geology and Geophysics, Yale
University New Haven CT, 06511

Non-traditional isotopes have proven to be useful tools to uncover information about ancient seawater and atmospheric chemistry, carbon cycling, and global weathering rates. This information is particularly sought after leading into the Sturtian pan-glacial event (717 Ma) where for the first time in over 1.5 billion years the silicate weathering feedback potentially failed, plunging the world into its deepest glaciation.

New data will be presented from a ~125 m thick record of marine carbonate rocks from the Copper Cap Formation of the Little Dal Group in Northwest Canada that records the recovery from the Islay negative carbon isotope anomaly (~732 Ma) through to the initiation of glaciation. Isotope measurements (n = 61) of Ca ($\delta^{44}\text{Ca}$), Mg ($\delta^{26}\text{Mg}$), and Li ($\delta^7\text{Li}$) display coeval patterns with large excursions ($\delta^{44}\text{Ca} > 1\text{‰}$, $\delta^{26}\text{Mg} > 1\text{‰}$, $\delta^7\text{Li} > 10\text{‰}$) beyond typical Phanerozoic variability. Fractionations of this magnitude require large swings in the relative rates of global weathering and hydrothermal processes, or significant shifts between calcite and aragonite seas. We will take a sequential approach in an attempt to discriminate between these models, and will use each isotopic system individually to make consistent predictions for the behaviour of the other two. Through the use of these combined datasets, our ultimate goal will be to link our results to shifts in the global carbon cycle and the onset of the Sturtian glaciation.