

The Isotope Record of Seawater Chemistry Change Across the Late Paleozoic Climate Shift

SHELBY A. LEGETT^{1*}, E. TROY RASBURY¹, ETHAN L. GROSSMAN², N. GARY HEMMING¹, AND CARRIE C. WRIGHT^{1,3}

¹Stony Brook University, Department of Geosciences, Stony Brook, NY 11794-2100, USA (*correspondence: shelbie.legett@stonybrook.edu)

²Texas A&M University, Department of Geology & Geophysics, College Station, TX 77843, USA

³University of York, Department of Archaeology, York YO10 5DD, UK

Published records show a profound rise in seawater $^{87}\text{Sr}/^{86}\text{Sr}$ coincident with the initiation of Late Paleozoic glaciation [1] and an even more abrupt decline at the end of the Carboniferous into the Permian [2], where it reached a minimum for the Phanerozoic near the end of the Permian. In our study, we see a remarkable relationship between the timing of changes in seawater $^{87}\text{Sr}/^{86}\text{Sr}$, $\delta^{11}\text{B}$, and $\delta^{44/40}\text{Ca}$ analogous to that seen in marine isotope systems in the Neogene [3].

The Early Permian saw the completion of Pangea along with extreme aridity evidenced by extensive evaporites following a period of significant coal deposits in the Carboniferous. These climate extremes allow us to further consider controls on seawater chemistry, particularly as it compares to the Neogene. In the Neogene, simultaneous increases in marine B, Li, and Ca isotopes and a decrease in Mg isotopes are attributed to sorption onto clays and other weathering products [3]. Conversely, going into the Permian, these isotopes, along with $^{87}\text{Sr}/^{86}\text{Sr}$, show the opposite trends suggesting a major reduction in continental weathering. This hypothesis is supported by our flux models of oceanic isotopic composition and elemental concentration.

[1] Bruckschen *et al.* (1999) *Chem. Geo.* 161, 127-163. [2] Korte *et al.* (2006) *PPP* 240, 89-107. [3] Greenop *et al.* (2017) *Clim. Past* 13, 149-170.