Weathering vs hydrothermal activity: A multi-proxy approach to examining Late Paleozoic glacial-interglacial seawater chemistry

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From the beginning of the Carboniferous to the Late Permian, geologic evidence suggests that the Earth experienced several major glacial and interglacial intervals and extreme climate changes [1,2]. Along with the creation of the supercontinent Pangea, these environmental transitions left their marks on Late Paleozoic seawater chemistry. In this study, we use the $\delta^{11}B$, $^{87}Sr/^{86}Sr$, $\delta^{44/40}Ca$, $\delta^{7}Li$, and $\delta^{26}Mg$ of Carboniferous and Permian brachiopods to track seawater chemistry thorughout the climate transitions.

The key controlling mechanisms that are common to all of these isotope systems are continental weathering and hydrothermal activity. At different times throughout the Late Paleozoic, these processes competed for dominance leading to varying seawater isotopic signatures recorded by fossil brachiopods. By combining $\delta^{11}B$, $^{87}Sr/^{86}Sr$, $\delta^{44/40}Ca$, $\delta^{7}Li$, and $\delta^{26}Mg$ analyses as proxies, we hope to more precisely determine the key controls on seawater chemistry composition at any given time during the Late Palezoic.

During Carboniferous glacial-interglacial periods, our preliminary data show positive correlation between brachiopod $^{87}Sr/^{86}Sr$ and $\delta^{44/40}Ca$, while $\delta^{11}B$ generally opposes these isotope systems. However, at the Carboniferous-Permian boundary, all three systems show a decreasing trend as Pangea amalgamates and extreme Permian aridity begins. With the addition of $\delta^{7}Li$ and $\delta^{26}Mg$ from these brachiopods, we hope to better constrain causal mechanisms such as continental weathering, hydrothermal activity, or both.

[1] Tabor & Poulsen (2008) *PPP* 268, 293-310. [2] Isbell *et al.* (2003) *Geol.* 31, 977-980.