Meteoric diagenesis of platform carbonates during the mid-Carboniferous

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Bahama-style meteoric diagenesis of platform carbonates in the western US during the end of the Visean may be associated with the rapid expansion of late Paleozoic Gondwanan glaciation. We present fourteen stratigraphic sections from carbonate platforms in the western United States that illustrate the regional distribution and variable intensity of physical and chemical diagenesis just below the mid-Carboniferous unconformity. In each section, we observe top-negative carbon isotope excursions that terminate in regional exposure surfaces that are associated with karst towers, desiccation cracks, fabric destructive recrystallization, and extensive root systems. Shells containing heavy carbon and oxygen isotopes, surrounded by isotopically light matrix and reworked clasts from dissolution collapse breccia pits just below the unconformity in southern Nevada require a diagenetic origin for the top-negative carbon isotopic excursion. The timing of the diagenesis appears synchronous with similarly-scaled top-negative carbon isotope excursions observed by others in England [1], Kazakhstan [2], and China [3]. The mass flux of light carbon required to generate these isotopic profiles is significant when extrapolated over the estimated platform carbonate areal extent for the end Visean. We develop a simple carbon box model to illustrate that oceanic DIC could be significantly elevated as light carbon from the terrestrial weathering flux reacts with exposed platforms before reaching the ocean and atmosphere. If these meteoric diagenetic reactions are sustained throughout the late Paleozoic Ice Age, atmospheric oxygen models that depend on the isotopic composition of DIC in the ocean are overestimating oxygen concentrations.

[1] Campion et al. (2015) Poster presented at: Northeastern Geobiology Symposium. [2] Ronchi et al. (2010) *AAPG Bulletin* **94**, 1313-1348. [3] Zhao & Zheng (2014) *Geochimica et Cosmochimica Acta* **141**, 508-531.