Goldschmidt 2023 Abstract
https://doi.org/10.7185/gold2023.18270

Secular change, early diagenesis, or both? A case study from Cretaceous Ocean Anoxic Event 1a

MATTHEW D NADEAU[1], JACK G. MURPHY[2], CEDRIC HAGEN[1], ZIMAN WU[3], ALLIYA A AKHTAR[1], ANNE-SOFIE C AHM[4], DANIEL A STOLPER[3], ADAM C MALOOF[1] AND JOHN A HIGGINS[1]

[1]Princeton University
[2]University of Pennsylvania
[3]University of California, Berkeley
[4]University of Victoria

Presenting Author: matthew.daniel.nadeau@gmail.com

Early diagenetic alteration by marine and meteoric fluids is widespread in shallow-water marine carbonate sediments. However, these same archives appear to synchronously record short-lived (~ million years) perturbations to the global geochemical cycles of carbon and other elements (e.g., Li, Ca, and Sr). Here we explore this apparent contradiction using a suite of geochemical proxies (δ^7Li, δ^{13}C, δ^{18}O, δ^{26}Mg, δ^{44}Ca, Δ_{47}, [Mg], [Ca], [Sr], [Li]) in a well-studied shallow water carbonate succession from Ocean Drilling Program Site 866A (Resolution Guyot, Mid-Pacific Mountains). Carbonate deposition at site 866a spaned ocean anoxic event 1a (OAE1a), a globally-correlative, short-lived perturbation to the global carbon cycle in the Late Cretaceous. Previous studies at this site have documented a +3‰ positive d^{13}C excursion, modest decline in seawater ^{87}Sr/^{86}Sr, and large stratigraphic variability in δ^7Li and δ^{44}Ca, all of which have been interpreted as reflecting temporal changes in the chemical composition of seawater associated with OAE1a. However, this site also preserves textural fabrics consistent with early diagenetic alteration by marine and meteoric fluids. Our results suggest early marine and meteoric diagenesis appear sufficient to alter all but the most diagenetically robust paleoenvironmental proxies (e.g., δ^{13}C values). The results of this work highlight the axiom that the extent to which early marine and meteoric diagenesis alter the chemical and isotopic composition of the primary carbonate sediment depends on the diagenetic setting and element/isotopic system in question. This work has broad implications for interpreting stratigraphic variability from shallow water carbonate sediments.