Goldschmidt 2024 Abstract
https://doi.org/10.46247/gold2024.23494

Radiogenic Sr isotope ratios spanning Cretaceous OAE2 record hydrothermal activity and ocean mixing

ANNA R WALDECK[1,2], ANDREW D JACOBSON[2], BRADLEY B SAGEMAN[2], BENJAMIN J LINZMEIER[3], GABRIELLA D KITCH[4], NILOUFAR L SARVIAN[2], CHUYAN WAN[2] AND MATTHEW HURTGEN[2]

[1]Pennsylvania State University
[2]Northwestern University
[3]Uroboros Innovations, LLC
[4]National Oceanic and Atmospheric Administration
Presenting Author: a.waldeck@psu.edu

Radiogenic strontium isotope ratios ($^{87}Sr/^{86}Sr$) preserved in marine carbonates record fluctuations in the balance between mantle (lower $^{87}Sr/^{86}Sr$) versus terrestrial (higher $^{87}Sr/^{86}Sr$) inputs of Sr to seawater through time, yet diagenetic effects may complicate interpretations. Here, we apply the radiogenic Sr isotope proxy to examine environmental signals during the Late Cretaceous Ocean Anoxic Event 2 (OAE2). Emplacement of one or more Large Igneous Provinces (LIP) likely triggered OAE2 and increased the hydrothermal Sr input flux. Previous studies have generated radiogenic Sr isotope records across OAE2 to estimate the scale of hydrothermal volcanism and the relative balance of mantle versus terrestrial Sr inputs.

We present four new bulk carbonate radiogenic Sr isotope records spanning OAE2: two from Southern Mexico (proto-Pacific) and two from the Western Interior Seaway (WIS), USA. In total, measured $^{87}Sr/^{86}Sr$ ratios range from 0.70724 to 0.70780. We compare our new records to the existing global database of radiogenic Sr isotope records across OAE2 to interpret the complexity of influences from hydrothermal inputs, continental runoff, ocean circulation, and diagenesis. The two Southern Mexico sites are the most proximal records to the contemporaneous Caribbean LIP, and both display rapid shifts toward lower $^{87}Sr/^{86}Sr$ ratios just before OAE2. The decreases are larger in magnitude than previously identified across this interval. The two WIS sites provide the first continuous radiogenic Sr isotope records generated from multiple samples spanning OAE2, and both display some of the highest $^{87}Sr/^{86}Sr$ ratios reported to date. Together, these records inform hypotheses about the interconnectedness of the WIS and global ocean, and the influence of volcanism, weathering, and diagenesis within the shorter-term context of OAE2, and they also advance our understanding of the longer-term secular evolution of global seawater $^{87}Sr/^{86}Sr$ ratios during the Cretaceous.