

Validation of the carbonate $^{238}\text{U}/^{235}\text{U}$ paleoredox proxy: Evidence from multiple localities spanning the Permian- Triassic Boundary

STEPHEN J. ROMANIELLO^{1*}, FEIFEI ZHANG¹,
THOMAS J. ALGEO^{2,3}, KIMBERLY V. LAU⁴,
XINMING CHEN¹, MAYA ELRICK⁵, ACHIM D.
HERRMANN⁶, ARIEL D. ANBAR^{1,7}

¹School of Earth & Space Exploration, Arizona State University, Tempe, AZ, 85287 USA

*sromanie@asu.edu

²Department of Geology, University of Cincinnati, Cincinnati, OH 45221, USA

³State Key Laboratories of BGEG and GPMR, China University of Geosciences, Wuhan 430074, China

⁴Dept. of Geological Sciences, Stanford University, Stanford, CA 94305-2210, USA

⁵Dept. of Earth & Planetary Sciences, University of New Mexico, Albuquerque, NM, 87131, USA

⁶Department of Geology & Geophysics, Louisiana State University, Baton Rouge, LA 70803, USA

⁷School of Molecular Sciences, Arizona State University, Tempe, AZ, 85287, USA

The development of robust, well-validated global marine paleoredox proxies for use in carbonate rocks would be advantageous for the reconstruction of past environments.

Over the past several years, we have pursued validation of the $^{238}\text{U}/^{235}\text{U}$ carbonate paleoredox proxy using a multipronged approach including laboratory experiments, modern analogs, recent sediments, and inter-comparison of multiple contemporaneous records spanning the Permian-Triassic boundary. Here, we will summarize some of our most important findings and present new data from Permian-Triassic sections—nearly all of which record clear $^{238}\text{U}/^{235}\text{U}$ excursions with similar magnitude decreasing from -0.15‰ to -0.75‰. Isolated sections such as Meishan show extremely high variability but such sections are easily identified and appear rare. With proper consideration of depositional and diagenetic conditions, $^{238}\text{U}/^{235}\text{U}$ in bulk carbonate sediments appears to be a reliable indicator of ocean paleoredox conditions.