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

STEPHEN J. ROMANIELLO1*, FEIFEI ZHANG1, THOMAS J. ALGEO2,3, KIMBERLY V. LAU4, XINMING CHEN1, MAYA ELRICK5, ACHIM D. HERRMANN6, ARIEL D. ANBAR1,7

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 $^{238}$U/$^{235}$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 $^{238}$U/$^{235}$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, $^{238}$U/$^{235}$U in bulk carbonate sediments appears to be a reliable indicator of ocean paleoredox conditions.