Correlated Mo and U isotope signatures in sediments from the Black Sea and the Cariaco Basin

S. WEYER[1], A. BRÜSKE[1], N. NEUBERT[1], V. SCHULTE[1], D. ZOK[1], O. DELLWIG[2], N. PLANAVSKY[3], T. LYONS[4]

[1] Leibniz Universität Hannover, Institute of Mineralogy, Germany (s.weyer@mineralogie.uni-hannover.de)
[2] Leibniz Institute for Baltic Sea Research (IOW), Germany
[3] Yale University, Dep. of Geology and Geophysics, USA
[4] UC-Riverside, Department of Earth Sciences, USA

In this study, we analyzed the Mo and U isotope compositions of sediment samples from the Black Sea and the Cariaco Basin [1] in order to explore the relationship between the two isotope systems. Samples from the sediment-water interface were taken at variable water depth below the chemocline along the basin shelves and from the deeper waters of both basins. From the Cariaco Basin, we furthermore analyzed samples from a core (IODP 1002B) that span a range from 30 to 590 cm below the seafloor (bsf).

Core top samples from both basins show highly variable Mo isotope ratios (δ^{98}Mo = 0.0-2.2‰, relative to NIST + 0.25‰), with the heaviest, seawater-like δ^{98}Mo values shown by sediments from the center of the Black Sea. U isotopes show only limited variations in (δ^{238}U = 0.0-0.2‰, relative to CRM-112A), and there is no correlation between the Mo and U isotope data. Black Sea sediments from 1-2 cm depth show additional U enrichment and isotope fractionation (with δ^{238}U up to 0.4‰) but similar Mo concentrations and isotope ratios compared to sediments from 0-1 cm. Furthermore, these samples show a distinct negative correlation for δ^{98}Mo and δ^{238}U, i.e., samples that display stronger Mo isotope fractionation also show stronger U isotope fractionation relative to the isotopic compositions of Mo and U in the water column. A similar correlation was observed for samples from the Cariaco Basin core, however, with an offset towards lower δ^{98}Mo and δ^{238}U.

Our results show that, although the mechanisms of metal reduction and scavenging in anoxic basins are likely different for Mo and U, related isotope signatures in sediments are frequently correlated. These findings may be of interest to those using Mo and U isotopes of sediment archives for paleo-redox reconstructions at local and global scales.

[1] See “Kendall et al. and Andersen et al. (2017) in *Reviews in Mineralogy and Geochemistry* 82” for an overview of previous Mo and U isotope studies of sediments from the Black Sea and Cariaco Basin.