Geochemical Variability of Terrigenous Sediments within the <2-Micron Fraction at IODP Site U1479

Farah Lino[1], Allison Franzese[2,3], Sidney R. Hemming[3], Louise Bolge[4], Amelia Faucher[5]
[1]University of West Florida, [2]Hostos Community College, CUNY, [2]Lamont-Doherty Earth Observatory, Columbia University, [3]Columbia University, [5]Vassar College

Marine sediments are inherently mixtures of materials from different sources. Identifying the sources of terrigenous sediments deposited at a given location (its provenance) can be a useful tool to study paleoclimate, especially paleocirculation. One way to identify the provenance is by matching the geochemistry (especially radiogenic isotopes) of the sediments with that of potential source areas. Early geochemical provenance work on marine sediments used the <63 μm sediment fraction, including silt and clay. Within the silt, physical sorting of sediments by grain size is known to occur. To accurately interpret geochemical data in terms of provenance variability, it is important to know how the geochemistry is related to sediments' grain size. Previous studies on marine sediments and loess deposits have investigated the effects of grain size on isotope ratios of Sr, Nd, and Pb either within the silt, or comparing silt to clay. In large part because of the results of those studies, most recent provenance work focuses on smaller grain size fractions (i.e., <5 μm or <2 μm). No studies have looked at geochemical variations within the <2 μm clay fraction. Furthermore, radiogenic Ar has recently come into use as a provenance tool in marine sediments, and its relationship with grain size is not known. Here we look at geochemical differences between the <63 μm and <2 μm fractions, and also within the <2 μm fraction. We measure isotope ratios of Ar, Sr, Pb, and Nd, plus major and trace element concentrations within the size fractions: <0.2 μm, 0.2-0.5 μm, 0.5-0.8 μm, 0.8-1.4 μm, 1.4-2 μm, bulk <2 μm, and bulk <63 μm. All measurements are made on the lithogenic sediment, excluding biogenic carbonates, authigenic oxides, and marine barite (<63 μm fraction only). We use samples from IODP Site U1479 (35°03.53′S; 17°24.06′E; 2615 mbsl) located just south of Africa. One important source of sediment to Site U1479 is the Agulhas Current, and provenance variability in this region has been used as a proxy for Agulhas Leakage. Initial results show an inverse relationship between $^{87}Sr/^{86}Sr$ and grain size from <63 μm down to <0.2 μm. Radiogenic Ar is positively correlated with clay fraction grain sizes, but this doesn't extend to <63 μm. This paper discusses the relationship of fine fraction grain sizes to isotopic ages and the controls that chemical composition and minerology may have on them.