Goldschmidt 2026 Abstract
https://doi.org/10.46427/gold2026.36246

An experimental approach to the inheritance of εNd in bottom waters and paleoclimatic archives

CASSANDRA BARTELS[1,2], CHANDRANATH BASAK[3], VICTORIA SILVERMAN[1], JUREK BLUSZTAJN[1], LISA HERBERT[4], ANTHONY RATHBURN[5], GRETCHEN SWARR[1] AND SOPHIA HINES[1]

[1]Woods Hole Oceanographic Institution
[2]MIT-WHOI Joint Program in Oceanography and Applied Ocean Sciences and Engineering
[3]Department of Earth Sciences,
[4]Florida State University
[5]California State University, Bakersfield

Deep waters throughout the global ocean retain distinct eNd compositions, which have been attributed to a top-down atmospheric and riverine contribution of Nd from nearby land masses. This difference in composition has been leveraged for paleoclimate applications, utilizing the eNd signature recorded in Fe-Mn-oxyhydroxide coatings on foraminifera to reconstruct water mass mixing proportions over time. However, recent work has suggested a substantial benthic (bottom-up) source of Nd that is independent of the signal obtained via mixing. This questions the original interpretative framework of dissolved eNd in seawater, where bottom sources are absent.

To investigate the presence and quantification (i.e., flux) of a benthic-sourced Nd to bottom waters and sedimentary archives, we performed a shipboard incubation experiment with sediment from the continental slope of Nova Scotia (42’22.99°N, 60’50.39 °W, 3626 m). We collected six multicores, two of which were used to establish the initial porewater REE and Nd isotopes (expressed as eNd) profiles. The remaining four cores were used in our incubation experiment. In short, Mn-oxide coated resin beads (a substitute for a popular substrate, i.e., foraminifera) were added to the sediment-water interface of three incubated cores. The incubated cores were put in a container filled with filtered seawater from the same location. The experimental setup was kept under oxic conditions, ran for over three weeks, and seawater overlying the incubated cores were sampled intermittently.

Overlying incubated seawater, Mn-oxide coated resin beads, porewater, and bulk sediments were sampled at the conclusion of the experiment. All fractions and/or their leachates are being measured for eNd and REE patterns. Preliminary results show eNd in Mn-oxide coated resin beads are in agreement with leached bottom sediments. When compared with bottom water dissolved eNd, resin-derived eNd show an offset greater than 1 e unit. Our observational data suggest that at the sediment-water interface, archives may be influenced by eNd of both sedimentary and seawater-origin. Next, the porewater eNd and REE concentrations will be put in a modeling framework to estimate the effect of sediment-derived REE on bottom water eNd along the flow path of the Deep Western Boundary Current of the Atlantic.