

Statement of Interest for the US GEOTRACES Tahiti-Antarctica-Chile (GP17) Workshop, Old Dominion University, Norfolk, VA, May 6-8, 2020.

Nd Isotopes and REE in the US GEOTRACES Tahiti-Antarctica-Chile Section

Chandranath Basak, Anna Paula Soares Cruz

Department of Earth Sciences, University of Delaware, Newark, DE 19716

In the modern open ocean, neodymium (Nd) isotope values of seawater are often explained by the advective mixing of end member water masses. Thus, Nd isotope ratios measured in sediments can be used to study past changes in deep ocean circulation and water mass mixing. The current interpretation framework takes into consideration two major end members one in the deep North Atlantic and another in deep North Pacific. Copious volume of deep waters form in regions around Antarctica. These deep water masses play important roles in the global deep ocean circulation and biogeochemical cycling of Rare Earth Elements (REEs). However, water masses around Antarctica are not considered as one of the end members in Nd isotope interpretation, mainly due to lack of data to characterize these water masses. Samples collected during GP17 can fill some of this knowledge gap.

Nd isotopes are one of the key parameters and hence is measured in each GEOTRACES expedition. Proposed cruise tracks will cover a vast expanse of south Pacific and off shelf regions close to Antarctica. These regions are ideal and unique for 1) characterizing Nd isotope end-members off Antarctica in the south Pacific sector, 2) capturing fine scale processes in water column REE cycling at the confluence of sea-ice and open ocean, 3) studying the effect of Antarctic shelf and its influence on REE cycling, 4) examining REE cycling in different productivity regimes across the frontal systems and south Pacific, and 5) water mass characterization (with respect to Nd isotopes) across ACC and into the deep south Pacific.

The University of Delaware “Ocean Geochemistry” group is proposing to study dissolved and particulate Nd isotopes and other rare earth elements in samples collected in both sections (i.e., GP17-OCE and GP17-ANT). A detailed study will help us obtain a holistic picture of REE biogeochemical cycling in the Pacific and will be complementary to previous US GEOTRACES sections (e.g., EPZT and PMT). Moreover, dissolved Nd isotope data from the high latitude Southern Ocean in the Pacific is critical to evaluate the integrity of Nd isotopes as a paleo water mass tracer.