

Statement of Interest:***US Arctic GEOTRACES: The distribution and size partitioning of dissolved micronutrient trace metals (Fe, Cu, Cd, Zn, Mn, and Ni)***

Jessica Fitzsimmons (MIT, Rutgers University) jessfitz@mit.edu

Robert Sherrell (Rutgers University) sherrell@marine.rutgers.edu

SCIENTIFIC OBJECTIVES

We plan to submit a proposal to study the full water column distribution of dissolved micronutrient trace metals (Fe, Cu, Cd, Zn, Mn, and Ni) as well as their size partitioning into soluble and colloidal phases in the Western Arctic Ocean as part of the summer 2015 US Arctic GEOTRACES cruise. Dissolved micronutrient trace metals are key parameters identified by the GEOTRACES Science Plan. In collaboration with US and International GEOTRACES partners, we intend to use our measured micronutrient distributions to identify potential sources of trace metals to the basin (Pacific Ocean delivery through the Bering Strait, sea ice, rivers, aerosols, continental shelves, and hydrothermal venting) and to elucidate the processes that influence their distributions (biological utilization, aggregation/scavenging, redox, photochemistry, etc.) in the Western Arctic.

We are further motivated to quantify the size distribution of micronutrient trace metals because the partitioning of metals between soluble and colloidal phases influences metal dissolved/particulate interactions, bioavailability, and residence time. We expect that the various inputs may have unique partitioning patterns, with implications for the ultimate fate and reactivity of these micronutrient metals within the basin. The size partitioning of trace metals has not yet been examined in the Arctic Ocean, and our multi-element analytical method provides a convenient evaluation of the size partitioning of all six metals at once.

LOGISTICS

Filtered (0.2 μ m) samples will be collected using established GEOTRACES protocols for dissolved trace metals at all depths of all stations, and we would further carry out ship-board ultrafiltration (Fitzsimmons and Boyle, in review, L&O: Methods) of samples from all stations to quantify the soluble and colloidal size fractions independently. Samples will be analyzed for their micronutrient metal concentrations at Rutgers University using a modified version of the automated multi-element ICP-MS method developed in Sherrell's lab (Lagerström *et al.* Marine Chemistry, 2013). We anticipate need for one berth for a person dedicated to ultrafiltration, and we may be able to provide a person to assist with the sampling of dissolved trace metal samples in the GEOTRACES van.

ANTICIPATED COLLABORATIONS

We welcome collaborations with any PIs interested in analysis of soluble or colloidal fractions of, for example, metals other than our six analytes, metal isotopes, metal binding ligands, and synchrotron analysis of colloidal metals at all or a subset of stations. We also anticipate close interactions with those measuring other dissolved metals, including ship-board determinations, and with groups measuring particulate pools and end-member sources of our six analytes.