Letter of Intent:

GEOTRACES GP17: The distribution and size partitioning of dissolved micronutrient trace metals (Fe, Cu, Cd, Zn, Mn, and Ni) and anthropogenic Pb

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SCIENTIFIC OBJECTIVES

I plan to submit a proposal to study the full water column distribution of dissolved micronutrient trace metals (Fe, Cu, Cd, Zn, Mn, and Ni) and Pb as well as their size partitioning into soluble and colloidal phases in the Pacific and Southern Oceans as part of both the OCE and ANT legs of the U.S. GEOTRACES GP17 Pacific GEOTRACES cruise. Dissolved micronutrient trace metals are key parameters identified by the GEOTRACES Science Plan. In collaboration with GEOTRACES partners, I intend to use my measured micronutrient distributions to identify potential sources of trace metals to the basin (low dust, upwelling to surface waters, margin transport, meltwater and sedimentary sources from Antarctica, and hydrothermal inputs) and to elucidate the effects that these inputs have on biological activity, which will vary significantly from the lowest productivity South Pacific gyre to the coccolithophore and diatom blooms of the ACC fronts to the most productive Antarctic polynya of the Southern Ocean. My multi-element analytical method provides a convenient evaluation of the concentrations of all seven metals in one sample, and it is a proven and intercalibrated method from the GN01 Arctic and GP15 PMT GEOTRACES cruises.

I intend to further quantify the size partitioning of dissolved trace metals into soluble and colloidal phases, since the partitioning of metals influences dissolved/particulate interactions, bioavailability, and scavenging residence times. Based on prior research, I expect that various external metal fluxes may carry unique partitioning patterns, with implications for the ultimate fate and reactivity of these micronutrient metals within the basin.

ANTICIPATED COLLABORATIONS

I have a history of collaborating broadly across the GEOTRACES network on prior GEOTRACES cruises.

• First, I invite collaborations with any PIs interested in analysis of soluble or colloidal fractions of, for example, metals other than our seven analytes, metal isotopes, metal binding ligands, and synchrotron analysis of colloidal metals at all or a subset of stations. My team has in the past and will continue to provide ultrafiltered samples for these groups at a subset of stations, as a service to U.S. GEOTRACES.

• I also have a track record of active collaborations with other groups during the dissolved metal data intercalibration stages, including groups also funded to measure the same dissolved metals as my group, either shipboard or in the lab; my group led the dissolved metal international intercalibration during GN01 Arctic GEOTRACES.

• Finally, I anticipate close collaborations during the data interpretation and publications stages with groups measuring particulate pools and end-member isotope tracer fluxes of our seven analytes.