U.S. GEOTRACES Eastern Pacific Zonal Transect: Shipboard Al, Mn, and Fe

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Research goals and relevance to cruise objectives: We propose to determine dissolved Al, Mn, and Fe in water-column and surface-water samples using shipboard flow injection analysis. These measurements will be used to test a number of hypotheses concerning the importance of sedimentary inputs, biological production, water-column oxygen depletion, hydrothermal emissions, and atmospheric deposition as sources or sinks for these three key GEOTRACES parameters. The Eastern Pacific Zonal Transect is ideally suited to these research questions, in that the cruise will traverse the highly productive upwelling region off Peru, the associated Eastern Pacific oxygen minimum zone, the major hydrothermal plume that extends west of the East Pacific Rise, and the remote oligotrophic waters on the northern edge of the South Pacific Subtropical Gyre. In terms of contributing to the broader cruise objectives, our measurements will provide semi-real time information on the distributions of these key elements along the cruise track, which may be useful in guiding adaptive sampling during the cruise, particularly in the context of sampling the oxygen minimum zone and the hydrothermal plume (Mn, Fe). Furthermore, our proposed measurements will provide a semi-real time check on potential contamination during the collection and processing of the water-column samples (Al, Fe). For these purposes, we propose to make our preliminary shipboard data immediately available to the cruise scientists. Project PI Resing will be responsible for the dissolved Al and Mn measurements, using the methods of Resing and Measures (1994) and Resing and Mottl (1992), and co-PI Sedwick will be responsible for the Fe measurements using the method of Measures et al. (1995) as modified by Sedwick et al. (2008). In addition to the shipboard analyses, we propose to complete the analysis of dissolved Al, Mn and Fe in our shore-based laboratories, and to determine total-dissolvable Al, Mn and Fe in unfiltered acidified samples, which will provide an estimate of the acid-labile particulate fraction of these elements.

Sample requirements: Ideally we will require two 125mL samples of 0.2 μm-filtered seawater and one 125mL sample of whole seawater from the GEOTRACES clean GO-FLO samplers, as well as selected filtered and unfiltered surface water samples from the towfish sampler.

Berth requirements: Ideally we will require 3 cruise berths to accomplish this work.

Anticipated collaboration and synergies: We anticipate a number of synergistic collaborative linkages with other projects that are likely to be proposed for the cruise, including the shipboard determination of dissolved Fe(II), the electrochemical determination of ligand-bound dissolved iron, the measurement of the isotopic composition of dissolved and particulate Fe, the measurement of particulate Al, Mn, and Fe, the measurement of various elements in aerosols and rainwater, the determination of other nutrient- and scavenged-type trace elements in the water column, and the shore-based determinations of dissolved Al, Mn and Fe using other analytical methods such as inductively-coupled plasma mass spectrometry.

References cited:

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