

Project Summary

Intellectual Merit: The mission of the GEOTRACES Program (www.geotraces.org) is “to identify processes and quantify fluxes that control the distributions of key trace elements and isotopes in the ocean, and to establish the sensitivity of these distributions to changing environmental conditions” (GEOTRACES Science Plan, 2006). This proposal seeks the necessary core funding to implement a zonal transect in the eastern tropical South Pacific (ETSP) from Peru to Tahiti as the second cruise of the US GEOTRACES Program. The section includes a large area characterized by high rates of primary production and particle export in the eastern boundary associated with the Peru Upwelling, a large oxygen minimum zone that is a major global sink for fixed nitrogen, and a large hydrothermal plume arising from the East Pacific Rise. This section was selected as a result of open planning workshops in 2007 and 2008, with a final recommendation made by the US GEOTRACES Steering Committee in 2009. The section is the first part of a two stage plan that will include a meridional section of the Pacific from Tahiti to Alaska as a subsequent expedition. This proposal is to provide the essential support and management structure for acquiring the trace elements and isotopes samples listed as core parameters in the GEOTRACES Science Plan, plus hydrographic and nutrient data needed by participating investigators. The objectives are (1) plan and coordinate a 52 day research cruise; (2) obtain representative samples for a wide variety of TEIs using conventional CTD/rosette and GEOTRACES Sampling Systems (GO Flo bottles on contamination-free carousel, Kevlar conducting cable, etc); (3) acquire “conventional” hydrographic data (CTD, transmissometer, fluorometer, oxygen sensor, etc) along with discrete samples for salinity, dissolved oxygen (to 1 μM detection limits), plant pigments, redox tracers such as ammonium and nitrite, and dissolved nutrients at micro- and nanomolar levels; (4) ensure that proper QA/QC protocols are followed and reported, as well as fulfilling all GEOTRACES Intercalibration protocols; (5) prepare and deliver all hydrographic-type data to the GEOTRACES Data Center (and US data centers); and (6) coordinate all cruise communications between other investigators, including preparation of a hydrographic report/publication.

Broader Impacts: The project is part of an international collaborative program that has forged strong partnerships in the intercalibration and implementation phases that is unprecedented in chemical oceanography. The science product of these collective missions will enhance our ability to understand how to interpret the chemical composition of the ocean, and interpret how climate change will affect ocean chemistry. Partnerships include contributions to the infrastructure of developing nations with overlapping interests in the study area, in this case Peru. There is a strong educational component to the program, with many Ph.D. students carrying out thesis research within the program.