

Intellectual Merit: Trace elements are known to play important roles as nutrients in biological cycling, particularly in regard to enzymatic and catalytic processes in the open ocean. Isotopes are valuable tracers of these and related processes, and of the ocean's interaction with the atmosphere and the solid earth, which in turn play a role in shaping many trace element distributions within the ocean. Nevertheless, significant gaps exist in both our knowledge of the larger scale distributions of these TEIs in the ocean and in our understanding of the processes responsible for those distributions. This shortfall has implications for numerous scientific endeavors that are relevant to a broad range of intellectual and societal issues, including the carbon cycle and climate change, as well as the marine food web and direct anthropogenic impacts on the oceans. Recent advances in sampling and analytical techniques coupled with a better understanding of the roles of TEIs in ocean biogeochemical cycles present us with an opportunity to rectify this problem. Moreover, we are motivated by the prospect of ongoing global change and the need to understand the present and future workings of the ocean's biogeochemical cycles.

We request support for management and logistics associated with the first US GEOTRACES zonal section in the North Atlantic as part of a global survey. We request support to:

1. organize and mount a 52 day research cruise,
2. manage on-board water sampling, including GO-Flo and Niskin bottle operational QA/QC,
3. Obtain, store, and ship back to the U.S. trace-metal clean water samples,
4. monitor trace-metal clean sampling using on-board Zn measurements,
5. acquire, quality control and manage hydrographic data, including:
 - a. CTD, transmissometer, fluorometer, oxygen electrode,
 - b. Discrete sample salinity and dissolved oxygen measurements,
 - c. Micromolar and nanomolar inorganic nutrients,
6. QA/QC shipboard measurements and submit data to the GEOTRACES data repository,
7. prepare a "framework" hydrographic report/synthesis for cruise participants and publication, and
8. coordinate pre- and post-cruise meetings

The cruise track and station locations were designed to highlight key processes and identify the major features of key TEIs distributions.

Broader Impact: It is widely agreed that the ocean biogeochemical research community needs a global picture of the key and ancillary GEOTRACES properties; the major impact of this project will be in its service to that community. This service will enable the development of better ocean biogeochemical models so that we can assess the likely impact of future climate change and anthropogenic pollution, and provide a basis for understanding changes observed in past oceans. The development of a reliable platform and procedures for sampling trace metals and isotopes will provide the community with a platform for future oceanographic fieldwork. The development of teams that understand the proper sampling and measurement techniques, many of whom will be graduate students and postdocs, will supply the community with a pool of skills necessary to achieve the goals of the next generation of ocean research programs.