US GEOTRACES North Atlantic Section: The chemical speciation of dissolved iron and copper.
[At the behest of program managers, this work will focus only on the Fe speciation component with more spatial coverage along the transect.]

Intellectual Merit. Of all the bioactive trace elements, iron (Fe) and copper (Cu) are perhaps the most strongly associated with organic ligands in the marine environment. The existing GEOTRACES program, funded in part by NSF and sponsored by SCOR (Scientific Committee on Oceanic Research), is aimed at quantifying the distributions and biogeochemical cycling of selected trace elements, including Fe and Cu, in the oceans. The 2010 U.S. GEOTRACES Atlantic Section cruise will be the first U.S. contribution to the GEOTRACES Global Survey effort and will survey a range of physical and biogeochemical processes that affect these trace elements in the Atlantic basin.
The work proposed here complements the existing U.S. GEOTRACES effort by characterizing Fe- and Cu-binding organic ligands in depth profiles across the Atlantic section. As both of these elements are typically >99% complexed by strong organic ligands in the marine environment, these ligands are a crucial component of the biogeochemical cycling of Fe and Cu in the oceans.
Specifically, the goals of the proposed work are to 1) characterize bioavailable Cu^{2+} concentrations and the role of strong Cu-binding organic ligands in mediating Cu bioavailability through the water column, 2) determine the distributions of strong Fe-binding organic ligands and the sources of variability in the relationship between strong ligand and dissolved Fe concentrations in the proposed hydrographic regions, 3) inter-compare shipboard and laboratory-based speciation analyses with those of other analysts as well as with published field data, and 4) assess any apparent contributions of aeolian deposition to changes in dissolved Fe- and Cu-binding organic ligand concentrations in surface waters. The results from this proposed study would provide much-needed field data for future modeling endeavors.

Broader Impacts. In a commitment to outreach and education, collaborative projects have been arranged to promote dissemination of results and significance to a diverse audience, including students and educators as well as the international public.
In project year 2, support is requested for an internationally linked education outreach effort between the field-based Bermuda Institute of Ocean Sciences (BIOS) Explorer Program (http://www.bios.edu/education/k_12/bios_explorer.html) and the University of California, Irvine (UCI) Center for Education Partnerships FOCUS project (Faculty Outreach Collaborations Uniting Scientists, Students and the Schools, http://focus.web.uci.edu/fth/uci-teach.php). Linking these two independent projects will facilitate international connections between students and teachers, as well as expand outreach opportunities. A key element to outreach activities will be a partnership with high school teacher leaders to develop lesson plans combining traditional learning with hands-on experiments related to the proposed research. The lesson plans will be made available to teachers in California and Bermuda electronically by the UCI Teacher Professional Development institutes.
To more broadly disseminate project results, a collaboration with Finger Lakes Productions International (FLPI) proposed in project year 3 will produce an audio feature for the "Our Ocean World" ocean literacy campaign (http://www.ouroceanworld.com/2001/oceanworld.htm). The 1.5-minute audio feature will highlight research findings and be distributed internationally to a syndicate of more than 200 public radio stations, podcasts, and mobile phonecasts. The audio file will be heard at least 500,000 times and will become part of a digital archive to serve as an enduring online educational resource.