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To: US GEOTRACES, Pacific Zonal Section

From: ***Rick Murray***, Boston University & ***Brad Moran***, University of Rhode Island

Re: Dissolved Ti in Seawater, Letter of Intent, February 15, 2012 NSF GEOTRACES

We anticipate submitting a proposal for the February 15, 2012 deadline to participate in the Pacific GEOTRACES section. Our research addresses the processes controlling the distribution of dissolved Ti in seawater. Despite Ti's importance as a biogeochemical and paleogeochemical tracer, there are only a few open ocean profiles that provide high precision ICP-MS data (Orians, Boyle, and Bruland in the early 1990's). S. Skrabal has used a CSV technique to assess Ti removal along continental margin boundaries. Peter Croot in Europe has developed a new CSV technique and is starting to generate some open ocean profiles. To our knowledge, we are the only group developing a high-precision ICP-MS technique.

Our team is currently funded through EAGER Chemical Oceanography to develop the new ICP-MS methodology. We are working with the PA-1 resin (Sohrin et al, 2008) for preconcentration, followed by ID-ICP-MS. This work is being performed in Moran's clean lab at URI, and has benefitted from input and training provided by Bruland and Boyle. We are in the process of making our first Ti measurements on samples graciously collected by Boyle and colleagues on the GEOTRACES Atlantic transect. We are first working with GEOTRACES reference standards (SAFe, etc.) Thus, our progress remains on track for participation in the upcoming Pacific field study.

Because of the paucity of data on Ti, virtually anything we learn about Ti's distribution in any open ocean environment will represent a major step forward. In the paleogeochemical realm, Ti is used as a provenance indicator and to help assess abundances of terrigenous material in mixed component particle assemblages. Some work, also from Murray's group, suggests an association of Ti with organic matter in open ocean sediments with << 1% terrigenous matter. It's highly reactive behavior further suggests that it alone could prove to be a useful tracer of particle flux. Furthermore, the few open ocean profiles that exist indicate a considerable enrichment in dissolved Ti from surface (several pM) to deep water (250+ pM). These limited data point to Ti's reactivity in the upper water column and, perhaps, an unknown deep enrichment process. In addition to improving our understanding of the geochemical behavior of Ti, our participation in GEOTRACES is likely to provide important constraints on the behavior of other particle reactive TEI's.

Our work aligns well with GEOTRACES' goals for the Pacific zonal section. We anticipate studying both high-resolution upper ocean processes and deeper water-column processes. Targeting the upwelling regime would enable us to study the boundary environment characterized by high nutrient/productivity and high particle flux. The EPR hydrothermal plume

region is a terrific natural system to study uptake and release mechanisms in metalliferous environments. Studying processes in/out of the OMZ should shed light on particle regeneration and variability in supply.

Sample Requirements: 250 ml acidified seawater per bottle. All stations, all depths.

Berth Requirements: None.

Collaborations / Synergies: All particle reactive species of TEIs (Al, Pa/Th, other U-series, etc.). Particle chemistry (Ti, Al, Th-series, etc).