Statement of Interest for the US GEOTRACES GP17 Sections
REEs/Nd isotopes/Si isotopes

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I express my interest in analyzing dissolved REE concentrations, Nd isotopes, and Si isotopes on samples from US GEOTRACES GP17 sections. In addition, if available, I am also interested in analyzing those parameters on a selection of particulate samples.

As lithogenic and scavenged-type elements, Nd isotopes and REE "patterns" are powerful tracers for a range of abiotic processes, including metal input, watermass mixing, scavenging, and redox. In contrast, Si is a typical nutrient-type element, and stable Si isotopes have proven extremely useful in studying the marine Si cycle, and its connection to other macro- and micro-nutrient cycles. These parameters are not new for GEOTRACES cruises; Nd isotopes are one of the GEOTRACES "key" parameters, and REEs are "essential" parameters, and Si isotopes are often categorized as "parameters of interest". However, efforts intended to compare and contrast REE/Nd isotope and Si isotope cycles are rare. Such an effort can be potentially rewarding in offering new perspectives on the cycling of these elements and isotopes, because (1) REEs/Nd isotopes can provide unique constraints on abiotic processes that cause Si isotope fractionation; (2) hypotheses speculate a coupled REE-Si cycle in the ocean, particularly in the deep Pacific.

The goals of the proposed analyses are twofold: (a) addressing questions related to cycling of REEs/Nd isotopes and Si, respectively; (b) testing hypotheses for a coupled REE-Si cycle in the Pacific Ocean. Some of my major scientific objectives include:

(1) Quantifying Nd isotope, REE, and Si isotope characteristics in major water masses in the south Pacific and the Pacific sector of the Southern Ocean. These areas are known to play a key role in regulating global biogeochemical cycles, but are under-studied for all parameters proposed here. Measurements for the two GP17 cruises would not only elucidate regional processes that control distributions of these elements and isotopes, but also provide key values that are needed to model cycling of these elements/isotopes on the basinal to global scales.

(2) Investigating controls on Ce in seawater. Ce anomaly is a commonly used paleo-redox proxy, but its controls in the modern ocean are not well understood. High resolution REE measurements of seawater, supplemented by measurements of particulates, across the major oxygen gradient along the GP-17-OCE line would provide a critical dataset for an in-depth exploration on various controls (e.g., oxidation by O_2 *vs.* oxidative scavenging by Mn oxides) on seawater Ce anomaly.

(3) Testify whether or not REE cycle is coupled to Si cycle. Good correlation between dissolved Si and REEs has been observed in some areas of the Southern Ocean, and has been proposed to result from REE-silicic acid complexation in seawater and interactions of these aqueous species with particles, particularly diatoms. GP-17-OCE and GP-17-ANT are sampling areas well suited to test these hypotheses. It is important to note that analysis of Si isotopes may provide unique information that is not readily available from REE/Nd isotope and Si concentration data alone, because of possible distinct Si isotope fractionation induced by REE-Si complexation and incorporation in diatoms.

I realize that several groups are interested in REEs/Nd isotopes, and one other lab is interested in Si isotopes. I am willing to coordinate with these groups on developing

collaborative proposals, if possible. I have been in contact with some of these groups, but participating in the workshop will be a good venue to meet relevant individuals directly to finalize the format of collaboration. This is particularly useful for me, because I am new to the US GEOTRACES community, although I used to involve in UK GEOTRACES research. I am also a new PI building a new isotope geochemistry group at University of Minnesota-Twin Cities. Analytical facilities available in my group include a new MC-ICP-MS, a new femtosecond laser ablation system, a TIMS machine, and a world-class Class-100 clean lab capable of processing seawater samples for trace element analysis. A quad-ICP-MS is also available in the department as a shared facility. My group is focused on isotope geochemistry as applied to modern and past marine processes. With all these new analytical facilities, I hope my participation in US GEOTRACES would help expand research capacity in ocean sciences at Minnesota. I sincerely hope you can consider my request for support to attend the workshop in May.

Sincerely Yours,

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