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Collaborative Proposal: GEOTRACES Pacific Section: Particulate trace element concentrations

Phoebe Lam and Chris German plan to submit a collaborative proposal to the Feb 15 2012 NSF OCE panel to process, analyze, and interpret particulate trace element distributions collected from the US Geotraces Pacific Section. Particles are a key parameter in the Science Plan, as they play a central role in the cycling of so many TEIs. The US GT Pacific section in particular will cross several regimes in which the nature of particles is completely different (coastal upwelling off Peru vs. hydrothermal plumes from the East Pacific Rise) and thus leads to different roles in affecting the cycling of dissolved TEIs.

Our preference is to analyze subsamples collected via in-situ filtration as opposed to particles filtered through the GO-Flos, as this gives us the most flexibility for analysis: in-situ samples would allow the analysis of size-fractionated particulate TEIs (“sinking” and “suspended” size classes), total and acid-labile fractions of TEIs, as well as the analysis of major carrier phases such as CaCO₃, biogenic Si, and POC. As with the US Atlantic Geotraces section, we will work with other investigators that require samples from in-situ filtration (eg. the short and long-lived radioisotopes) to ensure that trace-metal clean particulate samples can be collected simultaneously with samples requiring metal-coated cartridges.

We will analyze all key trace elements listed in Table 2 of the Science Plan, and selected other trace elements of interest (eg. Co, Ti, Ba.). We will use the same protocols that the Lam lab has optimized for samples from the US Atlantic Geotraces section: major carrier phases will be analyzed by standard protocols; trace elements will be analyzed by high-resolution inductively coupled plasma mass spectrometry (ICP-MS). Samples will be analyzed by ICP-MS for total and acid-leachable concentrations. The acid-labile fraction will be used to compare the degree of scavenging of various key TEIs onto particles between the high productivity coast, the oxygen minimum zone off Peru, and the hydrothermal plume.

Lead PI Lam will be responsible for the at-sea processing of particulate samples and the laboratory analysis of these samples. Both PIs will collaborate on the interpretation of the particulate data, with Lam taking the lead on the cycling of particulate TEIs in the upwelling, oligotrophic, and oxygen minimum zones, and German taking the lead on the cycling of particles influenced by hydrothermal processes.

Assuming that samples for particulate TEIs will come from in-situ filtration samples, we expect that we will require 1-2 dedicated berths for on-board processing of particulate

samples. We will also take responsibility for providing particulate samples to other interested investigators such as for radiogenic isotopes (eg. ^{230}Th , ^{231}Pa , Nd isotopes, ^{234}Th ...).