

US GEOTRACES Alaska-Tahiti Letter of Intent

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Dissolved Cobalt, Cobalt Speciation, and Metalloenzymes

We plan to propose the measurement of dissolved cobalt and cobalt speciation on the GP15 Pacific GEOTRACES section. Cobalt has the smallest oceanic inventory of biologically used metals, and hence is one of the scarcest of inorganic micronutrients required by phytoplankton. As a result of this low abundance, cobalt could have potential influences on phytoplankton community composition and primary productivity. Moreover, cobalt has a complex geochemistry being strongly influenced by both biological, scavenging, and redox processes. The prior zonal sections have observed large cobalt fluxes from oxygen minimum zones that permeate well into each basin. We hypothesize that the meridional GP15 section should observe a diverse distribution of cobalt and speciation due to intersection with the eastern tropical north Pacific as well as the subarctic ocean. While not a key parameter, full ocean sections of dissolved cobalt and cobalt speciation have been measured on all three of the prior US GEOTRACES expeditions as well as a number of international and compliant GEOTRACES expeditions. Moreover, dissolved cobalt was recently approved for inclusion in the 2017 IDP by the Intercalibration Committee. We also propose to collect and analyze samples for metalloenzyme proteomic analysis on particles from the GEOTRACES expedition. In recent years our laboratory has developed a novel biochemical mass spectrometry method called “targeted metaproteomics” capable of measuring metalloenzymes and other proteins directly in seawater for the first time. The distribution of metalloenzymes should be highly synergistic with other bioactive metal parameters (both dissolved and particulate metal distributions), and could promote novel biogeochemical interpretations from this GEOTRACES section.