

*US GEOTRACES Arctic Ocean Expedition 2015: Cadmium/phosphate relationships in Arctic water masses*

US GEOTRACES 2015 Arctic Cruise Statement of Interest

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In addition to being part of the management team (Kadko, Landing, and Cutter) and coordinating TEI sampling using the US GEOTRACES Sampling System, I have two GEOTRACES-relevant science interests that could be ideally addressed on this cruise. The first is a paleoproxy calibration issue. We have an existing, but uncalibrated record of Cd/Ca in the benthic foraminifera *Islandia norcrossi* from a station on the Chukchi shelf over the Holocene. To trace the inputs of nutrient-rich Pacific water through the Bering Strait, we need to establish the Cd/phosphate relationship in the various water masses of the Arctic Ocean and its source waters. Although it doesn't have to be done on this cruise, these results could be coupled with core top analyses of Cd/Ca in benthic and pelagic forams as an empirical calibration.

The second scientific issue I'd like to examine on this cruise is the atmospheric deposition of the metalloid elements selenium and arsenic to surface waters and sea ice of the Arctic Ocean, and the resultant effects on their biogeochemical cycles. We have shown that Asian coal combustion increases the concentration and deposition of selenium and silver to the subarctic Pacific Ocean (Ranville et al., 2010), and it is likely for other metalloids and mercury that are similarly enriched in coal. The deposition of these potentially toxic elements can affect the ecosystem health of the Arctic, particularly since air mass trajectories demonstrate that the Arctic Ocean is "downwind" of Asia. Furthermore, the enrichment of selenium in coal vs. other fossil fuels makes this element a good tracer for such emission sources. Selenium and arsenic have not been studied in the Arctic Ocean, and a pan-Arctic transect could provide a unique opportunity to examine the cycling of these elements where atmospheric deposition is the dominant input due to low metalloid concentrations in Arctic rivers.