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US GEOTRACES Arctic Transect: the geochemistry of size-fractionated suspended particles collected by in-situ filtration—the role of particles in TEI cycling in the Arctic Basin

I plan to submit a proposal to the Feb 15, 2014 NSF OCE panel to collect size-fractionated (<51 μ m, >51 μ m) suspended particles by in-situ filtration and determine their geochemical composition. Recent papers have demonstrated that the Arctic is characterized by an unusually weak biological pump, and that a significant proportion of the particulate organic carbon (POC) in the Arctic interior appears to be derived from lateral transport from the margins. Particulate TEIs are no doubt similarly affected. I am interested in how this horizontal particle transport may affect TEI cycling differently than the typical vertical particle transport encountered in other ocean basins.

- 1) Research goals and relevance to the overall objectives of the section
 - a. to collect **size-fractionated suspended particles** by dual flow in-situ filtration
 - i. 51 μ m polyester prefilter followed by paired quartz fiber (QMA) filters (~1000L through 142mm filters)
 - ii. 51 μ m polyester prefilter followed by paired 0.8 μ m polyethersulfone (Supor) filters (~500L through 142mm filters)
 - b. to determine the **major particle phases** (POC, CaCO₃, opal, lithogenics) and chemical dry weight of size-fractionated particles across the section
 - c. to determine the **total concentrations** of key (Fe, Al, Zn, Mn, Cd, Cu) and other trace and interesting elements (Co, Ni, Ti, Ba, P) in size-fractionated particles across the section
 - d. to distribute subsamples of particles to other PIs interested in making measurements of particulate TEIs
- 2) Sample requirements: I will require subsamples from the Supor filters for biogenic silica and particulate trace metals (including lithogenic material), from the QMA filters for POC and PIC, and from the >51 μ m prefilters for all components. There will be plenty leftover for distribution to other PIs.
- 3) Berth requirements

As on the US NAGZT and EPZT, the management and operation of the McLane in-situ pumps will be part of the short-lived Ra and Th isotopes proposal submitted by Matt Charette, Ken Buesseler, and Billy Moore, and my group will be responsible for everything to do with the particle collection aspect of in-situ pumping. This includes the preparation and cleaning of filter holders and filters, the on-board processing of in-situ pump particles samples, and the coordination and distribution of particle subsamples to funded investigators. We request 1-2 berths from this proposal to help with general on-board processing, subsampling of in-situ pump particle samples, and overall deployment, recovery, and maintenance of in-situ pumps on board. The short-lived Ra and Th isotope group will be requesting 3 berths for their work and for on-board in-situ pump management, for a total of 4-5 people in the overall pumping group.