

Sampling and analysis of Al, Mn, Fe, Cu, Zn, Cd, Hg and Pb in sea ice and snow

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Scientific Objectives:

- 1) Sea ice is heterogeneous by nature, and the first step in evaluating the role of sea ice in TEI cycling in the Arctic is to quantify the size partitioning and concentration ranges of TEIs within sea ice and the snow layer above. Trace-metal-clean sampling of sea ice and snow will allow us to determine these parameters.
- 2) The formation/melting cycle of sea ice and its seasonal trajectory likely affects the distribution, size partitioning, and chemical speciation of TEIs in the Arctic Ocean. In collaboration with other investigators we will study the influence of sea ice on the cycling of TEIs in the Arctic Ocean. We will
 - a) Collect ice cores and snow samples to distribute to PIs interested in making TEI measurements. (Limited to storage space and available corer inserts)
 - b) Distribute melted sea ice subsamples to PIs interested in organic speciation of TEIs
 - c) Coordinate with the water sampling teams to provide subsamples of seawater under the ice for interested PIs
 - d) Collaborate with analysts on board to test initially for potential contamination issues during collection of water under the ice
- 3) Auxiliary parameters such as ice thickness, ice temperature and salinity profiles, snow thickness, snow temperature, brine composition will be measured to aid in trace metal interpretation

Our proposed work will provide trace metal information from Arctic pack ice, and will benefit from the concomitant high resolution water column work. We will also provide samples to the community

Sampling Requirements:

Sea ice samples will be collected with custom-made TM-clean ice corer. A newly designed plastic/titanium corer is currently undergoing testing. We will require at least 10 cores per station, and will be able to collect about 12-15 more cores per station for interested PIs. Under the ice profiles (down to 2-3 m) will be collected with a Teflon pump and Teflon tubing. Snow samples will be collected as previously done in the Bering and Beaufort Seas (Aguilar-Islas et al., 2008) (Rember and Trefry, 2004).

Berths and Logistics:

Two berths minimum will be requested for the collection and processing of sea ice, snow, and water under ice samples. Cruise work includes sample collection (ice, snow, water), *in situ* auxiliary measurements, on-board processing (melting, filtering, subsampling), coordinating with water sampling teams.

We will require

- a) Onboard temperature controlled lab
- b) Sea ice survey and polar bear look out support
- c) Access to ice floes
Zodiac and/or helicopter transportation (optional if adequate access to ice from ship)

References:

Aguilar-Islas A.M., R. Rember, C. Mordy, and J. Wu. 2008. Sea ice-derived dissolved iron and its potential influence on the spring algal bloom in the Bering Sea. *Geophysical Research Letters*, 35, doi:10.1029/2008GL035736.

Rember R.D., J. H. Trefry. 2004 Increased concentrations of dissolved trace metals and organic carbon during snowmelt in rivers of the Alaskan Arctic. *Geochimica et Cosmochimica Acta*, 68, doi:10.1016/S0016-7037(03)00458-7