NSF OCE-1434085: GEOTRACES Arctic Section: Determining the Pathways, Fate, and Flux of Atmospherically Derived Trace Elements in the Ocean/Ice system.
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Many processes in the ocean cannot be directly observed and as such, tracers are used to provide important constraints on their rates and pathways. Be-7 is a tracer that, because of its mode of input, allows evaluation of mixing processes applicable to trace elements and isotopes (TEIs) in the upper ocean, evaluation of the partitioning of atmospherically-derived TEIs between the different Arctic catchments, and can provide estimates of the flux of TEIs into the Arctic water-ice system. This work addresses key tasks formulated within the GEOTRACES Science and Arctic Implementation Plans: 1) ***Provide realistic estimates of the underlying transport processes influencing measured TEI distributions***. Water column measurements of ^{7}Be will be used as a tracer of physical mixing processes, which redistribute biologically active species in the upper water column. Given quantitative knowledge of the circulation, mixing and ventilation of the water masses within which TEIs reside allows an assessment of the time- and space-integrated *in situ* biogeochemical behavior of these elements. 2) **Trace the partitioning of atmospherically deposited elements within the Arctic catchments:** The Arctic is unique to other GEOTRACES basins studied to date. For numerous TEIs, measurement not only in the water column, but also in the additional repositories of ice, snow and melt ponds are critical. The inventory of ^{7}Be within these catchments will be used to trace the partitioning of atmospherically deposited elements within the Arctic ocean/ice system. 3) ***Improve methods for quantifying the atmospheric deposition of TEIs:*** We propose to use measurements of ^{7}Be in the surface waters and in the lower atmosphere to develop estimates of the atmospheric input of relevant TEIs. In the Arctic, aerosol deposition is an important pathway for delivering trace element species, but assessment of this input has heretofore proven to be difficult.