

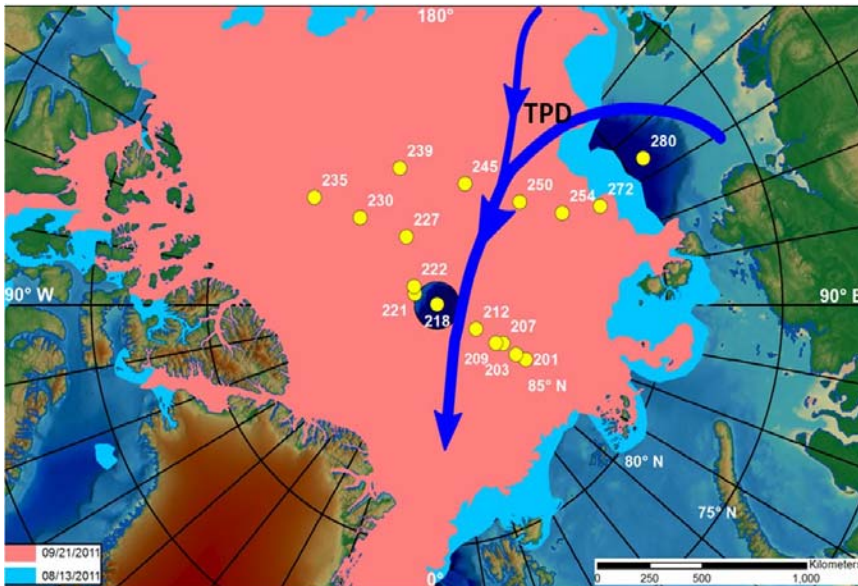
NSF PLR-1460290: Collaborative Research: Sample Analysis to Test a Novel Method of Determining Atmospheric Deposition of Trace Elements to the Ocean/Ice System of the Arctic

Award Amount: \$112,531.

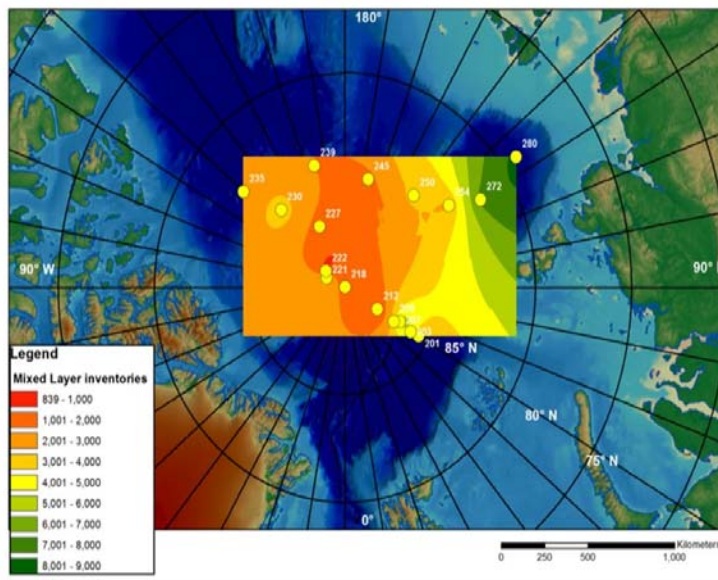
Award Time Period: 09/01/2012 - 08/31/2015

The atmospheric input of numerous chemical species into the global ocean equals or exceeds that from river sources. In the Arctic, existing data show that atmospheric deposition of contaminant elements like Hg, Pb, and perhaps Se may be a major source of

these elements, with likely sources being anthropogenic – industrial or power plant emissions associated with fossil fuel combustion in Europe, Russia, and Asia. This input has strong implications for the ecosystem, and even human health.



NIC Ice extent maps (pink, 9/21; blue, 8/13) overlaid onto station locations (yellow dots, with station number indicated) during the ARK-XXVI/3 campaign of the RV Polarstern. Blue lines indicate the generalized Trans Polar Drift transport (Galfond et al, in prep).



Contours of mixed layer ⁷Be inventory (dpm/m²). Even under the N. Pole, ⁷Be is found! The hypothesis is that mixed layer gradients of atmospherically derived TEIs (high in open water, low under the ice) drives transport of these species under the ice. These gradients are highest at the ice edge.

Assessment of this input is difficult, particularly in the Arctic, because measurements of deposition rates are rare and difficult to execute with accuracy. In remote areas such as the Arctic, we simply cannot “be there” to sample flux in a routine manner. Furthermore the

Arctic is complicated by the existence of different catchments (snow/ice and water) that partition the atmospheric input such that elements will have circuitous paths to the oceanic ecosystem. In a novel application, this work uses measurements of naturally-occurring ^7Be in the surface waters, ice and lower atmosphere, coupled with trace element measurements in aerosols, to provide estimates of the atmospheric input of relevant trace elements into the Arctic ice-ocean system. The PI participated in the 2011 RV Polarstern's ARK-XXVI/3 campaign to the Arctic during August 13, 2011 to September 21, 2011. The PI collected, water, melt-pond, snow, ice and aerosol samples from the entire polar transect. A graduate student, Ben Galfond, was trained in this data collection.