

**Letter of Intent for the US Arctic Geotraces Cruise**

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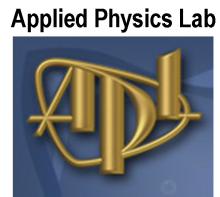
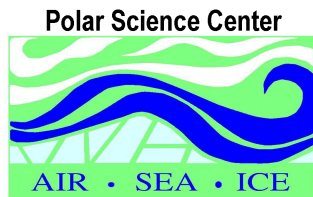
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Arctic sea ice is retreating in recent years, especially in the summer. This retreat has been linked to warming of the surface waters, heat that in some instances can survive through the following winter. This represents a positive feedback that acts to enhance sea ice loss. What are the sources of this upper ocean heating? The answer is not clear at this time. There are three main potential sources: (i) local heating from solar radiation, (ii) advection from warm waters on various arctic shelves, and (iii) transport of warm summer Pacific Water from Bering Strait and the Chukchi Sea. A vertical temperature profile taken through the upper 200 m of the Canadian Basin in the Arctic Ocean reveals an increasingly complex series of warm and cold layers, the origins of which can be quite difficult to understand if we only use physical tracers (temperature, salinity, potential vorticity) or even standard chemical tracers such as nutrients or dissolved oxygen.

Our proposed project would take advantage of the unprecedented opportunity represented by the Arctic Geotraces program to better understand the sources, structure, and fate of warm layers of the upper Arctic Ocean. Our main activities would be:

- (1) Purchase and deployment during the US cruise of several dozen additional xCTDs beyond those budgeted for the core program, in order to better sample the highly variable upper ocean structure.
- (2) Analysis of physical and chemical observations from the US and other Arctic Geotraces cruises, with a focus on tracing the origins of warm and cool layers back to the local surface, to shelves, or to inflowing Pacific Water.
- (3) Analysis of coupled sea ice – ocean model simulations, to do further origins analysis as in (2), but also to examine how such origins have been varying interannually with differing atmospheric and lateral boundary forcings.

We view this project as one way to tie together a number of different Geotraces projects, with the goal of better understanding upper ocean circulation and the fate of heat and sea ice in a warming arctic. We would hope for and seek out strong collaborations with any projects focused on tracing shelf or Pacific Waters, and with those that can sample ocean surface exchange. EG:



- B. Haley (*OSU*): Nd circulation tracer
- C. Buck, W. Landing, & D. Kadko (*Skidaway, FSU, Miami*):  $^7\text{Be}$  & other ocean surface exchange tracers
- J. Swift (*UCSD*): General hydrography
- J. Christensen (*Bigelow*):  $\text{N}_2\text{O}$  Chukchi Shelf tracer
- M. Baskaran & G. Stewart (*Wayne St. U, Queens College*):  $^{210}\text{Po}$  &  $^{210}\text{Pb}$  Pacific & surface flux tracers

We would not require any berths on the cruise, although we would plan to attend all meetings in order to foster collaboration.