US ARCTIC GEOTRACES

GEOTRACES – international, global effort to conduct multidisciplinary studies of processes affecting marine biogeochemical cycling;

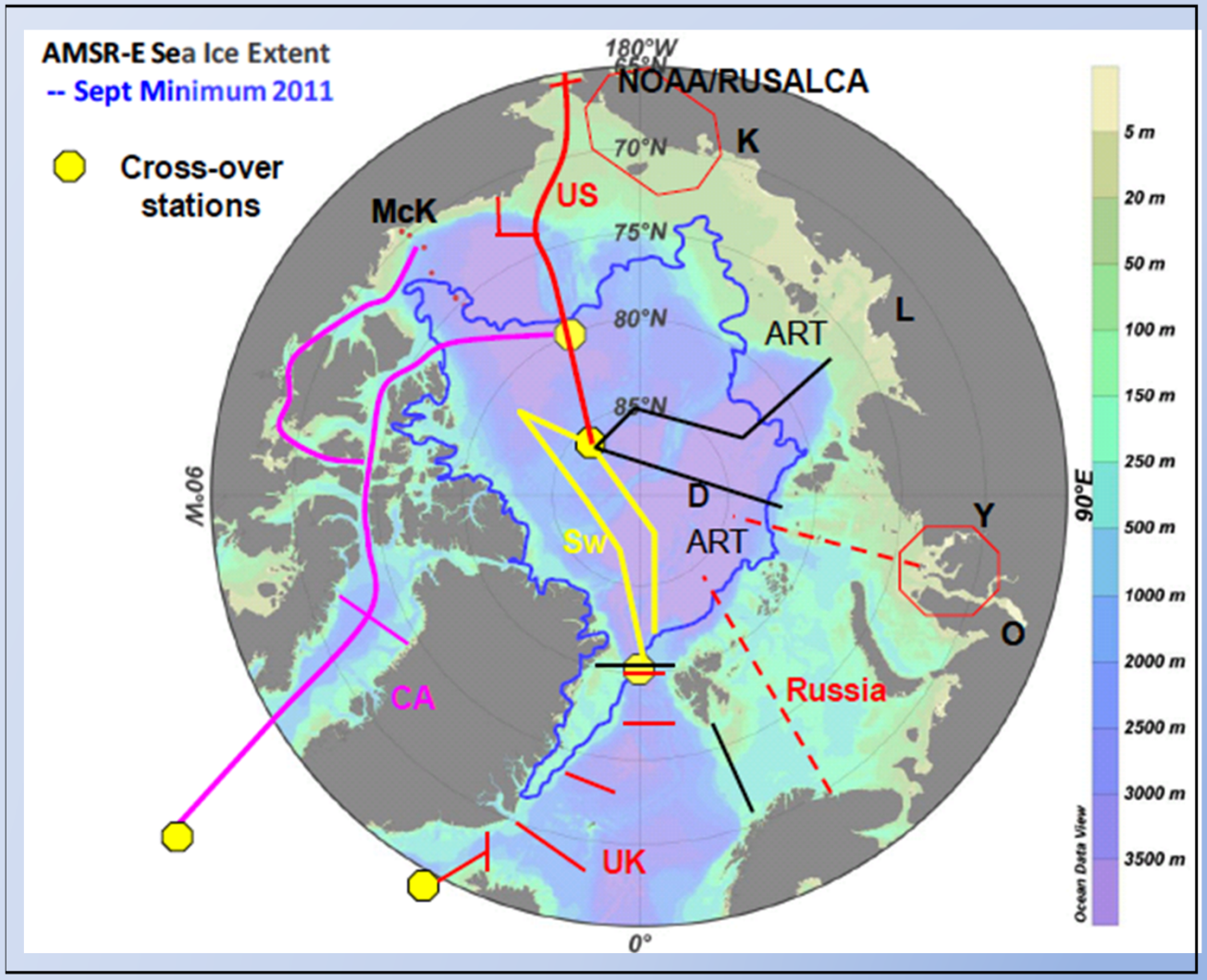
Emphasis on key trace elements and isotopes (TEIs), and their *sensitivity to changing environmental conditions*.

- **Extremely relevant to the Arctic, where *rapid climate change* and *accompanying biogeochemical responses* are occurring.**

<u>Overarching Scientific Goals</u>:

- **Understand current biogeochemical processes**
- **Establish baselines**
- **Provide insights into the Arctic's future**

2015 International Arctic GEOTRACES program designed at the Vancouver workshop (May 2012).



This project (multi-national, multi-icebreaker field effort) will be of historic significance; it is unprecedented in regional scope and scientific breadth and will provide a comprehensive, pan-Arctic geochemical data set.

US Arctic GEOTRACES Status

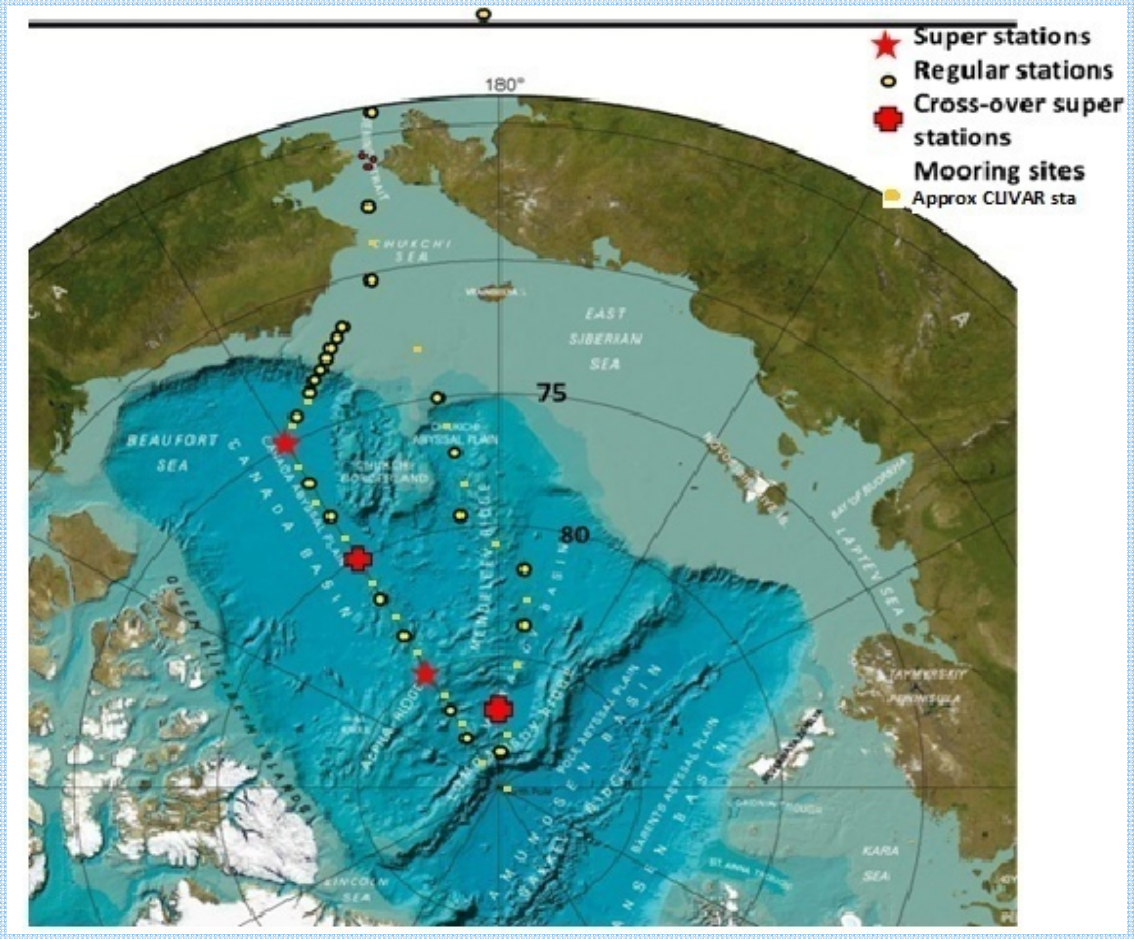
US expedition (Management Proposal) funded in 2014.

- **~24 science proposals funded ~ 43 PIs.**
- **CLIVAR "piggy-back" participation**

  ~ 24 additional stations, 5 days

- **Ship is "full-up": 51 science berths accounted for**

US Arctic GEOTRACES



The cruise track was chosen to achieve the science goals of the US Arctic GEOTRACES program:

1) **the chemical evolution of surface waters introduced through the Bering Strait, and of deep waters as they mix from the Atlantic into the Canada Basin;**
2) **sediment-water exchange within the continental shelves; shelf-basin exchange**
3) **atmospheric deposition to the ice/ocean system**
4) **transport of TEIs by sea ice.**

US Arctic GEOTRACES Status (cont)

Suggested cruise dates of Aug 7- Oct 10(12), 2015. The northernmost turn-around would be Sept 15, at the time of approximate sea-ice minimum.

We all realize that ice-conditions would ultimately dictate the final disposition of this plan.

Issues:

- **There will be sufficient vans and space (Hiller and Cutter). The helo-hanger provides some back-up.**

- **Loading and set up in Seattle is highly desirable.**

- **Concurrent sea-ice ops and ship ops critical**

- **Surface water sampling to be worked out.**

US Arctic GEOTRACES Status (cont)

Ongoing:

- Sea-ice work logistics.:

Subcontracted APL (UW) through Polarfield-CH2M. This in turn supported by NSF Arctic Research Support and Logistics (RSL) Program. A budget and requirements have been in existence for some time - Kadko visited APL this summer.

- Outreach:

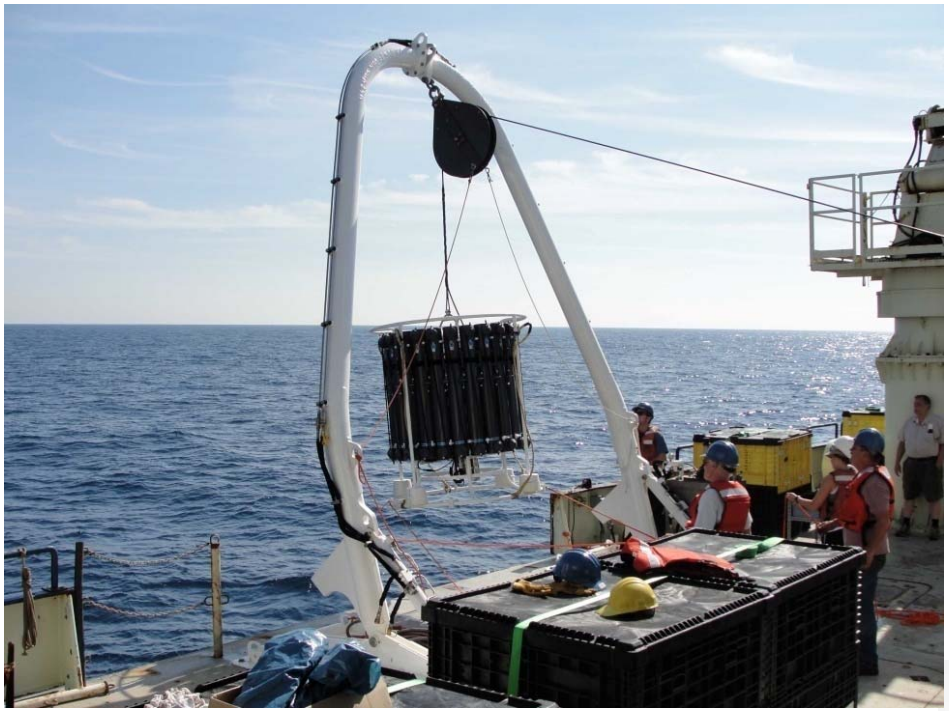
Landing and Kadko will undertake the outreach efforts including lectures (Barrow, Nome? Anchorage?), Polar-Trec, "Drift arrow outreach project", and other tasks.

Coming up:

- RUSALCA (Chris Measures)
- Coordinate with International partners (e.g. intercalibration efforts (Cutter), cross-over stations, student exchange)
- PI meeting, early in 2015. Scott Hiller, Dave Forcucci, and coast guard ops would attend to discuss safety, clothing that would be provided, ship and sea-ice operations, etc. At that time tweaks to the track and sampling needs and protocols, and roster will be addressed. There are sampling issues not encountered on previous GEOTRACES cruises (e.g., can't get surface towed fish samples - alternative sampling scenarios? & Sediment sampling that will not compromise clean sampling operations).

US GEOTRACES Clean Sampling System

- Seabird Trace Element-clean Carousel with (24) 12 L GO-FLO bottles, capable of firing up to 3 at once, Ti housings on CTD and sensors (T, S, O_2, fluor, trans); back up sensors and 50 GO-FLOs
- Dynacon winch with 7800 m of 14 mm Kevlar conducting cable (+ 20’ flat rack container)
- Clean lab van/container (UNOLS-compliant 20’)
- Portable A-frame (+ 20’ flat rack container)
- Boom, etc. for towing underway, clean “fish”

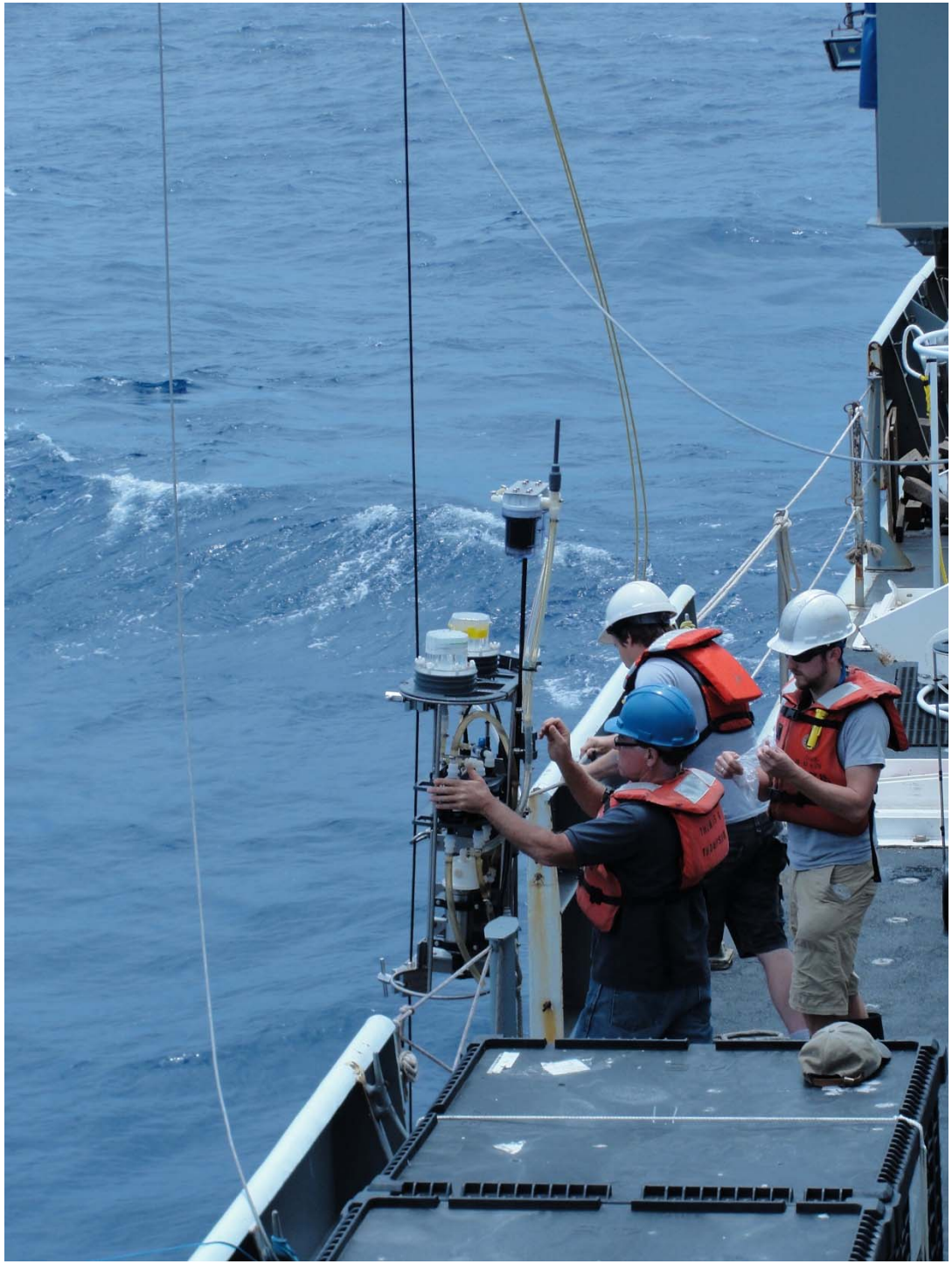


TE clean Carousel

Dynacon winch

In situ pumping system

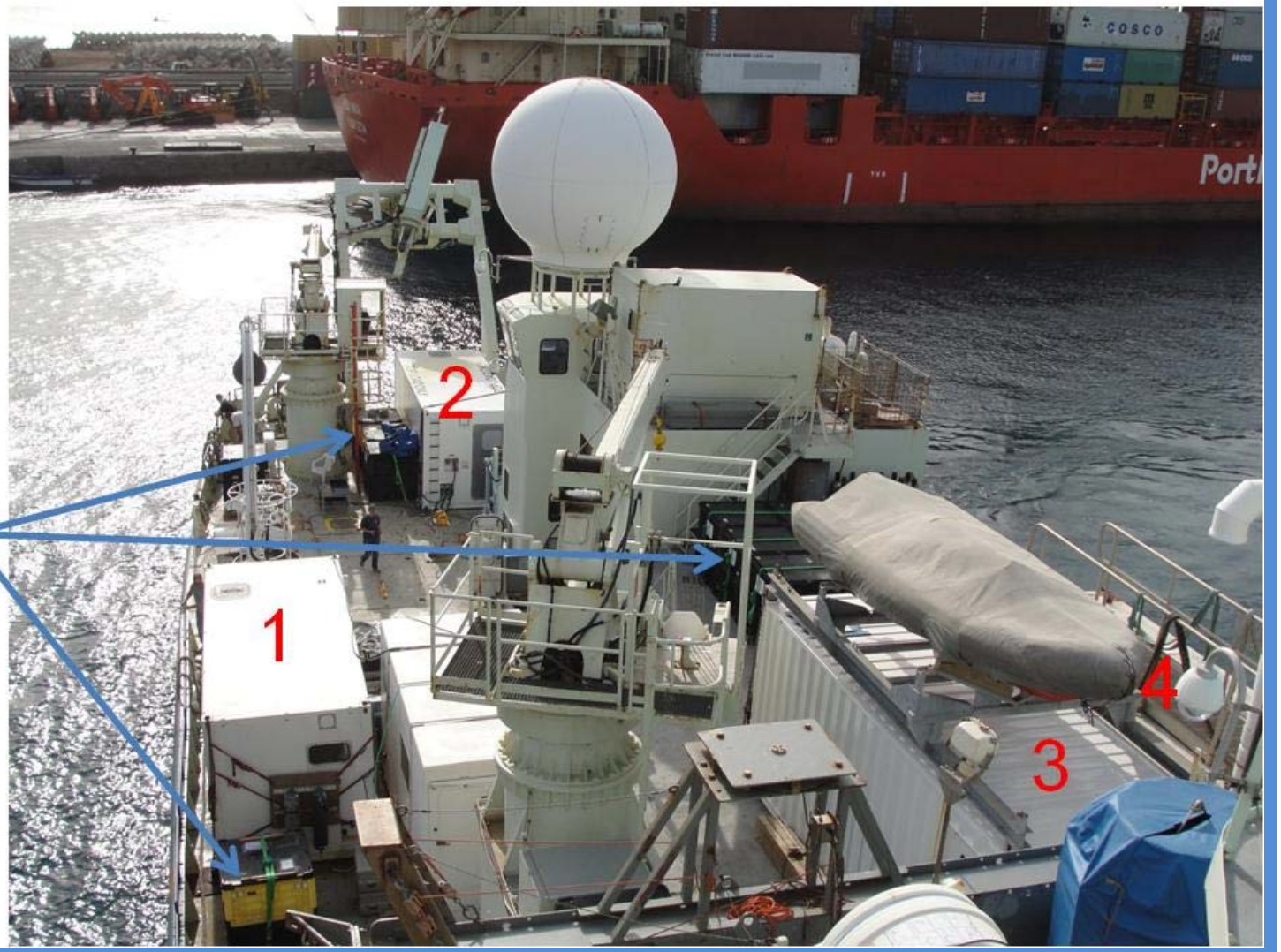
Up to 8 modified McLane pumps deployed on .322 jacketed Vectran cable spooled onto ship's hydro winch; deployment time up to 8 hours for collecting large volume particulate radionuclide and trace element samples



Aerosol and Rainfall samplers, R/V Knorr

Four lab vans: (1) GEOTRACES, (2) Hg, (3) Café-Th, (4) UH Analytical

Up to 70 pallet boxes for samples, but must be in hold or hangar

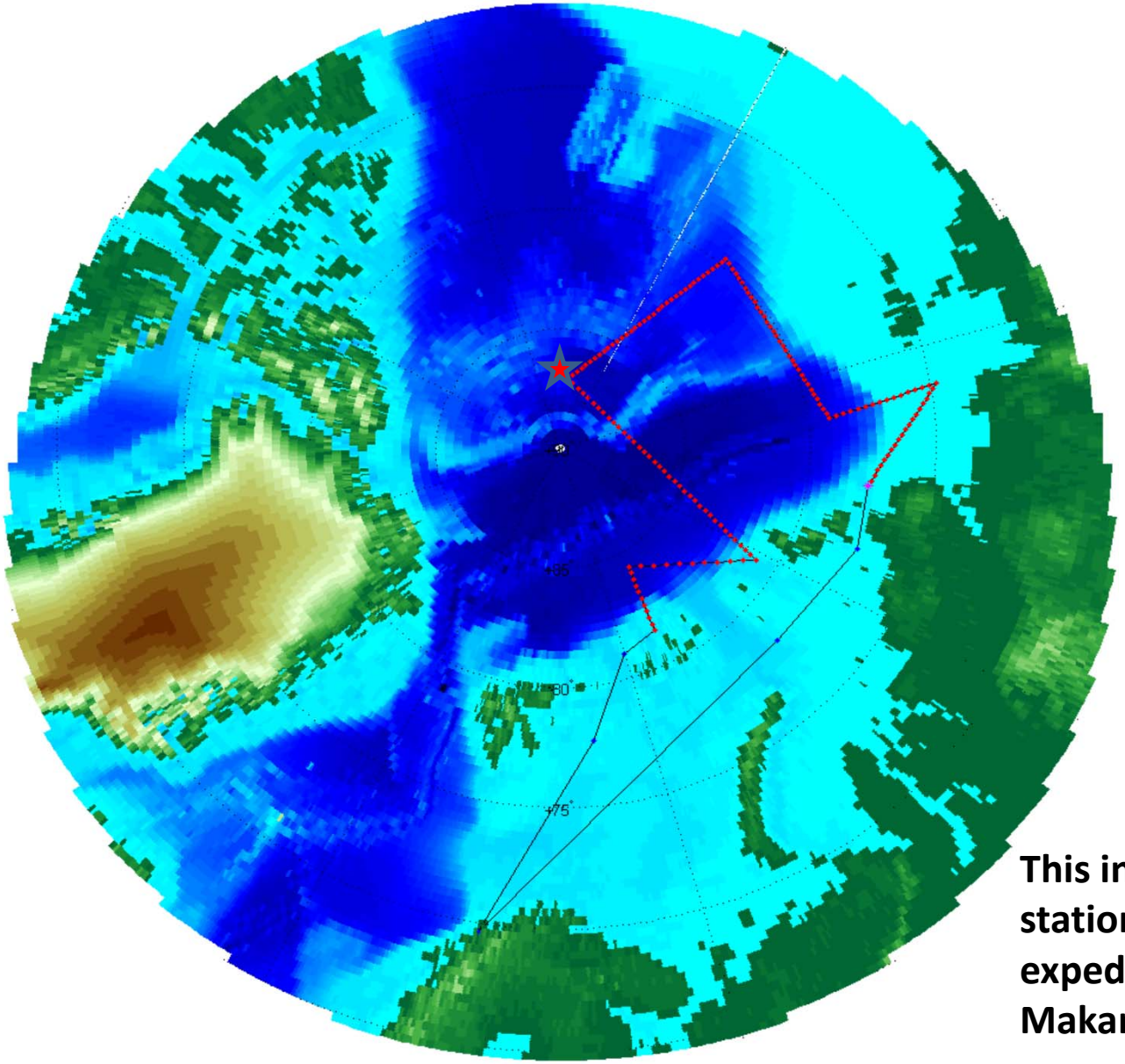


International Arctic GEOTRACES Status:

- US, German and Canadian expeditions funded.
- UK and Sweden not funded.
- RUSALCA planning with NOAA for 2015 is ongoing (for Bering Strait) and pending NSF

USCG HEALY and Canadian Coast Guard Cutter LOUIS S. ST. LAURENT working together (2010).

German expedition to the central Arctic Ocean "Transarc II“ on Polarstern.



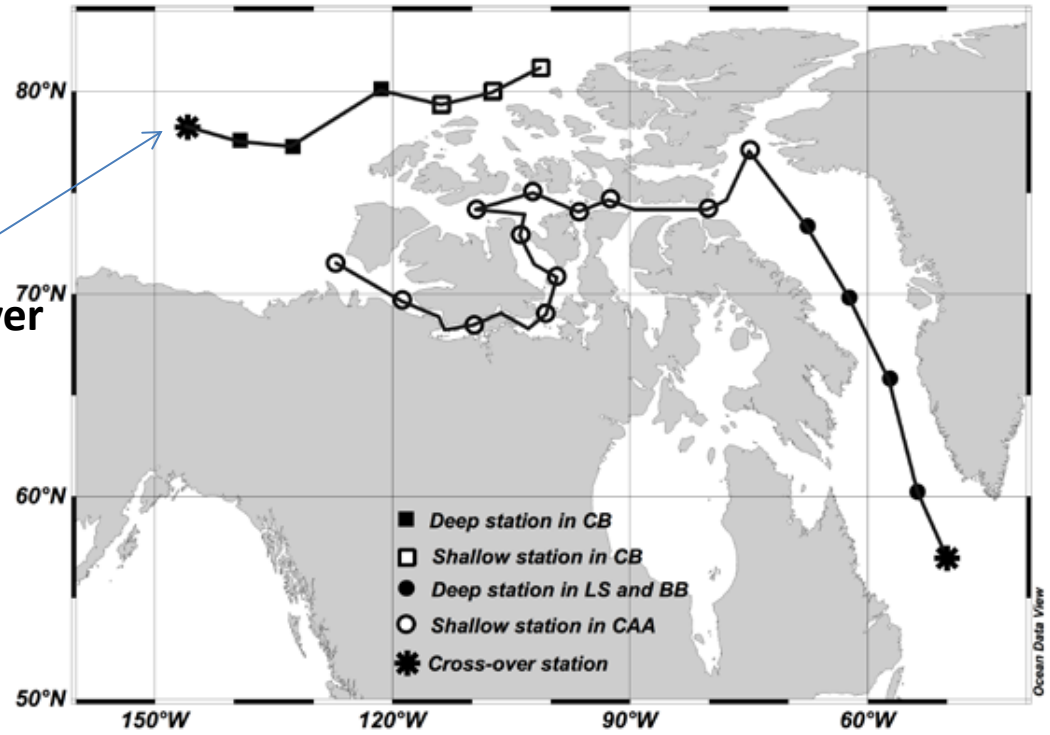
Map of working area with proposed cruise track

This includes one cross over station with the US expedition (probably in the Makarov Basin)

Canadian Effort

Examine the distribution and modification of geochemical tracers on a transect from Canada Basin, across the Canadian Arctic Archipelago (CAA) to Baffin Bay and the Labrador Sea

<u>Two</u> cruises planned



Canadian-US cross-over