

## Beaufort Gyre Exploration Project: Dispatch 15: Ice work

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We were very lucky to have warm weather and sunny skies to begin our first day working on the ice. Temperatures were a pleasant 3 degrees C, until the fog started to roll in after a couple of hours and conditions dropped to freezing – just before it was time to fly back to the ship.

After a brief reconnaissance flight this morning, Helicopter Pilot Chris Swannell, Rick Krishfield, Jeff Pietro and Ice Observer Roger Provost located a suitable multi-year floe for the deployment of an ITP (ITP 53), with room for more of the science party to perform a magnetic survey, take ice cores, and collect melt-water samples during the deployment. Rick made drill-hole measurements to determine sea-ice thickness and estimated the floe to have an average thickness of about 3.5 meters; it was about 150 m long by 80 m wide. The Captain maneuvered the ship to be about 400 m away from the floe because it is safest for the ship to be close to the ice site, and makes it easier to transfer gear and people in the helicopter. The heavier items (the ITP winch and bottom weights) were transported in sling-loads from the helicopter.

ITP 53 is the first of four ITPs to be deployed on this cruise. While 2 of the others have extra sensors, number 53 is a standard ITP measuring temperature and salinity down to 750 m depth in the water column. We deployed only the ITP at the site, although the other sites will be Ice-Based Observatories with multiple instrument systems deployed to measure ice, atmosphere and ocean properties. Deployment began with drilling an 11 inch hole using a gas-powered auger. Rick measured a thickness of 3.8 m at the site with 35 cm of the ice above sea level (freeboard).

Rick, John Kemp, Jeff Pietro, Steve Lambert (WHOI), and Carpenter Gary Morgan set up the light-weight portable tripod and winch system for deployment. The winch system was designed and fabricated at WHOI with the requirement that it be sufficiently small and light that an ITP could be deployed directly from an icebreaker (using sleds to haul it to the site) or slung from a helicopter for transport to the deployment site. At the same time, the components of the winch are sturdy and designed for easy operation in harsh arctic conditions.

Using the tripod and winch, the team deployed the bottom weight, and tether through the hole. They mounted the ITP profiling unit on the wire and guided it down through the ice before attaching the final component, the surface float to cap off the hole. The ITP will drift in the multi-year ice pack and collect valuable information about the physics of the Arctic water column over all seasons.

During the ITP deployment, other scientists on the floe were very busy making measurements of the sea-ice. The team performed an electromagnetic survey to measure ice thickness over the entire length of the floe (150 m), and made drill holes to measure thickness directly for validation. Alice Orlich (UAF) and Michiyo Kawai (TUMSAT) used an ice corer to drill out 10-centimeter ice cores. They measured the temperature profile through the sea ice and cut one core up into 10 cm segments. Alice bagged these to bring back to the lab for analysis to obtain a profile of ice density. These types of sea-ice measurements are key parameters, for example, for computing sea-ice thickness information from satellite data. Michiyo will collaborate with others to analyze the ice cores for alkalinity, calcium and dissolved inorganic carbon to understand the carbonate cycle at the air-ice-ocean interface.

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