

## Beaufort Gyre Exploration Project: Dispatch 4: Underway measurements of sea ice

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Early this morning Kunio Shirasawa (Hokkaido University), Kazu Tateyama and Hiroki Shibata (Kitami Institute of Technology, KIT, Japan) deployed an electromagnetic (EM) inductive sensor system off the ship's port bow to record under-way measurements of ice thickness. The 3.7 m-long system is suspended below the ship's crane, about 5 m above the ocean surface, and is housed in a wooden protective frame. For this deployment, plastic wrap serves to prevent damage by icing when the ship's spray freezes, but a custom PVC capsule is being designed for next year's deployment.

The EM measurements utilize the large contrast between the conductivities of sea-ice and seawater (sea-ice has a relatively much smaller conductivity) to infer ice thickness. The height of the sensor above the interface between the ice and the ocean is deduced from an electromagnetic field. The sensor is used in conjunction with a laser altimeter that records the distance between the instrument and the ice (or snow) surface so that the difference between EM and laser measurements provides the thickness of the sea ice plus the snow.

Since 2003, Kunio and Kazu have been making these underway EM measurements from icebreakers for comparison with satellite remote sensing data. Using the insitu EM measurements, Kazu is developing algorithms to relate surface properties of sea ice to sea-ice thickness. In the future, these algorithms may be used to relate passive microwave satellite data to sea-ice thickness.

Later in the expedition, the team will use different EM sensors on the sea ice to measure the thickness distribution of a floe. This will provide valuable initial conditions for the ice-based observatories (a suite of instruments mounted in the permanent sea-ice) that we'll deploy at the same time. Alice Orlich (UAF) will be taking simultaneous ice core samples that Kunio and Kazu will use to validate their EM data.

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