Images of iceberg edges help with calculating their thickness

By Val Schmidt

We arrived in Cumberland Sound on the evening of July 25 and the ship immediately commenced an SX90 sonar acoustic fisheries survey for Arctic Cod that they hoped to find in this area. This was not part of our own effort, but rather that of the chief scientist for this leg, Louis Fortier. That said, the SX90 is a new addition to the Amundsen and we are greatly interested in its operation.

The main reason for our own interest is that it also has the capability to image the edges and estimate the thicknesses of icebergs. While the resolution is coarse, we hope it will provide ancillary data during our own effort at iceberg mapping in the next few days.

The morning of July 26 began with an early 5am start. As the ship commenced a water column and benthic habitat sampling station, we departed the Amundsen aboard the “barge” for a few short hours of AUV and EM3002 sonar testing. While we will be running the AUV underneath the iceberg, the EM3002 will be mounted at a 45-degree angle to image the side of the iceberg. The barge is a small landing craft carried by the Amundsen, useful for calm weather science and operations to shore when required.

Smaller iceberg drifting in Cumberland Sound. Photo/Alex Forrest

Our plan was to find calm water near shore in the vicinity of Cape Mercy, NU (about 25 nautical miles from where the CCGS Amundsen was collecting other samples) in which to ballast the AUV with the new SwathPlus sonar module, conduct a short test mission and also conduct a patch test for the EM3002 shallow water multibeam. The team from the University of New Brunswick (UNB) has installed the EM3002 aboard the barge for the season and Travis Hamilton of UNB will operate the EM3002 during our iceberg-mapping event. A special mount has been manufactured that tilts the sonar toward the surface allowing the system to capture a high-resolution swath around the periphery.

We set out for Cape Mercy, to the only inlet with any soundings on the chart. We would later learn that this foreboding looking location was once part of a Cold War era Defense Early Warning Station ("the DEW Line"). The enclosed area afforded calm water for our ballasting tests. After these tests, two short AUV missions were run and data was collected for the EM3002 patch test. The next step is to reproduce what we were doing here upside down.

The opportunity to test the AUV was fortunate as the vehicle was unable to successfully complete a mission, stubbornly refusing to dive beneath the surface. In addition, the CTD

(conductivity-temperature-depth) sensor mounted on front of the AUV failed to collect data during our test – a recurring problem that we had thought had finally been resolved in our pre-cruise testing. This was of significant concern for those on the team interested in studying the mixing dynamics associated with the iceberg. These issues made for a solemn return to the ship as we pondered our next step. We took some time to warm up and take a short nap before having a closer look at the log files being stored by the AUV during the in water tests. The ship had also been busy while we were away, conducting various casts and box-core samples, which had brought up several hundred species of benthic critters.

After a careful inspection of the log files of the AUV we determined our Acoustic Doppler Current Profiler (ADCP) – an instrument used to measure water currents – to be malfunctioning, such that the AUV was unable to reliably measure the distance to the bottom. This would result in the vehicle frequently measuring zero meters when the bottom was in fact more than 14 meters. Altitude measurements are critical to operation, as the AUV will initiate evasive maneuvers to prevent collision with the bottom when values near zero are returned.

This behavior prevented the AUV from diving beneath the surface. Investigation of the ADCP data showed beam 3 of the 4-beam array to contain no useful data. With no further recourse we opened the ADCP module to see if we might be able to test or isolate the problem. No immediate options to do so were apparent, but we took the opportunity to ensure all connectors were firmly in place.

On reassembly and testing we found beam 3 to be producing data comparable to the other beams. While the solution is not wholly satisfactory, we hope to have an opportunity to test the system in the water later this afternoon.

Excitement increases for the real event. We expect to be above

70 degrees north within the next day or so. Once above this latitude, the search will begin in earnest to find a suitable target. While smaller ones like this one in Cumberland Sound are scenic, they are too small for our needs.

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