

# Tahoe researcher helping map icebergs

By Alex Forrest

Our departure from Quebec City was delayed for a day, but sailing has been pretty smooth since. We're now five days out, nearing the northernmost tip of Labrador, and soon will cross over to Baffin Island. For the Autonomous Underwater Vehicle (AUV) team, this means that we're closing in on our objective of mapping the underside of an iceberg.

For the team, which includes Alexander Forrest (UC Davis), Andrew Hamilton (University of British Columbia), Derek Mueller (Carleton University), and Val Schmidt (Coastal Center for Ocean Mapping – University of New Hampshire), this AUV deployment represents the culmination of several months of working with the Canadian Ice Service in preparation for any envisioned scenario. Although the team has experience with AUVs under-ice in the Arctic and Antarctica, this application has several challenges that haven't previously been encountered. Unlike shorefast-ice tested before in earlier deployments, the target we are searching for will be moving and rotating while we are surveying. Typical drift rates can be 10 to 15 km per day. Additionally, we will be testing a bathymetric mapping sonar unit that we have only had access to since the day before our departure.



Seals resting  
on an

embayment.  
Photo/Alex  
Forrest

We had our first taste of the challenges in store for us once we came through the Strait of Belle Isle (in between Newfoundland and Labrador) where the ship made a slight diversion to a fragment of the Petermann Ice Island (PII-A) that has been drifting south from northern Greenland since August 2010. This is the same fragment that has recently been in the news as a result of its size (its long axis is nearly 10 km long and at least half that across).

After debriefing from our helicopter pilot, we were flown across to PII-A to make ice thickness measurements at seven stations. Similar measurements had been made by a Newfoundland-based R&D organization when it had established these stations in mid-June. With these two sets of measurements, it will be possible to produce an estimate of how fast the ice is melting and to examine how this might be related to drift.

On our first foray over to the island we managed to make measurements from two stations. The helicopter was then required to return to the ship to refuel before heading back to find another three stations. Of the last two stations that we were unable to find, one was thought to be on a smaller piece of ice that had detached from the rest of the iceberg. The second was simply never found.



Alex Forrest,

Derek Mueller  
and Andrew  
Hamilton  
suited up to  
fly to PII-A.  
Photo/Val  
Schmidt

As the ship pulled away from PII-A, we found ourselves speculating what the conditions might have been on the underside of the iceberg given the state of the surface. While we might expect similar undulating conditions, there could be significantly greater crevassing in regions where the original glacier had been furrowed by the underlying rock. There is also concern that marginal regions of the iceberg will be worked by wave action that will result in embayments where the vehicle could be trapped.

Our trip then has continued north and the next stop for the AUV team will be Cumberland Sound (southern Baffin Island to the northwest of Iqaluit). Once there, we will take advantage of the fact that we will be in relatively shallow water (50 to 100 m) to conduct a last round of in-water tests of the vehicle. This will be a final chance to do a full systems check before reaching the iceberg we intend to survey next week. This is obviously a far cry different than the systems checks we were able to do in North Hatley (southern Quebec) during the first week of July.

We spend our evenings dreaming up and discussing scenarios that might arise in an effort to be prepared for the unforeseen challenges that lay ahead. We also are struggling to fully understand the nuances of the bathymetric sidescan sonar and the limitations of the rest of the instrumentation we will be working with. While these are relatively normal growing pains for any AUV operation, they are made all the more difficult by being at sea. However we're making progress

and expect to be fully ready to go when the time comes.

*Alex Forrest is a post-doctoral researcher at UC Davis Tahoe Environmental Research Center in Incline Village. He is part of a team of scientists mapping the underside of an iceberg in the Arctic using autonomous underwater vehicles. Some of the same instruments being used for this project were recently used at Lake Tahoe to map the locations of Asian clams.*