Photo Credit: Ocean Research Project

RBR Instruments travel to the far North with the Ocean Research Project's 100-day expedition

Ottawa, ON

Over the next several weeks, two of RBR's instruments are travelling to some of the most remote and uncharted glacial fjords off of Greenland's Western coast.

ORP's Proposed Route

In April, Matt Rutherford and Nicole Trenholm of the Ocean Research Project (ORP) began preparations in Annapolis, Maryland to make the journey to Greenland. On July 24th, their 42-foot schooner, *Ault*, left Nuuk, Greenland to make the final challenging trek heading north to the 77th parallel.

To help NASA understand why Greenland's glaciers are retreating, Rutherford and Trenholm are deploying a CTD probe and a thermosalinograph into some of the island's least-studied fjords.

Mass loss from the Greenland ice sheet quadrupled from 1992-2001 to 2002-2011.

Fiamma Straneo and Patrick Heimbach, *Nature*, 2013.

The research team hopes that the CTD data will help scientists understand why Greenland's ice sheet is melting so quickly below the surface of the ocean. Recently, Drs. Fiamma Straneo and Patrick Heimbach identified this submarine melting as one of the leading hypotheses for the initial retreat of Greenland's outlet glaciers.

In their review in *Nature*, Straneo & Heimbach report that the mass loss from the Greenland ice sheet quadrupled from 1992-2001 to 2002-2011. In fact, mass loss from the Greenland ice sheet now accounts for 25% of observed sea-level rise globally.[i]

Scientists want to understand why.

In April 2015, NASA launched a five-year campaign to help understand submarine melting in Greenland – a project called Oceans Melting Greenland (OMG).[ii] To help Rutherford and Trenholm conduct research for this mission, RBR lent the Ocean Research Project an RBRconcerto CTD logger and a thermosalinograph.

Nicole Trenholm ready to deploy the RBRconcerto CTD.

"This data will provide great insight into the stability of polar glacial systems."

Matt Rutherford, ORP Founder, speaking of the CTD data to be collected.

The RBRconcerto CTD enables the team to capture an instantaneous profile of the ocean's conductivity, temperature, and pressure. The cable they are using allows them to deploy the CTD to depths up to 1,500 feet -- almost as deep as the CN Tower is high.

The team has high hopes for what the CTD profiles will uncover in terms of how fragile Arctic marine environments are impacted by increasingly warmer Atlantic water. "This data will provide great insight into the stability of polar glacial systems," ORP founder Rutherford said.

While traveling up the west coast of Greenland, Rutherford and Trenholm are also "ground-truthing" for NASA's Aquarius, one of the satellites responsible for tracking global salinity levels.[iii] "Ground-truthing" involves checking the satellite's accuracy by comparing reference measurements collected on the ground to measurements provided by the satellite.

To help ensure the accuracy of Aquarius' high-latitude measurements, Rutherford and Trenholm are using RBR's ship-mounted thermosalinograph to collect "in-situ" data on salinity levels in Baffin Bay. As surface water is pumped through the main compartment of the thermosalinograph, the sensors give high-accuracy measurements of the water's conductivity and temperature, which are then used to determine ocean surface salinity.

In a recent guest post on ORP's blog, NASA scientists Brucker, Vernieres, and Dinatt explained why the data from the thermosalinograph is so valuable. "For the last 5 years, satellite data allows us to study salinity almost everywhere…These satellite observations of salinity are reliable over the tropical and mid-latitude warm oceans, but satellite salinity observations in the polar oceans are challenging." Satellite measurements, for instance, are less sensitive to salinity in colder, polar ocean waters.

Furthermore, although satellites can observe low salinity from high altitudes, freshwater runoff from Greenland's ice sheet often travels in narrow coastal currents. Since these currents are so close to the coast, they can be difficult for the satellite to detect. "While the direct impact of runoff on the coastal currents may be difficult to detect from space, model results have shown that large melt water runoffs

Aug. 6, 2015: Posted Photo of Glaciers captured by Matt Rutherford and Nicole Trenholm of ORP.

from the Greenland ice sheet change the salinity of the seas surrounding Greenland, especially in Baffin Bay," they explained. The thermosalinograph measurements collected by Rutherford and Trenholm will help NASA scientists refine their models and understand the complex physical processes shaping the future of Greenland's ice sheet.

"Gathering data from regions such as Greenland requires commitment and resources beyond even typical oceanographic sampling. The ORP's approach of forming partnerships between government, non-profits, and industry will enable these valuable data and experiences to go straight to the hands of the people who need it most -- not just scientists, but also an interested and engaged public. That's the strength of an organization such as ORP," said Dr. Clark Richards, research scientist and physical oceanographer at RBR Ltd.

Find out more about RBR's rugged and versatile CTDs.

Follow ORP's 100-day expedition.

RBR creates instruments to measure the blue planet. From the ocean abyss to the polar ice cap, our sensors track water parameters – temperature, depth, salinity, dissolved gases, pH, and many others. With design and manufacturing centrally located in Ottawa, our team works in a fast-paced, dynamic atmosphere to serve customers from all corners of the globe.

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[i] Fiammetta Straneo and Patrick Heimbach, "North Atlantic warming and the retreat of Greenland's outlet glaciers," *Nature* 504 (December 2013): 36.

[ii] For more information about NASA's Ocean Melting Greenland (OMG) mission, visit http://science.nasa.gov/missions/omg/.

[iii] For more information about NASA's satellite Aquarius, visit http://aquarius.nasa.gov/.