

Arctic coastal and drifting ice processes and dynamics

Annual Report 2023

Licence # 02 025 23R-M Issued to D. Mueller, Carleton University

This year's fieldwork focused on 2 areas: Milne Fiord, northern Ellesmere Island and Admiralty Inlet, northern Baffin Island. Please note, that we are also involved in community monitoring projects in Pond Inlet and Igloolik, which are mentioned below. We are including them since they are related to our field research travel. These activities are not research and are not covered by this licence.

Milne Fiord, Ellesmere Island:

A team of 5 people went to the Milne Fiord area from July 8 to 29, 2023. They camped at the air strip at Purple Valley and travelled by helicopter to a fly camp on the Milne Ice Shelf from July 11 to 19. This allowed the team to deploy seismometers to measure ice quakes and other seismic activity when ice cracked during their stay. Radar surveys were conducted to examine the thickness of the ice shelf and the team measured the amount of surface melt on the ice shelf from ablation stakes that are visited every year. This year, the team put instruments into a rift in the middle of the ice shelf to measure the water current, salinity and temperature under the ice shelf. A remotely operated vehicle (ROV) was used to explore the rift, as well as an old sub-glacial channel underneath the ice shelf. We were able to locate and sample benthic organisms (e.g., scallops, sea cucumbers, brittle stars and sea anemones) that are living on horizontal ledges of ice within the ice shelf. This is a unique situation and our samples will help discover how long ago this community was established. We also maintained the oceanographic mooring that has been measuring Milne Fiord water properties since 2011 along with some other moorings that were installed more recently. These data, plus our water column profiling, showed that the Milne Fiord epishelf lake, a layer of freshwater floating on the ocean, which had drained during the Milne Fiord calving event in 2020, has not recovered at all. This past year, we were able to maintain and re-install several weather stations (<https://cryologger.org/milne-ice-shelf/> and <https://cryologger.org/purple-valley/>). Radar surveys and surface ablation measurements were conducted on Milne Glacier which flows into Milne Fiord. Glacier velocity trackers and temperature sensors were reinstalled. This information is used to assess glacier deterioration processes since 1966 and investigate how the glacier melt affects the Milne Fiord system. Last winter, our research partner and team member from Ausuittuq, Joseph Shoapik, was able to deploy an iceberg tracking beacon on an iceberg in Jones Sound. This iceberg drifted out of Jones Sound and headed into Navy Board Inlet before breaking up. We were also fortunate to have an online article on the Canadian Geographic website that was written by Dustin Patar (<https://canadiangeographic.ca/articles/last-bastion-of-ice/>).



Milne Fiord fieldwork: a radar survey on Milne Ice Shelf (left panel) and ROV sampling of a brittle star (right panel).

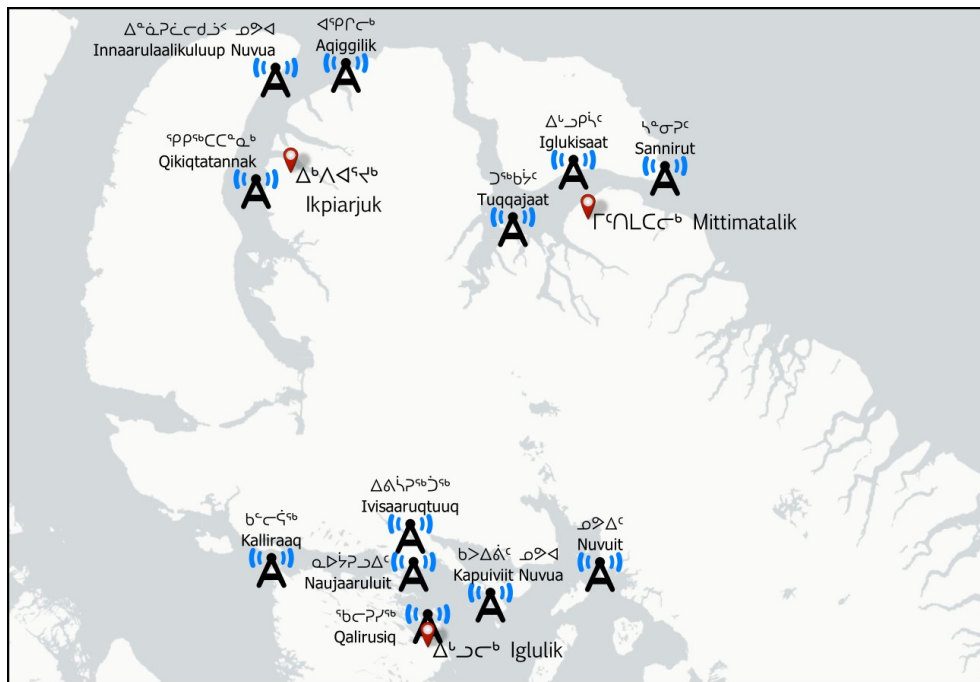
Admiralty Inlet, Baffin Island:

Ada Loewen (PhD student, Carleton University) spent most of May and June 2023 in Ikpiarjuk to complete her thesis research and to promote community monitoring efforts. Ada collected water column profiles and deployed ice motion sensors, and four time-lapse cameras at various locations in Admiralty Inlet throughout May and June. Changes in shore cracks leading up to landfast ice breakup were examined using repeat Remotely Piloted Aircraft System (RPAS; aka ‘drone’) surveys. A 1.5 km section of the shoreline in NE Admiralty Inlet was monitored during May and June 2023 to see how it changed over time so that we could better understand this important precursor to landfast ice break-off events.

Ada and Derek Mueller worked with Jonah Muckpah, Kimball Qamanirq, Stephanie Qamanirq, Camille Lavallee, Kimball Qamanirq, Tony Akumalik, Hosia Kadloo, and Veronica Ipilie (all employees of research partner Arctic Bay Adventures) to deploy community weather stations in 3 locations around Admiralty Inlet. Ada and Derek travelled to Mittimatalik in late May/early June to work with Andrew Arreak (SmartICE) to deploy 3 weather stations for community monitoring and Derek worked with Donald Ittuksardjuat, Patrick-John Attagutluk, Travis Qaunaq and Daniel Attagutluk in Igloolik to install more stations there. These weather stations measure wind speed and direction and air temperature and we receive data from them every hour. Unfortunately, some of the instruments stopped working but we hope these maintenance issues will be addressed in the coming months. Data from these weather stations are available here: <https://cryologger.org/weather/>. We also installed TV screens at the HTA (Ikpiarjuk, Mittimatalik and Igloolik) and at the Hamlet (Ikpiarjuk) offices where people can come to look at the latest weather information in English and Inuktitut.

In October 2023, Ada and Katherine Wilson (SmartICE) travelled to Ikpiarjuk to meet with Tuvaliriji, the SmartICE community management committee. We shared preliminary results from data collected

earlier in the spring and received guidance and feedback on our research from them and the Ikajuqtiit Hunters and Trappers Association.



Location of weather stations deployed around Ikpiarjuk, Mittimatalik and Iglulik. Note that we are only using the ones in Admiralty Inlet for research.



Aqiggilik weather station near the floe edge in May 2023