

Arctic coastal and drifting ice processes and dynamics

Annual Report 2019

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Issued to D. Mueller, Carleton University

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We had a very successful field season this year and worked in two main locations, northern Ellesmere Island and Arctic Bay to examine coastal, drifting ice processes and ice break up. In addition we had personnel on the *CCGS Amundsen* working with an automated camera.

Ellesmere Island:

From June 24 to July 1, 2019, Derek Mueller and Yulia Antropova visited Grise Fiord and Resolute Bay to discuss our research with community members. They presented our work on the ice shelf and glacier in Milne Fiord, located at the northern coast of Ellesmere Island. We showed underwater video footage of benthic organisms (scallops, soft coral, brittle stars, etc) living inside the Milne Ice Shelf. People were interested in our work and were supportive of our plans to sample these animals next summer. From July 2 to July 22, Jérémie Bonneau and Drew Friedrichs joined the team to carry out oceanographic, hydrological, and glaciological measurements in Milne Fiord. We made a 40 cm hole with a hot water drill to retrieve our instruments from a channel carved into the underside of Milne Ice Shelf by meltwater from the land. These instruments have been monitoring water temperature, salinity, and currents since the summer of 2018. The instruments were re-deployed to continue monitoring changes in the channel for another year. The team also retrieved the instruments deployed in 2018 to monitor water and sediments in the Milne Fiord epishelf lake (a layer of freshwater floating on top of sea water), and re-deployed the instruments for another year. A transect of water salinity, temperature and depth profiles was conducted across the epishelf lake to analyze the water layers. On Milne Glacier, two meteorological stations were installed to monitor surface melt. The team also installed a GPS recorder to investigate glacier movement. Measurements revealing the glacier ice thickness and properties of the bed under ice were conducted to monitor the position of the grounding line (where the glacier ice detaches from the bed and becomes afloat). Two tracking beacons were also deployed on drifting ice islands to follow their movements. For further details and images see:

<https://wirl.carleton.ca/research/ice/ice-shelves/milne-ice-shelf/> and
<https://wirl.carleton.ca/research/ice/epishelf-lakes/milne-epishelf-lake/>

Arctic Bay:

From May 24 – June 6, 2019, Gregory Crocker and graduate students Ada Loewen and Calder Patterson stayed in Arctic Bay, NU and spent two field days in Admiralty Inlet. Field work was supported by local guides Nigel Kigutikajuk and Levi Kalluk on May 27, and Nigel Kigutikajuk and Gideon Allurut on May 29. The team travelled by snowmobile and qamutik to collect atmospheric and oceanographic data relating to sea ice break-up and to deploy scientific

instrumentation at a field site on the sea ice west of Suujaqtalik (between Strathcona Sound and Baillarge Bay). A 10 cm diameter sea ice core was taken at the field site to measure ice temperature and salinity, and two profiles of water temperature, salinity, depth, and currents were taken at two different locations across the inlet to look at water column properties below the ice. The equipment deployed included a weather station that measures air temperature, wind speed and direction, and relative humidity, a thermistor chain frozen into the ice to measure temperatures through the ice, an ocean current profiler to measure ocean currents up to 20 m below the ice, and a time lapse camera on the shore. A second time lapse camera was deployed by members of the Tallurutiup Imanga Nauttisuqtiit (Guardians) near Elwin Inlet a week later. All the instruments deployed on the ice (weather station, thermistor chain, current profiler) collected data until June 24 when they were collected by Nigel Kigutikajuk. The time lapse cameras continued taking photos until the first week of August when they were recovered by the Guardians. For further details and videos from the time lapse cameras see: <https://wirl.carleton.ca/research/ice/sea-ice/landfast-ice-breakup/>

CCGS Amundsen:

An automated camera system was designed to take photos of icebergs interacting with the coast of Hans Island. Team member Adam Tremblett embarked on the CCGS Amundsen to bring the camera to Hans Island but plans changed and it was installed on the icebreaker itself to monitor interaction between sea ice and the ship. An overflight of Hans Island was conducted in anticipation of returning another year to deploy the camera there.