Public Registry - Project Proposals

NPC 150581: Sikunnguaq - the likeness or image of ice in maps

Close

Proposal Status: Conformity Determination Issued

Overview Documents

Project Overview

Type of application: New

Proponent name: Randall Scharien

Proponent company: University of Victoria

Project Description:

Project Background and Objective This project was initiated by the SmartICE community management committee in Mittimatalik, the self-titled “Sikumiut (people of the ice)”. The Sikumiut includes Elders and youth from Mittimatalik and members from the Mittimatalik Hunters and Trappers Organization, Hamlet Council, Canadian Rangers, Search and Rescue, and Parks Canada. Our international project team is now made up of co-principal investigators from University of Victoria, SmartICE, University College London in the United Kingdom, and the University of Bremen in Germany. Together with the Sikumiut and SmartICE community management committees in Iqaluktuuttiaq, Uqsuqtuuq, and Qikiqtarjuaq, we have co-designed a Nunavut based research plan to make better maps for identifying sea ice features related to safe travel from images and data collected by satellites. Recent changes in sea ice have led to more unpredictable conditions, leading to increased accidents and adverse effects on food security, health and wellbeing, economy, culture, and identity. Warming air temperatures, along with shifting ocean currents and weather patterns, have shortened the length of time in each year when sea ice is stable, affected ice roughness, and produced new cracks and areas of slush buried under surface snow. New tools are needed to complement local travel practices that are grounded in Inuit Qaujimajatuqangit (IQ), to overcome challenges associated with changing and unpredictable travel risks. Images and data collected by satellites, already used for some travel planning, can potentially provide more detailed information about the aspects of sea ice directly related to safe travel. Our objective is to understand how sea ice features related to safe travel can be identified in new satellite technologies, with a focus on a radar-based satellite technology called synthetic aperture radar (SAR) as a key source of sea ice information. Methods Together with the community management committees in the four participating communities Mittimatalik, Iqaluktuuttiaq, Uqsuqtuuq, and Qikiqtarjuaq, we have identified ice roughness, slush, and ice thickness as priority sea ice features for monitoring with satellite images and data. Our project will conduct field work on sea ice close by to each of the four communities in late March to late May in 2025 and 2026. All field work will be done in close consultation with the SmartICE community management committees, as they rely on project outcomes for local sea ice mapping efforts. SmartICE community operators, some of whom are co-investigators on this project, will also participate in field data collection. All field research associated with our objectives is non-intrusive and observational. We will measure snow and sea

ice properties on areas of sea ice nearby to the four participating communities, making day trips from research stations and other accommodations, travelling by snowmobile when conditions are safe. We will carry a small amount of spare gasoline and oil for the snowmobiles and for powering a 2-stroke ice core barrel drive. Data collection includes the use of ice augers and electromagnetic (EM) sensors for ice thickness, ice core barrels for taking ice cores, equipment for measuring snow properties in snow 'pits', battery operated temperature sensors for measuring snow and sea ice temperatures, and drones for taking photographs and scanning the surface (LiDAR and EM sensors). There will be stationary thermistor-based sensors (SmartBUOYs) installed in the sea ice until they can be removed in the spring. The SmartBUOYs are routinely deployed in the ice under the direction of the SmartICE community management committees and are marked for visibility. All EM and scanning (LiDAR) sensors are low power and do not make intrusive sound. All waste from daily sea ice activities will be transported back to the communities for proper disposal. Communicating Results The results will be shared with the participating communities as well as other communities across Nunavut where the Inuit-led, IQ-grounded, Sikumik Qaujimajjuti ("tools to know how the ice is") system for community ice information sharing has been implemented. Roughness and slush mapping results will be incorporated into the SmartICE Ice Travel Safety Maps, the need for which was first recognized by community management committees. They identified that the ice charts produced by the Canadian Ice Service are primarily designed to support shipping and ice-breaking and are generated at temporal and spatial scales that are inconsistent with on-ice travel. We will use the community management committee meetings in Nunavut communities as the primary means of communicating project results, with other means including our project report to the NRI, and national conferences like ArcticNet. Data will be stored in the Polar Data Catalog and data and results will be made available by request.

Project Schedule

Start Date: 2025-03-15

End Date: 2026-05-31

Project Map

List of project geometries:

| Id | Geometry | Location Name |
|---|---|---|
| 14123 | polygon | f202411179908372-Ikaluktutiak |
| 14124 | polygon | f202411173924051-Mittimatalik |
| 14125 | polygon | f202411173284319-Qikiqtarjuaq |
| 14126 | polygon | f202411175119419-Uqsuqtuuk |

NPC Planning regions:

No Approved Plan

North Baffin

Project Land Use and Authorizations

Project Land Use:

Scientific Research

Scientific Research

Licensing Agencies:

Nunavut Research Institute

Nunavut Impact Review Board

Material Use

Equipment:

| Type | Quantity | Type | Use |
|---|---|---|---|
| Snowmobile | 12 | 2m x 1.5m x 1.5m | Access to field sites from project communities in 2025. |
| Snowmobile | 8 | 2m x 1.5m x 1.5m | Access to field sites from project communities in 2026. |
| Surveying drone | 4 | 373mm x 101mm x 298mm (unfolded) | Mapping sea ice surface roughness. Take off weight is less than 250g. |
| Surveying drone (LiDAR) | 1 | 45cm x 45cm x 25cm | Mapping sea ice surface roughness using LiDAR technology. |
| EM-31 | 4 | 145cm x 38cm x 23cm | Geonics EM-31 electromagnetic induction (EM) device for measuring the apparent conductivity of sea ice and water, for inferring the sea ice thickness. Operates at 9.8 kHz. |
| GEM-2 | 4 | 183cm x 12.5cm x 10cm | Geophex Ltd. multi-frequency eletromagentic sensor for measuring the apparent conductivity of sea ice and water, for inferring sea ice and slush/snow thickness. |
| Thermistor-based stationary sensor (ice buoy) | 4 | 40cm x 15cm x 240cm | SmartBUOYs that provides vertically spaced measurements of air, snow, sea ice, and water temperature, for monitoring changes in snow and ice thickness over time. |
| Ice coring system | 4 | 128cm x 23cm x 7cm | Kovacs Mark II coring system to retrieve 9cm diameter sea ice cores up to 1m long. |
| Ice thickness kit | 4 | 60cm x 40cm x 25cm | 2 augur flights (50cm each), a 50cm extension rod, a handbrace, and an ice thickness measuring tape. Dimensions are for the kit when everything is dismantled and packed. |
| Snow pit kit | 4 | 58cm x 22cm x 35 | Each kit contains a foldable shovel, ruler, snow grain card, density sampler, battery operated temperature probe, brush, cloth, and notebook. Used for documenting snow grain and snow layer properties. |

Engine drive 4 55cm x 38cm x 32cm Kovacs 2-stroke core barrel engine drive for powering the Kovacs ice coring systems.

GNSS receiver 1 13cm x 13cm x 14cm Emlid Reach RTK GNSS Receiver for positioning.

Hydraprobe snow sensor 2 38cm x 8cm x 30cm Battery operated probe for measuring moisture and electrical conductivity of snow for remote sensing studies. Dimensions are for the probe and logger case. Actual sensing probe is 5.7cm long. Made by Stevens.

SLF snow sensor 1 4.5cm x 9cm x 4cm SLF Snowpro-17 uses a capacitive sensor for measuring snow density.

Fuel Use:

Type Container Capacity Use

Gasoline 4 20 Powering snowmobiles

Hazardous Material and Chemical Use:

Type Container Capacity Use

No data found

Water Consumption:

Daily Amount (m2) Retrieval Method Retrieval Location

0 Community-based research station or hotel Municipal services

Waste and Impacts

Environmental Impacts:

Impacts: sea ice sites will be visited daily by snowmobile and daily field sampling involves measuring snow and sea ice properties while on the sea ice. There will be trampling around the sites when accessing them and small snow pits and ice core holes. Holes will be drilled in the sea ice to deploy ice buoys and their marking flags. Small snow and sea ice samples will be bagged daily and brought back to the research station or hotel accommodation and melted to measure for salinity. The water amount will be small enough that it will be dumped down the sink when done. Mitigation: The research stations or hotels will be handling all waste removal. Fueling of snowmobiles will take place daily at the research station or at retail services in the community that have their own fuel storage/containment/spill kits available if necessary. Efforts will be made to limit the snowmobile tracks and trampling at sites, and to restore the sites as they were before activities took place.

Waste Management:

Waste Type Quantity Generated Treatement Method Disposal Method

No data found