Non-technical Project Description

Project Title: *Sikunnguaq* - "the likeness or image of ice in maps"

Lead: Randall Scharien, University of Victoria (randy@uvic.ca)

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 stationary thermistor-based sensors (ice buoys) installed in the sea ice until they can be removed in the spring. The positions of these ice buoys will be determined by members of the community management committees and will be marked for visibility. All EM and scanning (LiDAR) sensors are low power and do not make intrusive sound. We will have a spill response plan and spill kit, and all waste 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.