

The Copernicus Expansion Missions Sea Ice Experiment (CEMSIE) is a collaborative scientific project led by a Canadian university team with researchers from nine countries. Dr. John Yackel, Professor of Geography, University of Calgary is the project principal investigator, and he leads a team of three other Canadian University scientists and six other international University scientists. The project involves numerous Canadian government scientists and University graduate students.

What the Project Involves

The 'Copernicus Expansion Missions' refers to a group of new satellites set to launch between 2027 and 2029 by the European Space Agency aimed at providing Canadians with new and improved capability to measure the thickness of sea ice on a near-daily basis. This is vital for northern community safety during the ice-travel and hunting seasons near Canada's northern Arctic communities.

The project unites scientists in snow, sea ice, and satellite remote sensing to improve how Arctic sea ice and snow thickness are measured from space. The project is supported by Polar Knowledge Canada (POLAR), Canadian High Arctic Research Station (CHARS), Polar Continental Shelf Project (PCSP) and the Canadian and European Space Agencies. These space agencies are preparing several upcoming satellite missions focused on the polar regions. Fieldwork will involve 25–30 scientists, engineers, and technical staff working in rotation, with an average of 12-14 personnel staying at CHARS at any given time.

CEMSIE will examine landfast (non-moving) sea ice near Cambridge Bay using scientific instruments placed on the ice and specialized radar sensors aboard research aircraft and satellites. A temporary, seasonal field camp will be located about 15 km southwest of the community. It will include portable tents and small equipment shelters, all removed at the end of the project. Small field teams will make day trips to the camp to collect snow and sea ice data.

CEMSIE values Inuit Qaujimajatuqangit and is committed to open data, community involvement, and respectful communication with Nunavummiut. The project will work with the Kitikmeot Inuit Association, the Hamlet of Cambridge Bay, POLAR, and CHARS to share information through:

- **Community meetings and presentations** with the EHTO led by project lead John Yackel.
- **Summary reports and visual materials**, including plain-language posters and maps for Cambridge Bay, the EHTO, and CHARS.
- **Training and involvement opportunities**, such as local guiding, logistics support, or participating as an observer during twin otter aerial radar surveys.

Fieldwork includes measuring snow depth, ice thickness, layering, density, salinity, and surface roughness. These measurements will be coordinated with airborne radar instruments that simulate data expected from the upcoming CIMR, CRISTAL, and ROSE-L satellite missions. Aircraft will conduct short daily flights from the Cambridge Bay airport over Dease Strait, Queen Maud Gulf, and Victoria Strait to compare ground, airborne, and satellite observations and assess how well satellites detect true snow and ice thickness.

Transportation will rely on snowmobiles, small sleds, fixed-wing aircraft (Twin Otter or similar), and occasional helicopter use for regional sampling and airborne data validation. No heavy equipment is required. All flights are planned for April 10–15, 2026, weather permitting.

Why the Project Is Needed

Accurate observations of sea ice are vital for climate monitoring, weather prediction, northern shipping, and community safety. Satellite measurements of Arctic snow and sea ice are difficult because snow

characteristics and thickness vary across short distances and strongly influence radar signals. These variations introduce uncertainty in satellite-derived ice thickness. As the Arctic Ocean increasingly shifts toward first-year ice, improving measurement accuracy has become more urgent.

Data collected through CEMSIE will help refine the algorithms used by current and future satellites, strengthening climate and weather forecasting, marine safety, and understanding of Arctic change. Because sea ice is central to global heat exchange and ocean circulation, improved measurements will also benefit broader climate research.

Where the Project Will Take Place

Work will occur on landfast first-year sea ice in Dease Strait, about 15 km southwest of Cambridge Bay. All logistics, accommodation, and aircraft operations will be based out of CHARS in Cambridge Bay. Aircraft surveys will cover Dease Strait and extend over Queen Maud Gulf and Victoria Strait. The study area lies well outside protected areas and wildlife sanctuaries and is known for stable late-winter ice conditions appropriate for safe fieldwork and high-quality data collection.

When the Project Will Occur

Field activities will occur over six weeks next spring, beginning around April 1 and ending by May 15, 2026. During this period, the snowpack remains cold and dry, which is necessary for accurate radar measurements. Once melt begins in mid-May, radar signals degrade, and fieldwork must end. While CEMSIE contributes to a multi-year international effort supporting future satellite missions, all on-ice work near Cambridge Bay occurs only within this short seasonal window.