Ocean Networks Canada in the Arctic: Local problems, global connections

Submitted by Katie Shoemaker Fri, 2017-12-08 14:25

Only 0.5 percent of the world’s population lives in the Arctic, a remote region where extreme conditions prevail and daily life revolves around ice, both glacial ice and sea-ice. And as global warming continues to cause rising atmospheric and ocean temperatures, that all-important sea ice is increasingly melting away.
There are two reasons why disappearing sea ice in the Arctic matter to someone living in a large urban centre in the U.S. or India or China: Because most of the world’s biggest cities—including New York, Mumbai, and Shanghai—are located on coastlines and melting glacial ice sheets, and subsequent sea-level rise will threaten heavily populated coastal areas around the globe. Climate change in the Arctic also influences global weather patterns and extreme events such as hurricanes and wildfires.

Simply put, the Arctic’s melting sea ice is a local problem that has global connections. As many scientists proclaim, what happens in the Arctic doesn’t stay in the Arctic. It affects us all.

**Technology and data: Cambridge Bay community observatory**
Ocean Networks Canada’s (ONC) cabled community observatory at Cambridge Bay in Nunavut was the first of its kind in this remote location and extreme Arctic environment when it was installed in 2012, and has continuously produced real-time benchmark data to help scientists, researchers and local communities understand the changing ocean and sea-ice conditions.

The observatory monitors the coastal Arctic’s undersea environment with instruments and sensors that measure air and water temperature, solar radiation, oxygen, turbidity, salinity, and other ocean conditions. Real-time data, including underwater and onshore video, are available online via ONC’s website.

This past summer, ONC expanded further north into the High Arctic by installing ocean observing infrastructure at Gascoyne Inlet, approximately 800 kilometres closer to the North Pole than Cambridge Bay. The new instruments and sensors have been producing continuous real-time data since September.

“It’s difficult and challenging,” ONC associate director of science services Richard Dewey says of installing and maintaining observatory infrastructure in the Arctic. “But that’s what Ocean Networks Canada does best.”
Science and research: Sea-ice modelling, ocean acidification monitoring

Part of gaining a better understanding of climate change in the Arctic is the study of sea-ice processes, including growth and melt rates, and ocean acidification, which is when carbon dioxide (CO2) from burning fossil fuels dissolves in seawater, making oceans both warmer and more acidic.

In 2015, ONC took leadership of a collaborative Safe Passage project aimed at improving the understanding of sea-ice processes, especially those critical to Arctic transportation, commercial shipping, and marine operations. The Polar Knowledge Canada (POLAR)-funded project integrates science, technology, and data with existing and historical monitoring programs and observations, including local and traditional knowledge of sea-ice processes such as routine observations of seasonal freeze-up and break-up.

Ada Loewen

A recently completed research project by the University of Victoria’s Ada Loewen looked at
forecasting sea-ice growth and melt. Loewen’s thermodynamic model—which used data from ONC’s Cambridge Bay observatory and snow depth samples to help predict ice thickness—found that while the date of freeze-up and growth season can be reasonably forecasted, melt season and break-up are more difficult to predict due to melt pond dynamics and the occurrence of extreme weather events and conditions.

“Every part of my research was supported by ONC infrastructure, data, and staff,” says Loewen. “Working with ONC has provided me with opportunities to take part in interesting science, work with great people, and develop research skills.”

A new research project by the University of Calgary’s Patrick Duke will study ocean acidification and the effects of increasing temperatures in the Arctic, and will incorporate data from the Cambridge Bay observatory.

“The high latitudes of the Arctic are currently a carbon sink for atmospheric CO2, which dissolves better in cold water. Cold water also holds more CO2,” says ONC’s Dewey. “But as ocean and atmospheric conditions get warmer sea-ice cover will be reduced. We’re likely going to see more snowfall, less sea ice and more open water.”

Brent Else

“There are very few observations of dissolved CO2 in Arctic waters, and to my knowledge this is the only sensor-based one,” says Duke’s academic supervisor, University of Calgary assistant professor Brent Else. “The volume and quality of data we are getting is remarkable. The other big advantage is to be able to see the data in real time.”

Community engagement: Outreach programs and youth education
Understanding sea ice and climate change in the Arctic is reliant on engaging with local experts and utilizing traditional knowledge. Prior to the installation of the Cambridge Bay observatory, ONC established relationships in the community through an outreach program that included youth education, direct involvement in research, use of local resources for equipment installation and maintenance, public presentations, live data displays, reports and online materials, and training for northern scientists. A highlight of the Safe Passage project was ONC’s innovative Arctic youth science ambassador program, which is founded on mutual respect and connects Indigenous knowledge with ONC data and ocean science.

“The first youth science ambassador program was a huge and absolute success,” says ONC associate director of user services Maia Hoeberechts, who leads the learning and engagement efforts. “The program, combining Indigenous knowledge with participatory research and citizen science, was very well-received in Cambridge Bay.”

A new youth science ambassador, Cambridge Bay’s second, will continue to participate locally in classroom presentations, student mentoring, community events, and the snow-monitoring program, which observes and measures snowfall, snow depth, and sea-ice thickness. “I am so happy to be on the team and excited for the upcoming new ideas for Cambridge Bay and the Arctic,” says Pearlie Mae Howard.

ONC is now extending its community-led snow, ice, and ocean monitoring programs into Kugluktuk and Gjoa Haven with goals that build on previous work: using local and traditional knowledge to make scientific observations; expanding engagement and educational outreach, including the youth ambassador and Ocean Sense school programs; developing community-friendly data products like navigation aids?maps and online information?to show current ice routes for travel, hunting, and trapping; working with the Canadian Ranger Ocean Watch
program and federal agencies in the Arctic to share and ingest data; and partnering with Nunavut Arctic College to develop an instrument technology course.

?Ocean Networks Canada has the expertise to be the leader in future community-based science research,? says ONC?s Hoeberechts. ?ONC infrastructure and data help Arctic communities identify and prepare residents to deal with local problems while thinking about global connections, and see substantial benefits from ongoing research and science.?

**ONC at Arctic Change 2017 conference in Quebec City**

ONC staffers—including those from the science, user services, learning and engagement, marine operations and technology, innovation and engineering, and communications teams—will be attending the Arctic Change 2017 conference from 11-15 December in Quebec City:

- Visit us in Booth 11 at Arctic Change 2017
- A list of talks/posters by ONC staff, students, and partners can be found [here](#)

**More information:**

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**About Ocean Networks Canada:**

ONC monitors Canada?s west, east, and Arctic coasts to continuously deliver real-time data for scientific research that helps communities, government, and industry make informed decisions about our future. Using cabled ocean observatories, remote control systems, interactive sensors, and big-data management, ONC enables evidence-based decision-making on ocean management, disaster mitigation, and environmental protection.

Established in 2007, ONC is a University of Victoria initiative funded by the Canada Foundation for Innovation, the Government of Canada, the Government of British Columbia, CANARIE and IBM Canada.

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**About Polar Knowledge Canada:**

POLAR is responsible for advancing Canada?s knowledge of the Arctic, strengthening Canadian leadership in polar science and technology, and promoting the development and distribution of circumpolar knowledge. POLAR operates the Canadian High Arctic Research Station (CHARS) and conducts cutting-edge, world-class Arctic research out of this extraordinary facility to improve economic opportunities, environmental stewardship, and quality of life for northerners and all Canadians.

- [Polar Knowledge Canada](#)
ONC project partners:

- Canada Foundation for Innovation
- University of Quebec, INRS Centre Eau Terre Environnement
- Carleton University
- University of Calgary
- University of Alberta
- University of Victoria
- Canadian High Arctic Research Station
- Canadian Ice Service
- Environment and Climate Change Canada
- Fisheries and Oceans Canada
- Transport Canada

Learn more:

- ONC’s Cambridge Bay community observatory: Using technology, the Internet, and data to #knowtheocean (see PDF below)
- ONC’s Arctic observatory map

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PDF File:

Cambridge Bay community observatory (PDF)

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