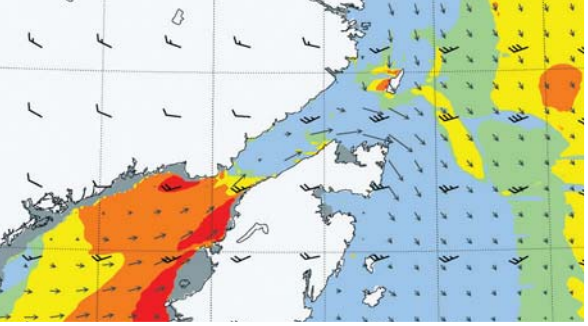

NRC pioneers in the development of high resolution ice forecasting in Canada's Arctic

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Ocean, Coastal and River Engineering

NRC model measures and predicts the effects of pressured ice

Pressured ice conditions arise when environmental forces cause the convergence of ice, creating dangerous build-ups. This pressured ice can have seriously adverse effects on ships causing them to be stranded in harsh climates and increasing the safety risks to the crew aboard. Until 2011, no reliable method was available to predict these dangerous regions making it extremely difficult to navigate through ice-covered waters. Depending on the severity of ice conditions, a vessel affected by pressured ice can be beset between a few hours to a couple of weeks.

NRC has since become a pioneer in the development of high resolution ice forecasting in Canada's Arctic. Research on the topic was aimed at developing specific characterizations of pressured ice, and quantifying the ability of ships to navigate in such conditions. The result of this research, the Pressured Ice Model, is now being used successfully by organizations that have major operations in the Arctic.

The model technology incorporates complex numerical constructs to predict jamming and arch-formation in narrow channels of the Canadian archipelago and other regions of interest. Maps created by the model demonstrate the evolution of ice thickness, ice concentration, ice pressure build-up and ice ridging. The advanced model enables the prediction of ice movement and dynamics, and most importantly, regions of pressured ice conditions.

Captain David Fowler of the Canadian Coast Guard (CCG) was able to successfully implement the information provided by the Pressured Ice Model in his travels through the Gulf of St. Lawrence this past winter, prior to his retirement. A proud mariner of over 36 years, Captain Fowler used the software to reroute and escort vessels to their destination.

Photo contributed by Tim Keane, Fednav

The picture was taken in June 2007 when the UMIAK, icebreaking bulk carrier, was beset in pressured ice for 10 days.

"The model helps you predict where the worst ice conditions will be providing you with the most desirable route," said Captain Fowler. "It is unique in that it compiles the best ice, current and wind information available and tells the mariner what the ice conditions will be rather than what they were."

In February 2014, Captain Fowler was in command of an icebreaker in the Cabot Strait when he received a call from a tanker traveling toward Charlottetown. Using the Pressured Ice Model, he provided updated route information to guide the tanker to a rendezvous position, then successfully escorted it to Charlottetown avoiding regions of a higher pressure value without incident.

Photo contributed by Captain Fowler, CCG

Captain Fowler at the controls of the Terry Fox while backing down the starboard side of the tanker. Using the Pressured Ice Model, he successfully escorted the tanker to Charlottetown avoiding regions of a higher pressure value without incident.

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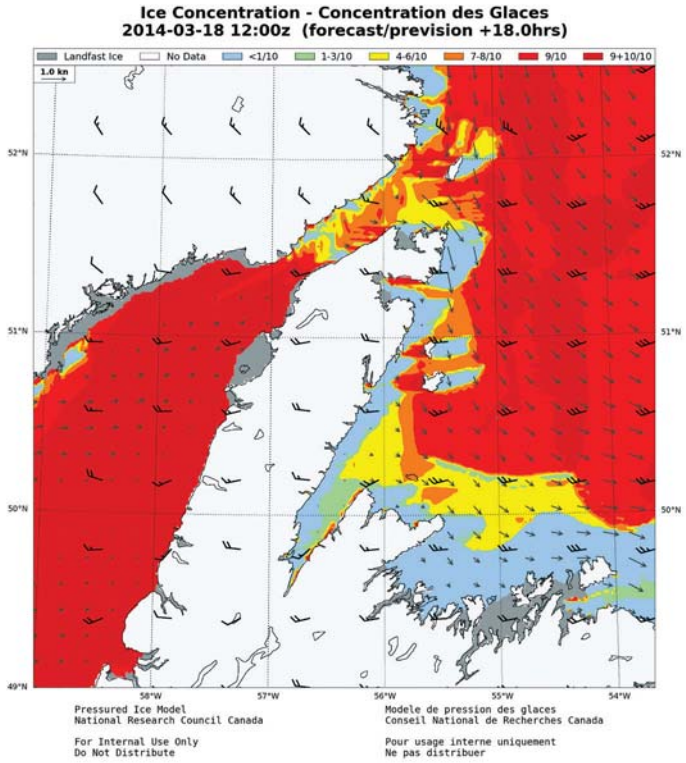


The model has been implemented at the CCG regional office in St. John's, Newfoundland, licensed for use by a large O&G operator and it has been successfully licensed for training by the Marine Institute of St. John's. In addition, the forecast generated by the model has been provided to Canadian Ice Services (CIS) for the regions of the Gulf of St. Lawrence, Strait of Belle Isle and the Newfoundland Coast.

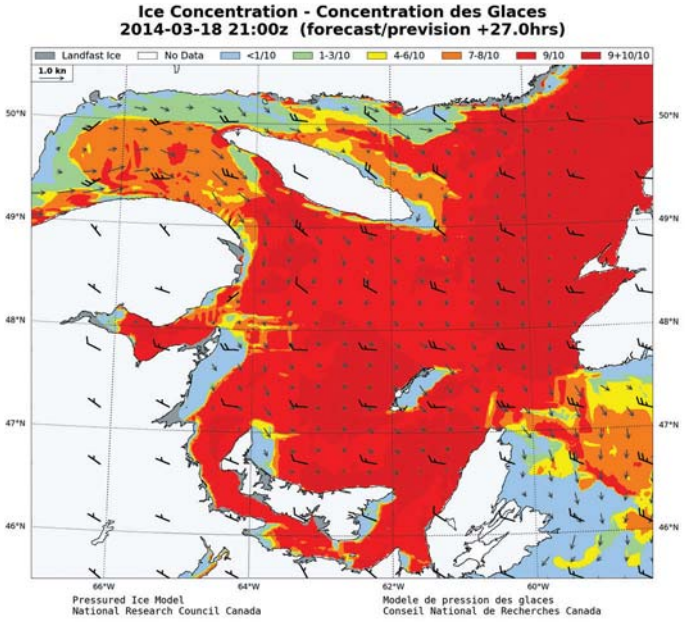
The availability of this technology to Arctic shippers is vital. Once a ship is beset in pressured ice, there is very little that can be done. When this occurs, there are many concerns including the health and safety of the crew, the increasing cost of operations and adverse environmental effects.

The tool is unique in that it is possible to modify the interface to allow for the input of local conditions, making the data all the more reliable and decreasing the risk of vessel besetting. It is being continuously updated to allow for the incorporation of feedback from end-users.

Including local weather in the calculation was one of the suggestions Captain Fowler discussed with the NRC team. "Working with NRC was a great experience," said Captain Fowler.

"They were pro-active in seeking our feedback being very receptive to our comments and suggestions. It was clear that they wanted to achieve a solution that would work best for us, considering everything from the environment we worked in to the tools we had to work with. I hope that this type of research that supports and improves our economy and safety while protecting the environment will continue to have Canada's support."

Work on the model continues. Collaborating with clients and partners, NRC also hopes to create tools such as guide booklets, charts and tables to provide accessible information on the criteria of ship besetting.



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July 2014 Également disponible en français.