

Advancements in Ice Forecasting and Analysis in Support of USCG Operations



Presenter:

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25 May 2023



Mission and Organizational Alignment



The U.S. National Ice Center provides global to tactical scale ice and snow products, ice forecasting, and related environmental intelligence services for the United States government.

USNIC tri-agency organization composed of:

NOAA component:

Ice Services Branch under Ocean Prediction Center (NWS)

Navy component:

Naval Ice Center under Fleet Weather Center – Norfolk

USCG component:

Mobility and Ice Operations Division under the Office of Waterways and Ocean Policy



TEAM, EXCELLENCE, RESPECT

Great Lakes Ice Products and Services

Direct Support to the National Economy

2021-2022 Ice Season

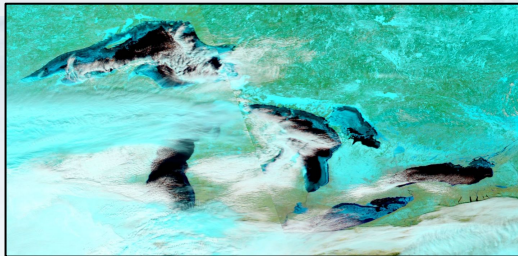


USCG Sector Sault Ste Marie → Conducted Operation Taconite

- Duration: 108 days of icebreaking operations
- 9 USCG Cutters and 2 Canadian Coast Guard Cutters assigned spending a total of 5,731 hours of icebreaking to assist 404 commercial vessels transit
- Supported movement of 7.9 million tons of cargo (e.g., iron ore, coal, salt, stone, cement, gasoline, diesel and heating oil) valued at ~\$283 million

USCG Sector Detroit → Conducted Operation Coal Shovel

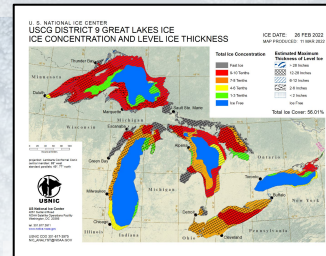
- Duration: 76 days of icebreaking operations
- 6 USCG Cutters assigned spending a total of 881 hours of icebreaking to assist 198 vessel transits
- Supported movement of ~\$140 million in cargo



MODIS imagery on February 24, 2022. Image source: NASA Worldview



U.S. Coast Guard Cutter Mackinaw



USNIC analysis valid February 26, 2022 - date of maximum ice coverage



U.S. Coast Guard Cutter Neah Bay and Canadian Coast Guard Ship Samuel L. Risley

TEAM, EXCELLENCE, RESPECT

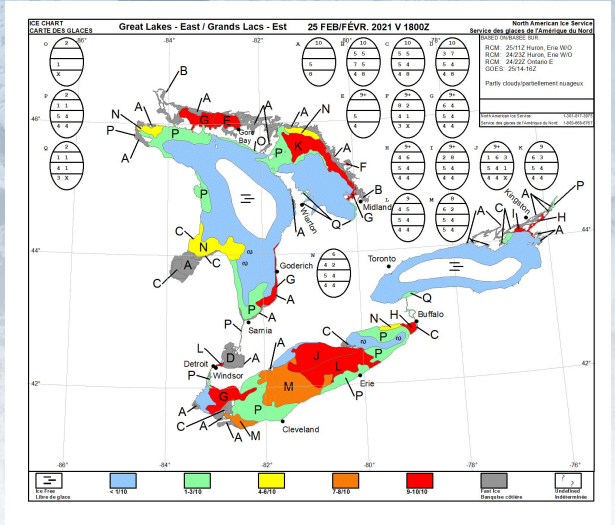
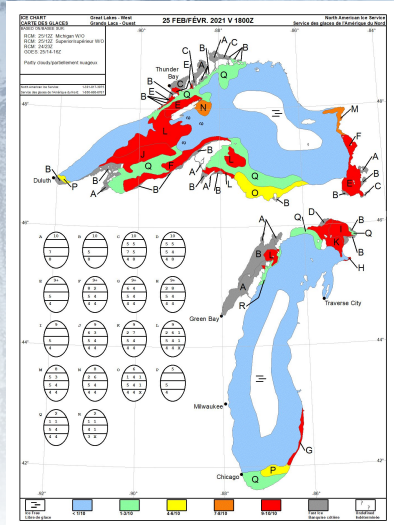
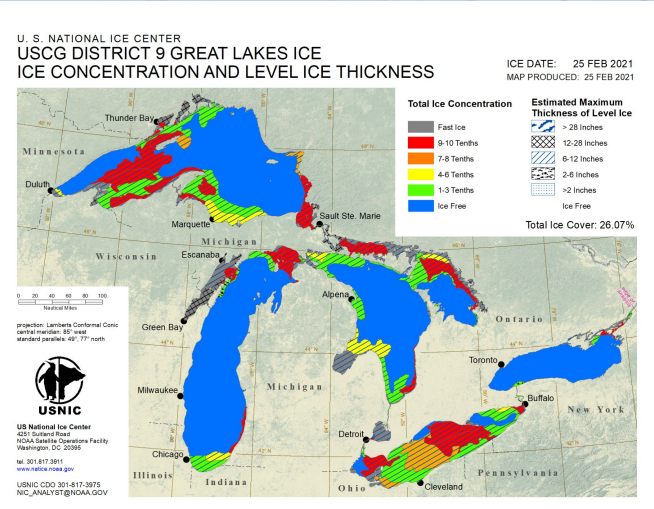
USNIC Support to USCG Operations

Background: Prior to 2022



Broad products covering the entire Great Lakes region

- Good for situational awareness and asset management across the lakes
- Valid 18Z each day - no forecast component
- Not useful for tactical scale decision making



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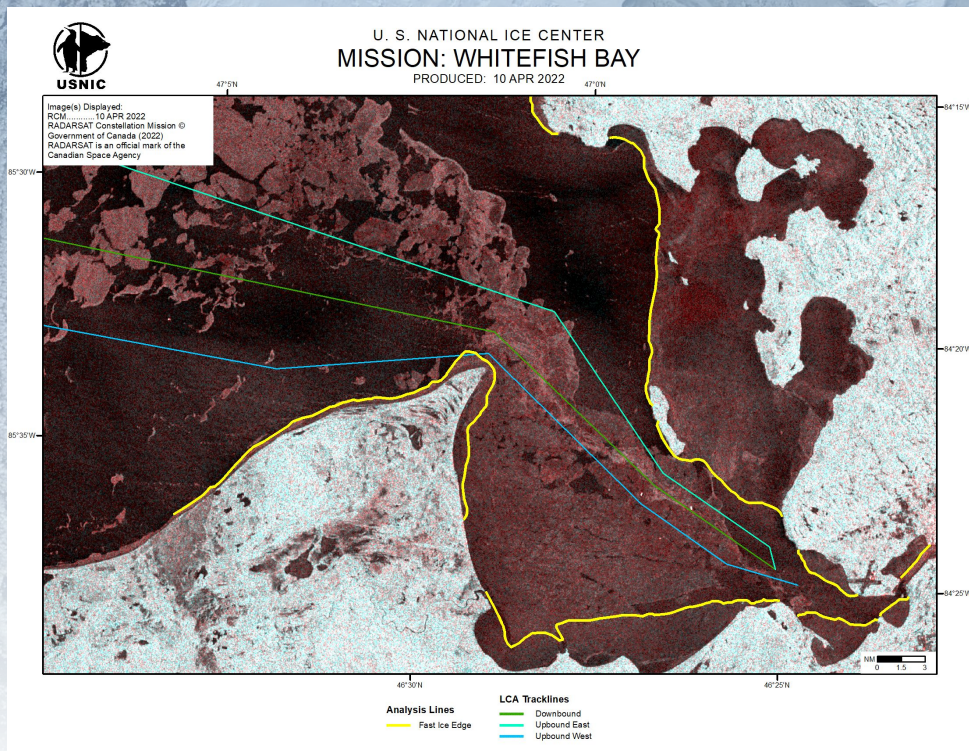
USNIC Support to USCG Operations

Background: Spring Breakout 2022



Request for additional support from USCGC Mackinaw

- More timely information - e.g. available in the morning at the start of the days operations - annotated satellite imagery in particular was desired
- Addition of Lake Carriers Association tracks to products
- Forecast information
 - Where is the ice moving?
 - Will existing ice deteriorate/will new ice start to form?
 - Will shore fastened ice breakup?





USNIC Support to USCG Operations

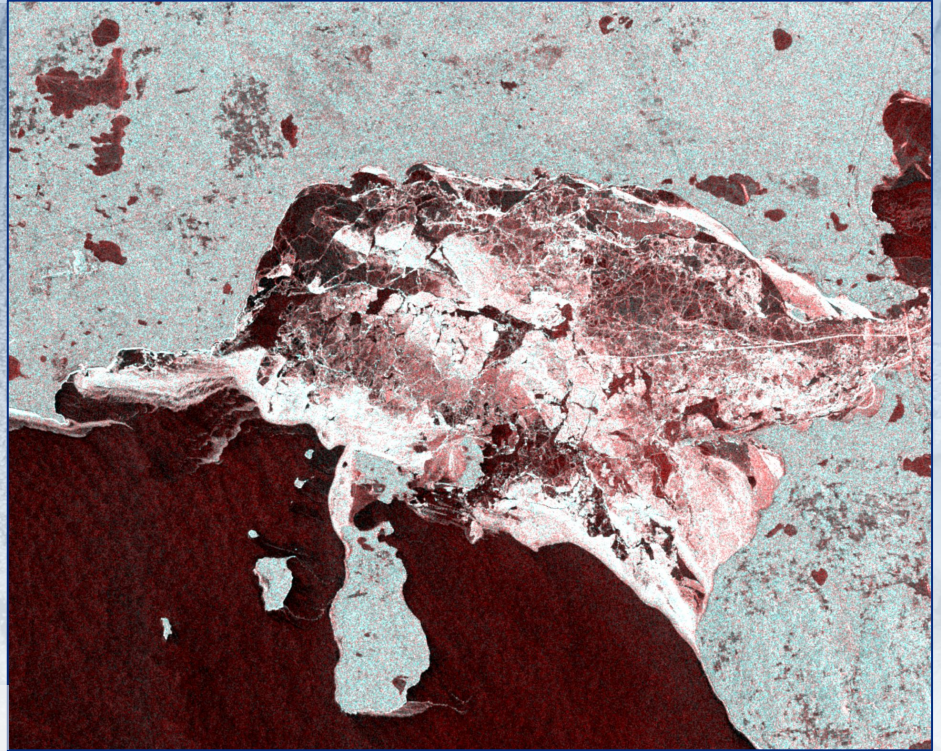
Spring Breakout 2022: Satellite Imagery Sources

Primary Imagery Source:

- Synthetic Aperture Radar (SAR) from the Radarsat Constellation Mission

Secondary Imagery Sources:

- Radarsat-2 (also SAR)
- Sentinel-1 (also SAR)
- GOES
- VIIRS



RADARSAT Constellation Mission (RCM) © Government of Canada (2022) RADARSAT is an official mark of the Canadian Space Agency

USNIC Support to USCG Operations

Current Status: Preparation and Execution Winter 2022-23

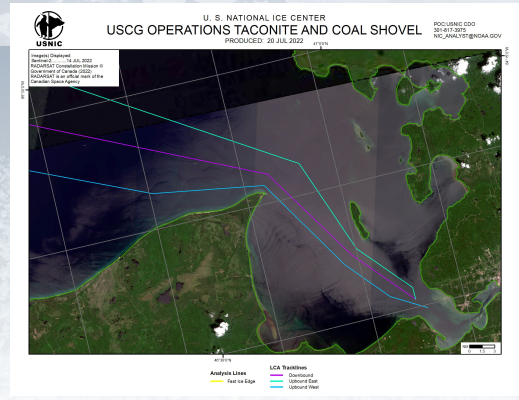
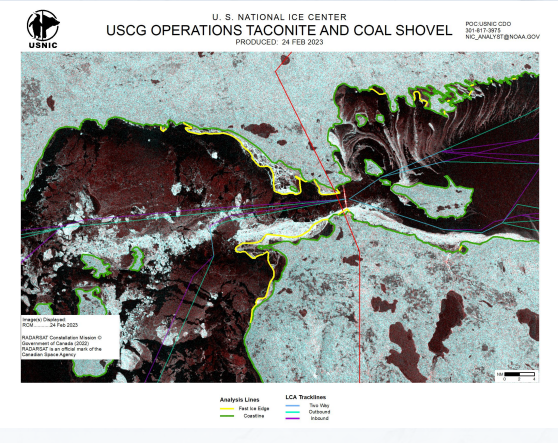


Coordination with the USCG Sectors Sault Ste. Marie and Detroit

- Lessons learned from spring 2022
- Additional areas of importance for USCG winter operations

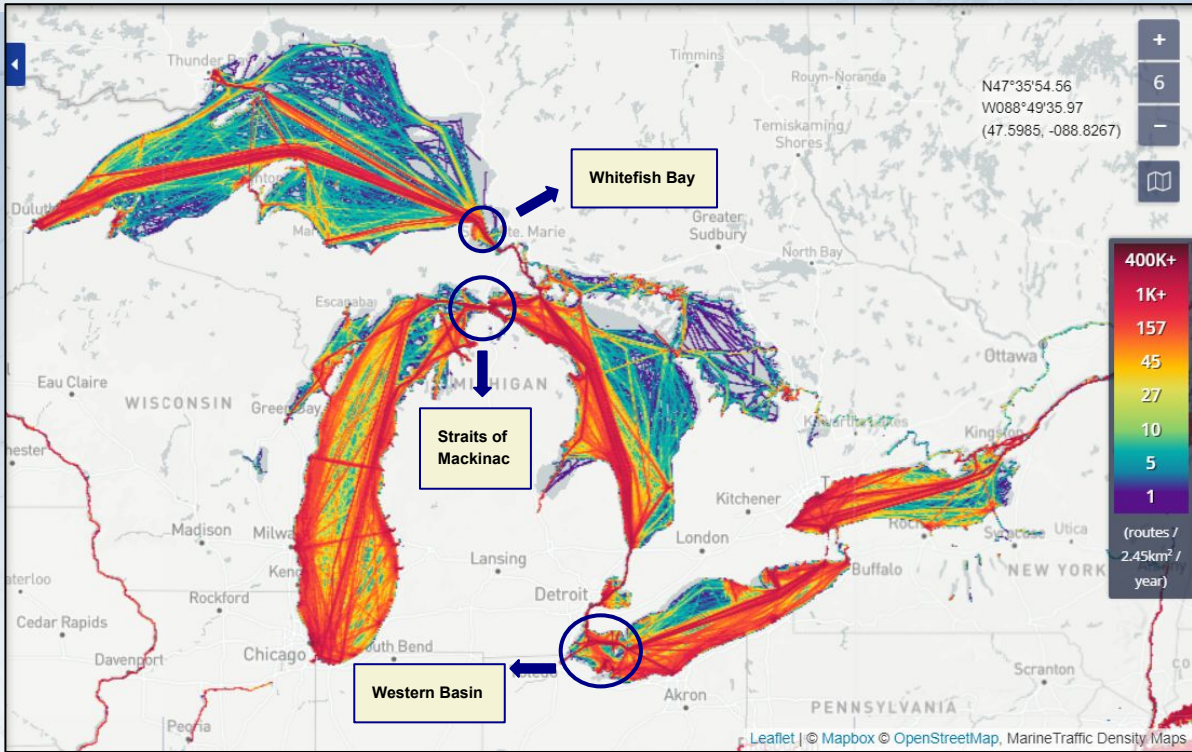
Internal coordination at USNIC - Operations, Satellite Imagery Order Desk, IT

- Accessing additional sources of satellite imagery - e.g. Sentinel-2
- Improving capabilities of our GIS software



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Evolution of and Increasing Demand for Tactical Scale Products



2021 Great Lakes Shipping Routes (routes / 2.45km² / year) Source: marinetraffic.com

In coordination with USCG Sectors Sault Ste. Marie and Detroit, USNIC developed new products focused on key areas for winter shipping

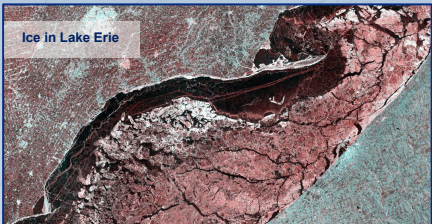
Focus Areas for 2022-2023 Season:

- Lake Erie: Western Basin
- Lake Superior: Whitefish Bay
- Lakes Huron and Michigan: Straits of Mackinac

Commercial Satellites

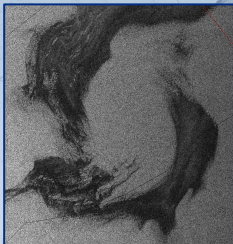


Radarsat-2



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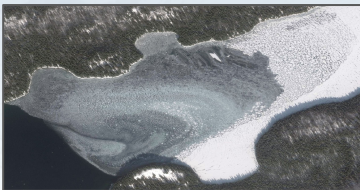
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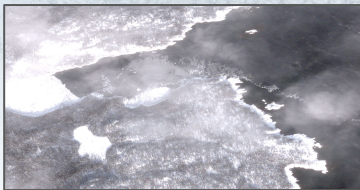
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Synthetic aperture radar (SAR) platforms - taskable by USNIC's Satellite Imagery Order Desk

WorldView and BlackSky



WorldView Imagery © MAXAR (2022)



BlackSky Imaging © (2022) Image Taken 20 Jan 2022 1717 UTC

High resolution optical imagery - we can we can submit a request to NRO and USGS for imagery over a location

USNIC Support to USCG Operations

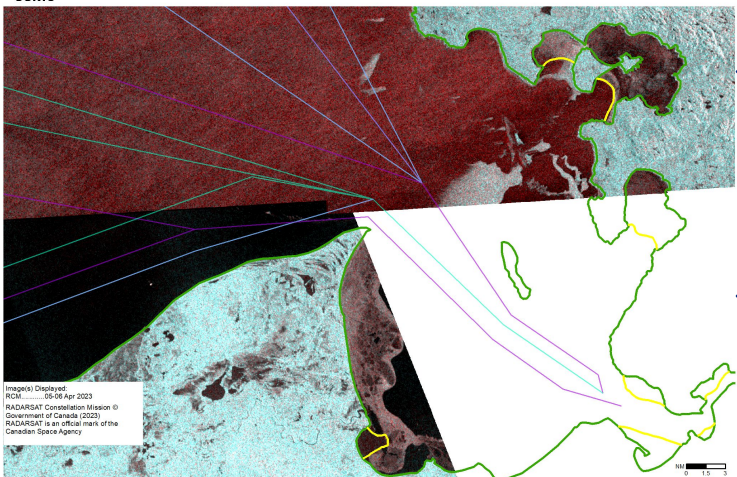
Continued Evolution: Winter 2023-24 and Beyond



Goal: Continued, iterative improvements each season

- Idea: Initial product using older SAR imagery followed by update once optical imagery is available:

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 USCG OPERATIONS TACONITE AND COAL SHOVEL
 PRODUCED: 06 APR 2023
 POC:USNIC CDO
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Analysis Lines
 Fast Ice Edge
 Coastline

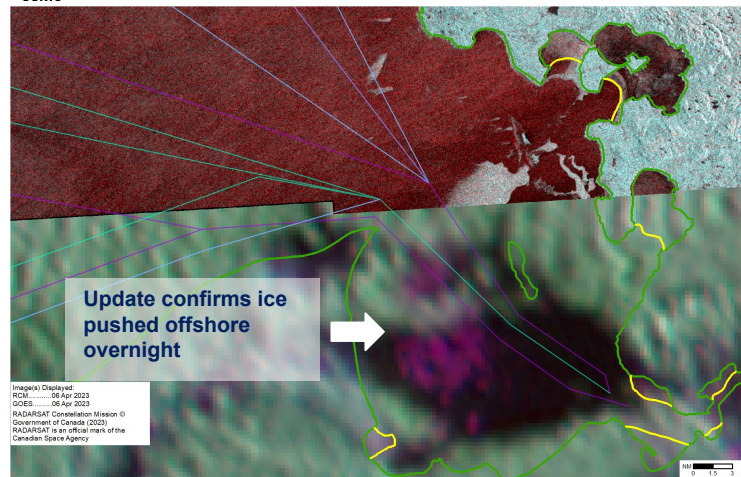
LCA Tracklines
 Two Way Outbound
 Inbound

SAR Imagery valid between 11-12Z

SAR Imagery valid around 23Z the prior evening

GOES imagery valid around 13Z

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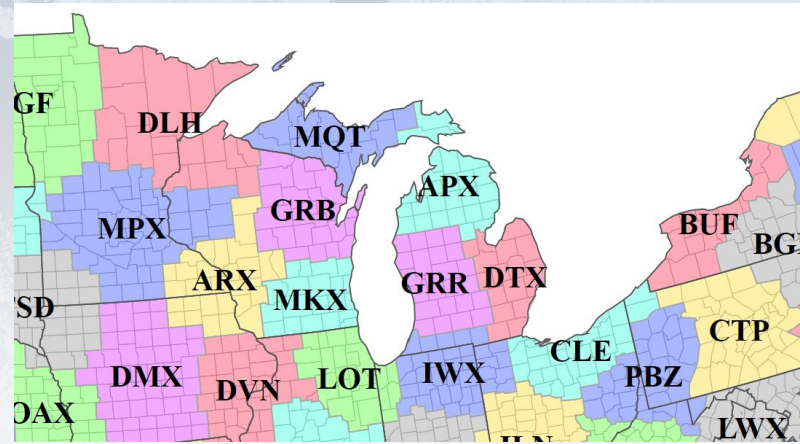


USNIC Integration into NWS

The NOAA component of USNIC formally became the Ice Services Branch of the Ocean Prediction Center in May 2020

Goal: continued integration with different parts of the NWS

- Copy relevant WFOs on IDSS for situational awareness?
- Add more marine and/or weather information to ice products?
 - Currently providing watches/warnings
- Joint IDSS where appropriate?
 - This is already occurring with MQT & DLH for the National Parks Service



Questions

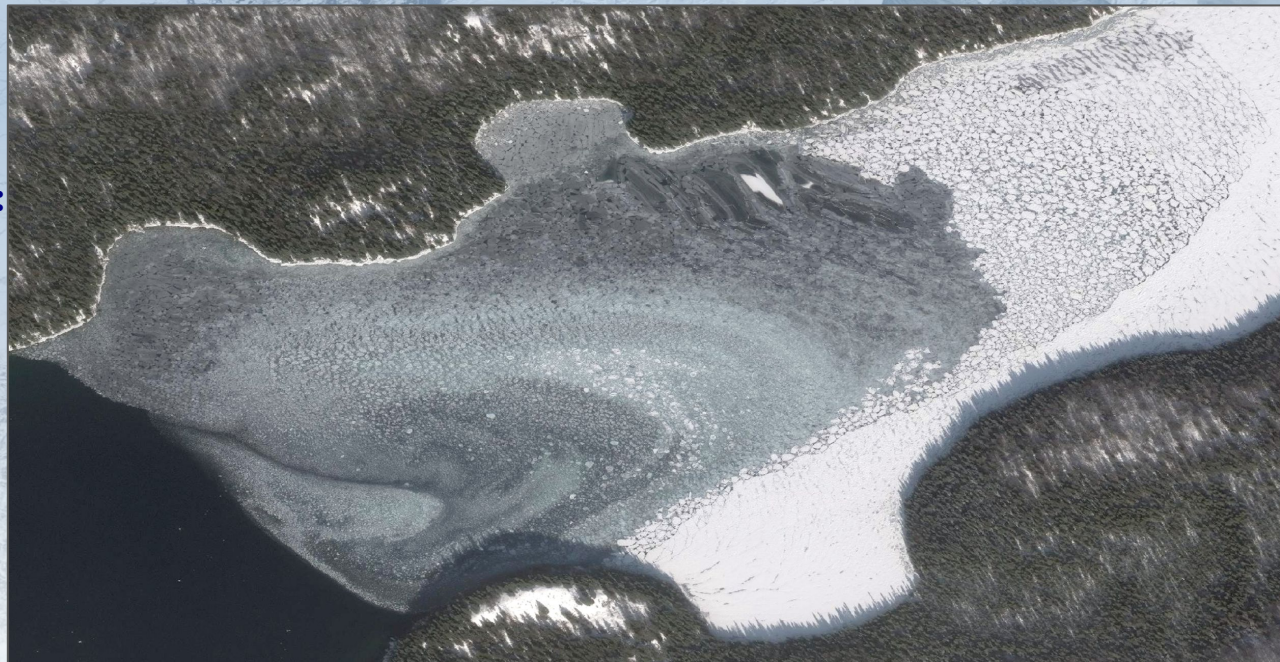


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<https://usicecenter.gov>



WorldView Imagery © MAXAR (2022)

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