

# Satellite SAR Ice Mapping with RADARSAT-2

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## Overview

Satellite derived surface temperature is the most used and distributed CoastWatch product. Research and development is needed to validation and enhance this data in the Great Lakes region, and to develop regional products for GLERL and its regional CoastWatch data users. New satellite sensors such as RADARSAT-2 Synthetic Aperture Radar (SAR) products supply enhanced ice-type classification data and mapping algorithms.

## Objective

Support decisions in aviation, marine, and surface navigation

## Proposed Work

- Plans to transit Lake Superior to collect in-situ with US Coast Guard
- If RADARSAT-2 data is obtained, algorithm development can proceed using GLERL's library of SAR signatures

## Accomplishments

- RADARSAT-2 was launched in December, 2007
- After a commissioning phase of about 3 months, data available mid-March, 2008

## Scientific Rationale

Remote sensing is an important component of GLERL's new theme areas, particularly physical environmental and ecological prediction. Sensing provides data for model initialization, validation, monitoring, management, and decision making owing to:

- the number and capabilities of current and future satellites
- the cost effectiveness of these satellites to provide synoptic and localized data (E.g. NASA EOS suite of satellites)
- the synoptic view provided only by satellite observation (real-time, high temporal and spatial resolution)

There are many potential applications to Great Lakes scientific research. Scientists will develop algorithms to quantitatively map chlorophyll, classify and map ice cover and ice movement, identify algal blooms/whitings vs. plumes, detect and map change (such as from erosion), detect and map potential fish habitat, thermal fronts, upwelling, and other variables. Processes can be studied with high spatial resolution 2D and 3D sensors such as interferometric, hyperspectral, and lidar sensors.

Development of these algorithms requires scientific research. Measurement capabilities, real-time nature of the measurements, and archive of measurements by innovative products such as COSMO-SKYMED provide vital knowledge of physical, biological, and chemical processes in the Great Lakes.

### **Governmental/Societal Relevance**

Great Lakes CoastWatch utilizes imagery from new satellite sensors such as Synthetic aperture radar (SAR) for ice classification and mapping and ocean color sensors such as MODIS or the Sea Viewing Wide Field-of-View Sensor (SeaWiFS) for ocean color (chlorophyll) products. Data derived from these satellite sensors is needed to:

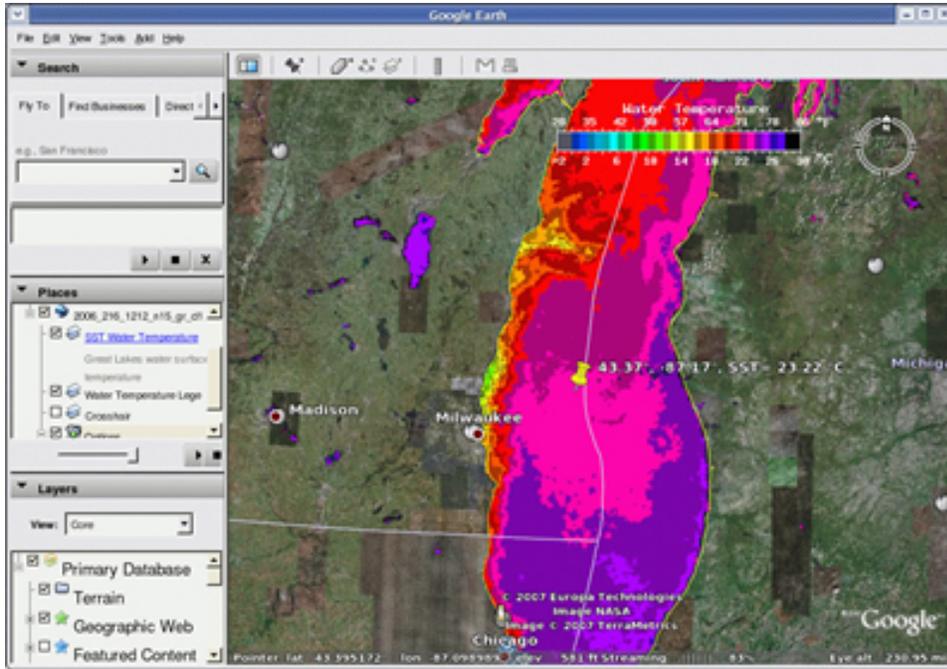
- Enhance the Great Lakes CoastWatch product suite available at GLERL
- Develop regional products and applications for the Great Lakes of use to management, the scientific community, and the public
- Contribute to the operational responsibilities of sister agencies (i.e. U.S. Coast Guard, National Ice Center, National Weather Service, and Sea Grant)
- Planned to be incorporated into the developing Great Lakes Observing System (GLOS) as “backbone or core” data and products.

### **Relevance to Ecosystem Forecasting**

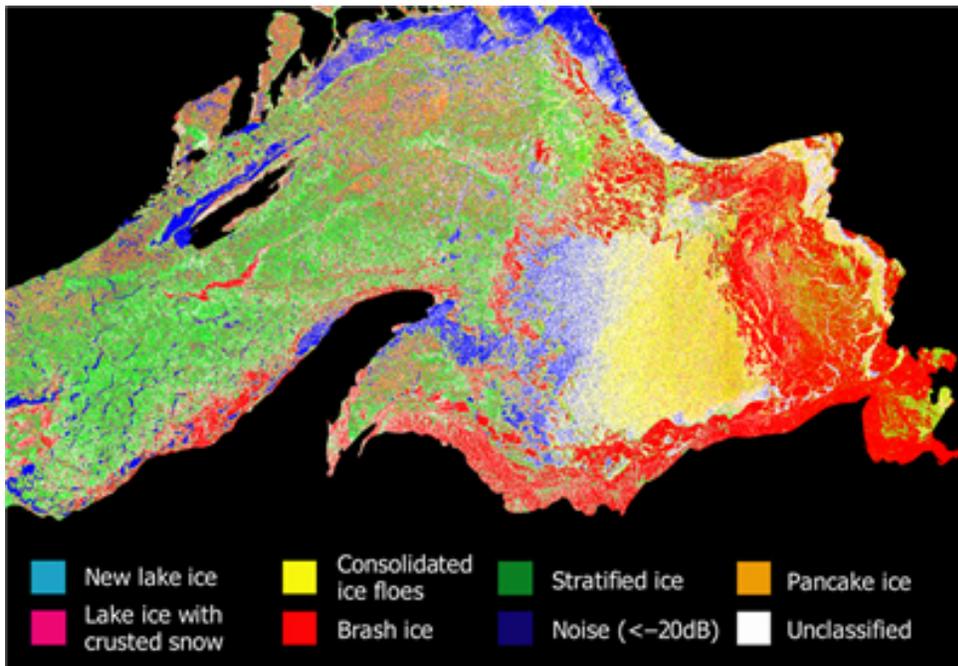
Developing the capability to measure and track parameters such as ice, turbidity, chlorophyll, DOC, SM, winds and harmful algal blooms at the synoptic scales is needed for model development to improve forecasts. In the proposed Great Lakes Fishery Commission’s (GLFC) Yellow Perch proposal, high resolution satellite data is used to detect, define, and monitor plumes from the Maumee and Detroit Rivers in correlation to Yellow Perch production.

Defining the size and extent of a plume will also provide an estimate of total suspended matter, validation of sediment transport models, and guide to optimize in situ sampling. Plume parameters are also important because sediment/dissolved organic carbon protect harmful bacteria from UV radiation. Moreover, ice cover extent and thickness are sensitive indicators of climate change and variability.

### **Products**



**Product Development - Google Earth**



**Future Products - RADARSAT-1 March 22, 1997 - Ice Type Classification (Satlantic)**