NOAA Lake Superior Monitoring

Lake Superior Environmental Monitoring Collaborative

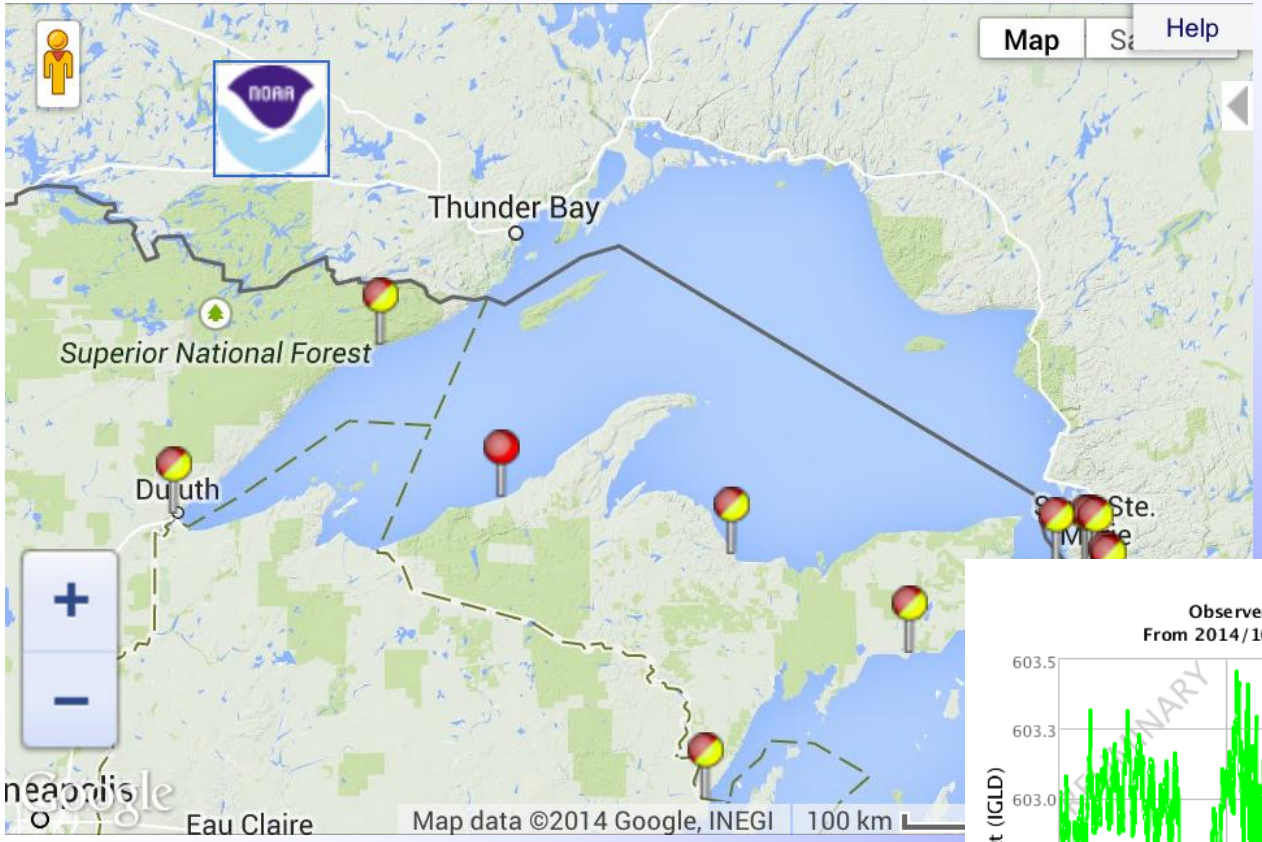
November 19, 2014

Duluth, MN

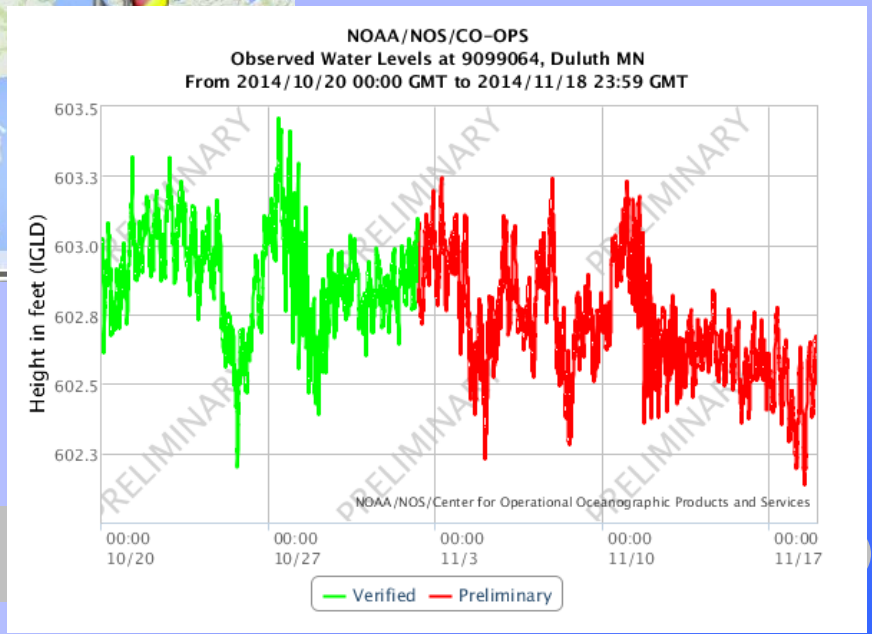
Steve Ruberg
NOAA
Great Lakes Environmental Research Lab
Ann Arbor, MI

GLERL

Lake Superior Water Level Data

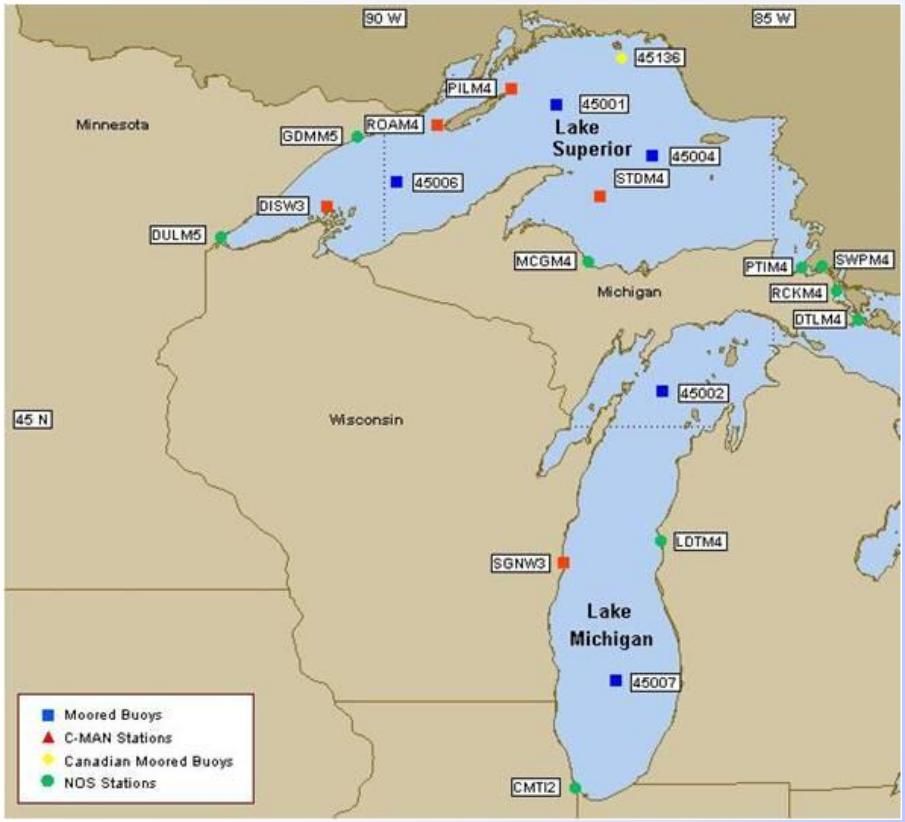


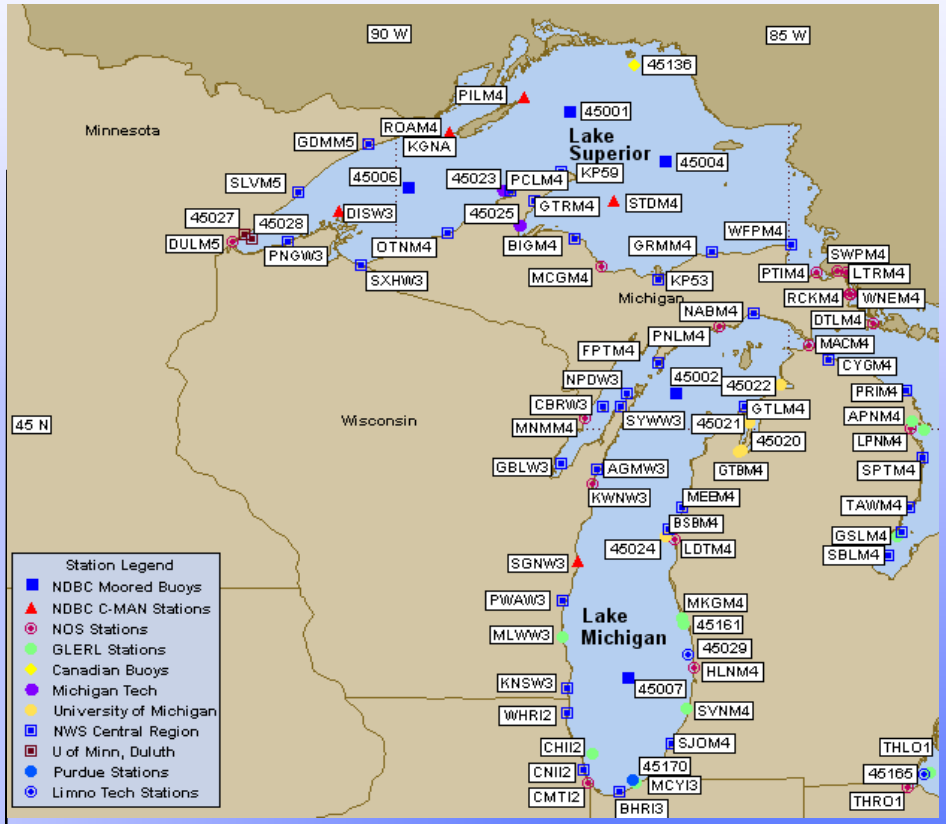
An important observation for the St Louis River estuary (NOAA NERRS)



GLERL

Marine Weather Data Sites
Western Great Lakes





ndbc.noaa.gov

GLERL

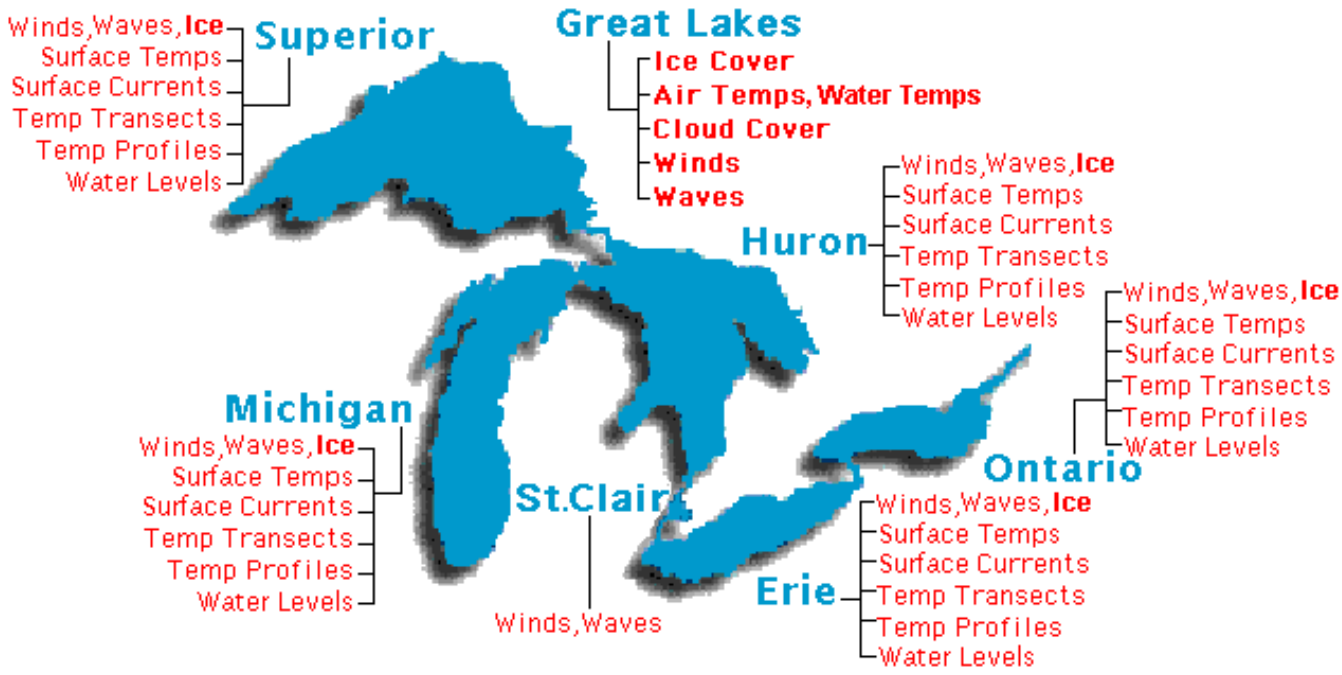
Great Lakes Coastal Forecasting System

GLCFS

- Computer models that predict:
  - waves, temperature, currents, water levels, ice
- Nowcast every 6 hours
- 5-day forecast every 12 hours
- Scales of 0.5 km to 10 km

Great Lakes Forecasting System

Nowcast every 6 hours
Forecast (5-day) every 12 hours



www.glerl.noaa.gov/res/glcfs

Show apps

NOAA/GLERL Great Lakes Surface Currents Map

See Additional Currents: Latest Depth-Averaged | 3hrs Previous Depth-Averaged | Latest Surface | 3hrs Previous Surface
Updated four times per day at 3 and 9 Eastern Time

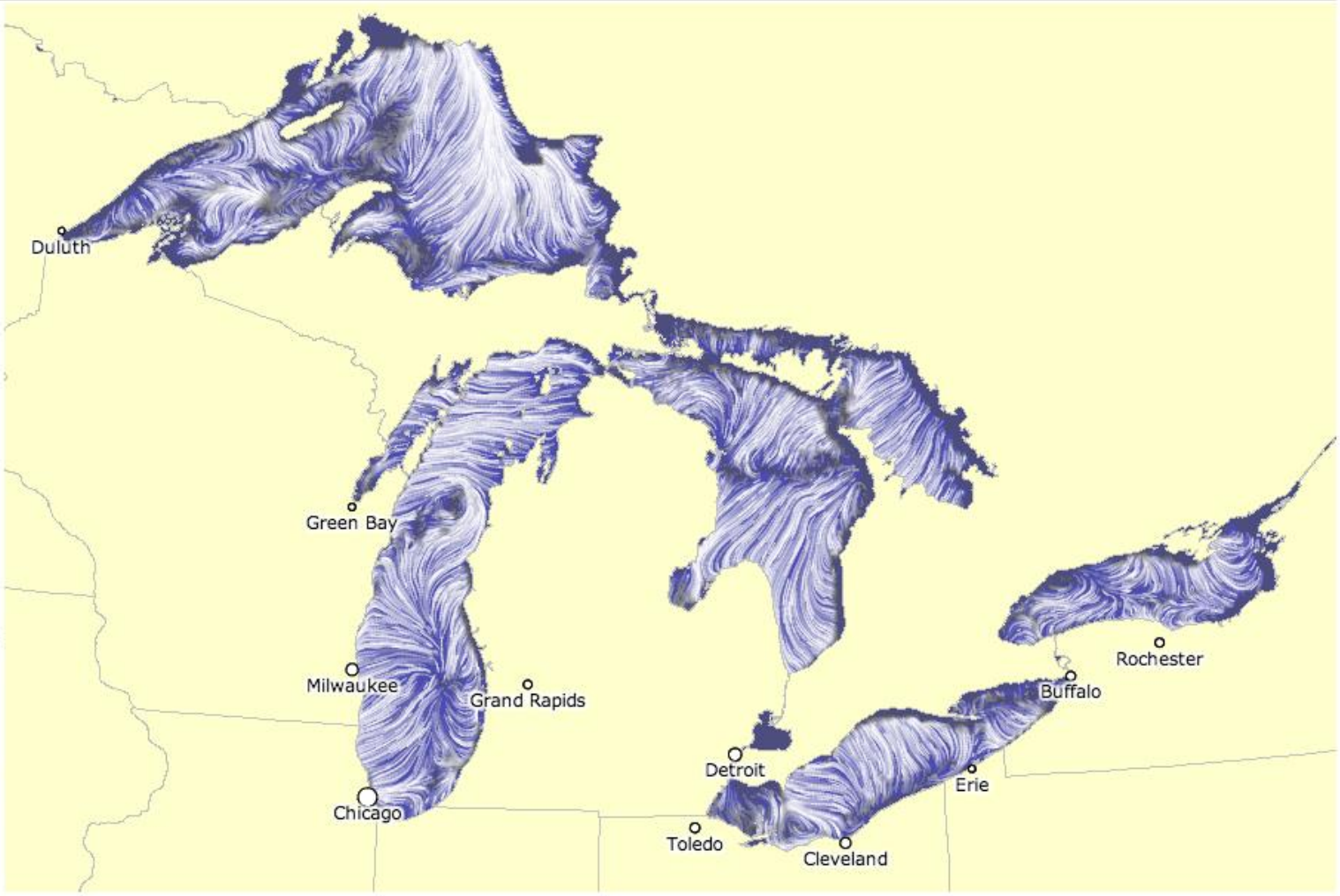
Valid:
2014-08-07
12:00 GMT

top speed: **28.3 cm/s**
average: **8.9 cm/s**

1 cm/s
2 cm/s
5 cm/s
7.5 cm/s
10 cm/s
20 cm/s

Monthly Depth-Averaged Currents for 2010-2013

Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
Nov
Dec

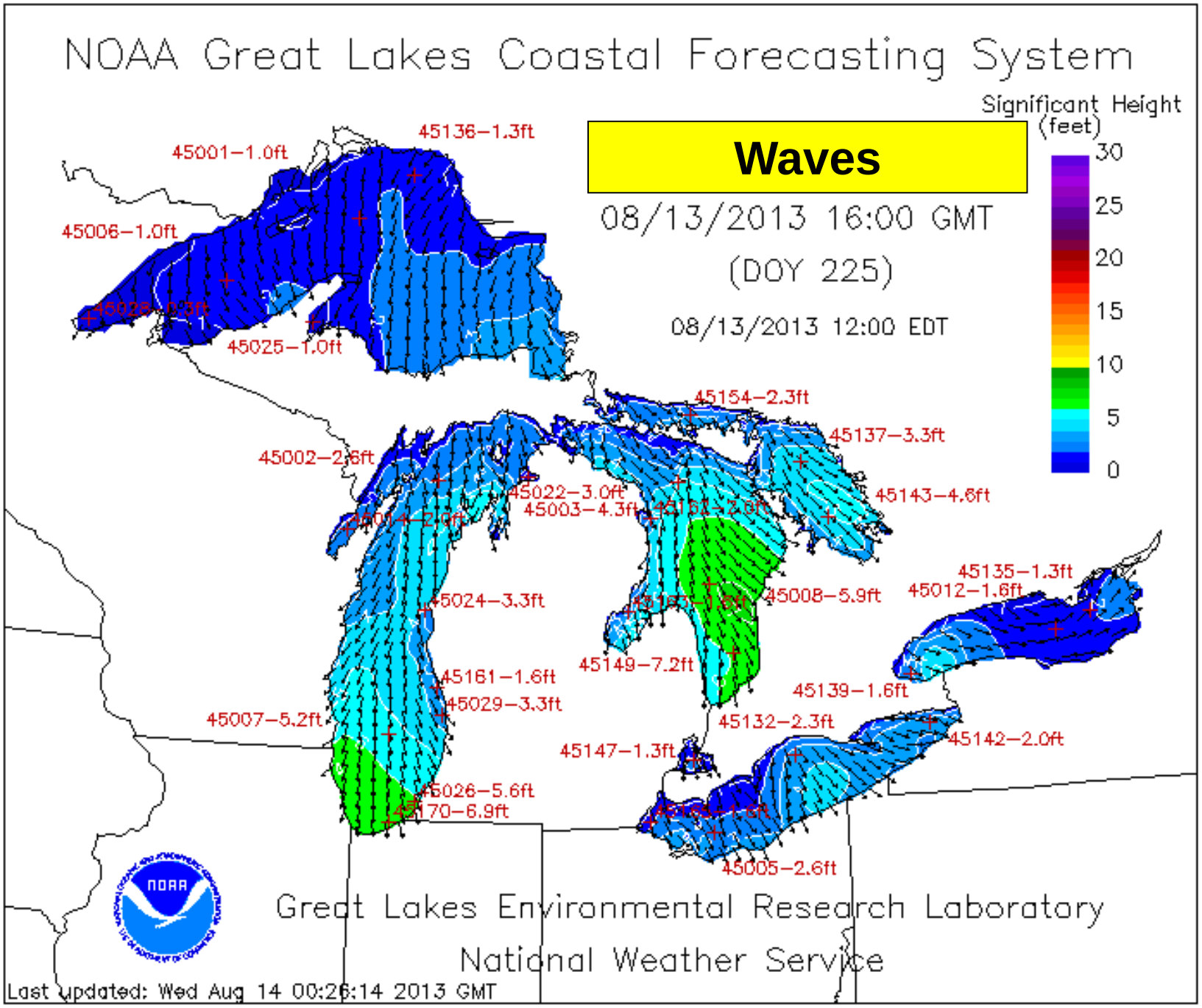


Click on map to zoom; click and drag to pan. This animation may not work on all browsers.

The flow patterns depicted in these visualizations of lake currents are based on simulations from the Great Lakes Coastal Forecasting System operated by NOAA's Great Lakes Environmental Research Laboratory.

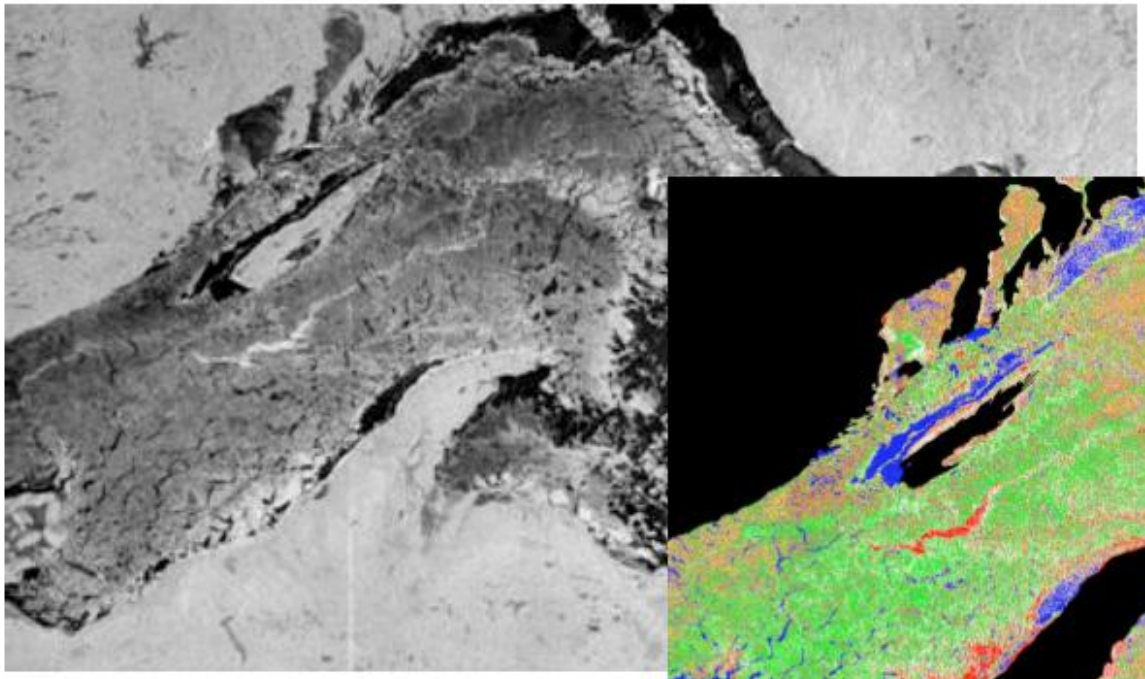
The "Latest" and "3hrs Previous" visualizations depict water motion corresponding to a **snapshot** of lake currents at the present time and three hours previous to the present time. Lake currents can change rapidly with changing wind conditions.

GLERL
Great Lakes Environmental Research Laboratory


NOAA Great Lakes Coastal Forecasting System
Waves
08/13/2013 16:00 GMT
(DOY 225)
08/13/2013 12:00 EDT
Significant Height
(feet)
30
25
20
15
10
5
0
45136-1.3ft
45001-1.0ft
45006-1.0ft
45025-1.0ft
45154-2.3ft
45137-3.3ft
45002-2.6ft
45022-3.0ft
45003-4.3ft
45143-4.6ft
45024-3.3ft
45008-5.9ft
45135-1.3ft
45012-1.6ft
45149-7.2ft
45161-1.6ft
45029-3.3ft
45139-1.6ft
45007-5.2ft
45132-2.3ft
45142-2.0ft
45147-1.3ft
45026-5.6ft
45170-6.9ft
45005-2.6ft
Great Lakes Environmental Research Laboratory
National Weather Service
Last Updated: Wed Aug 14 00:26:14 2013 GMT

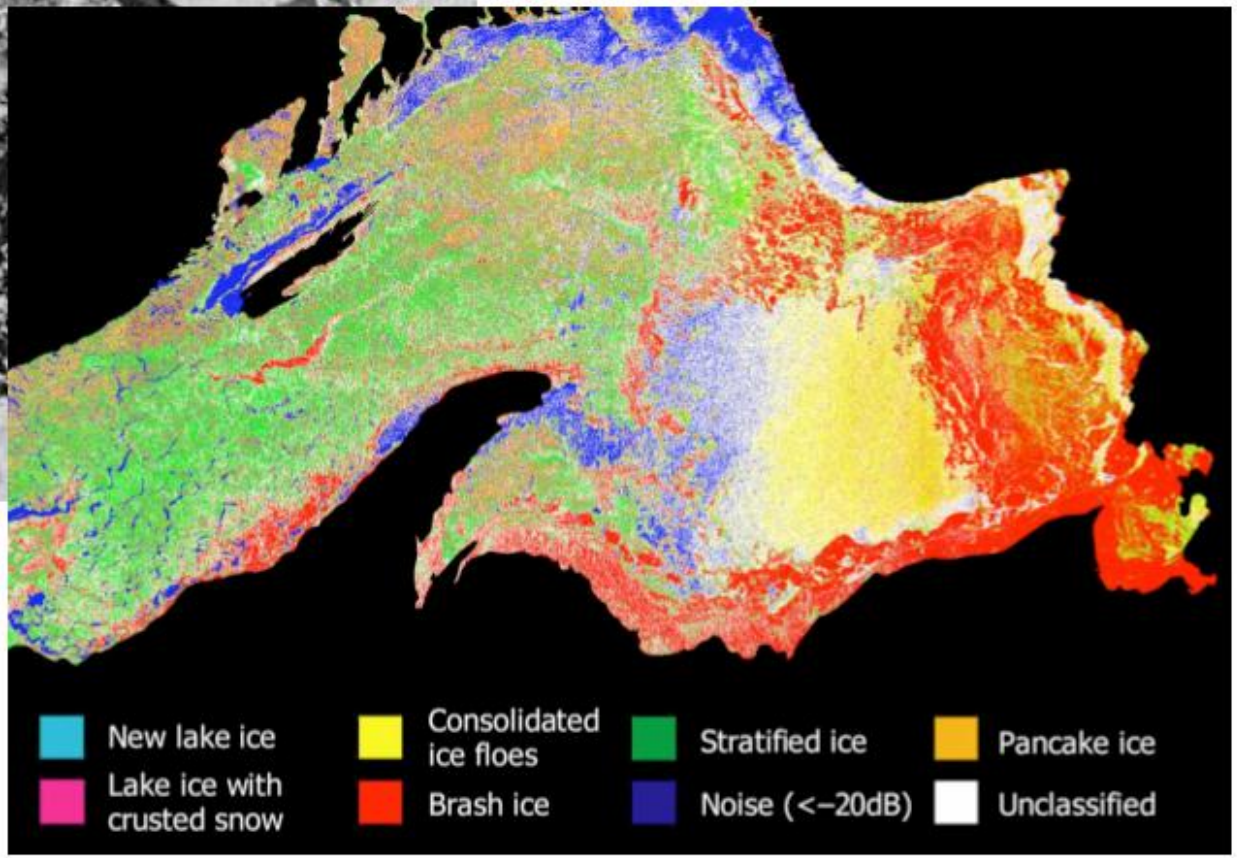
Great Lakes Ice Classification

Parameter: Lake ice type and location
Decision Support: Safety of lake transportation

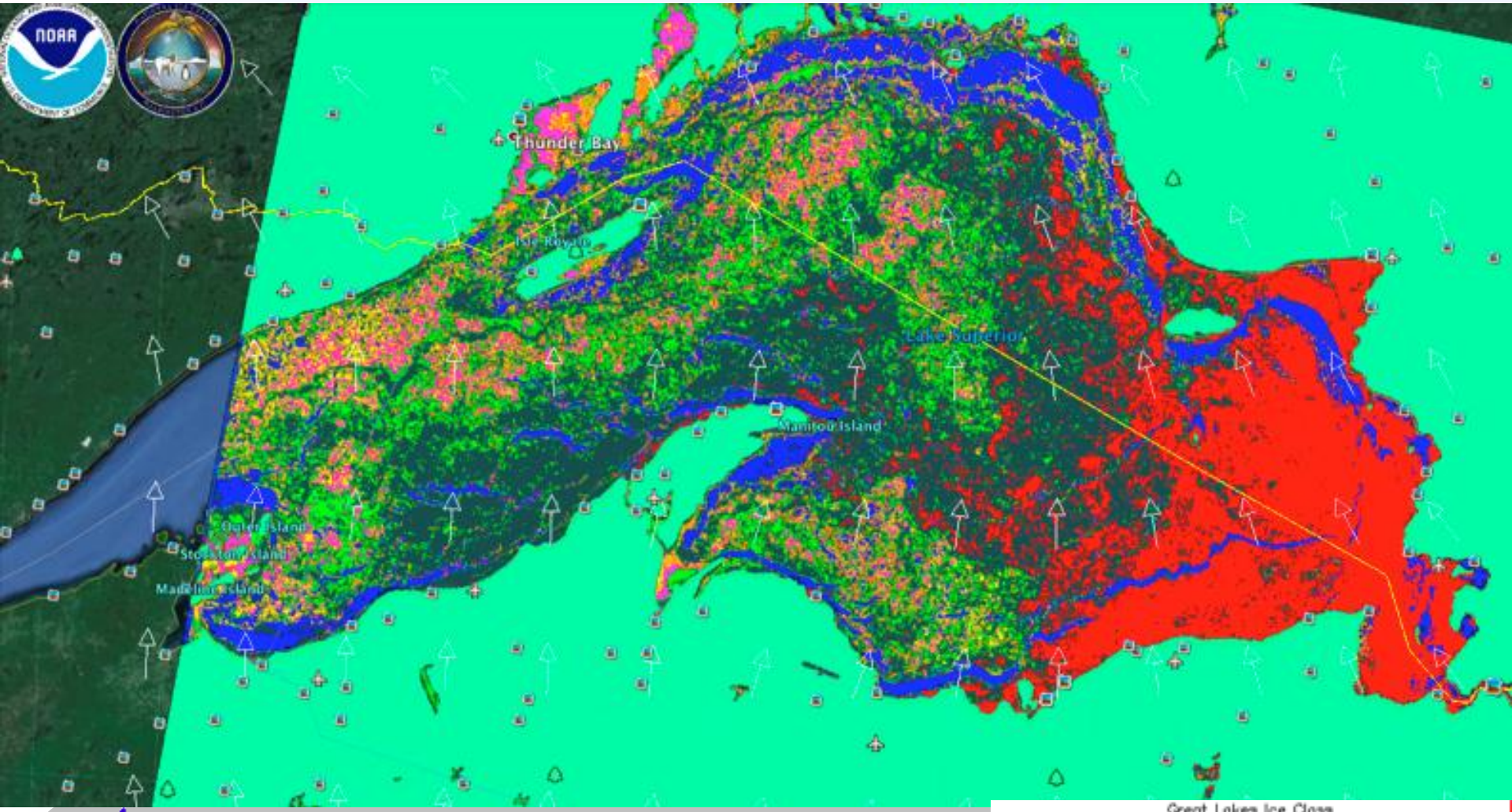


RADARSAT-1
© CSA, 1997
March 22,1997
During GLAWEX'97
(GLERL)

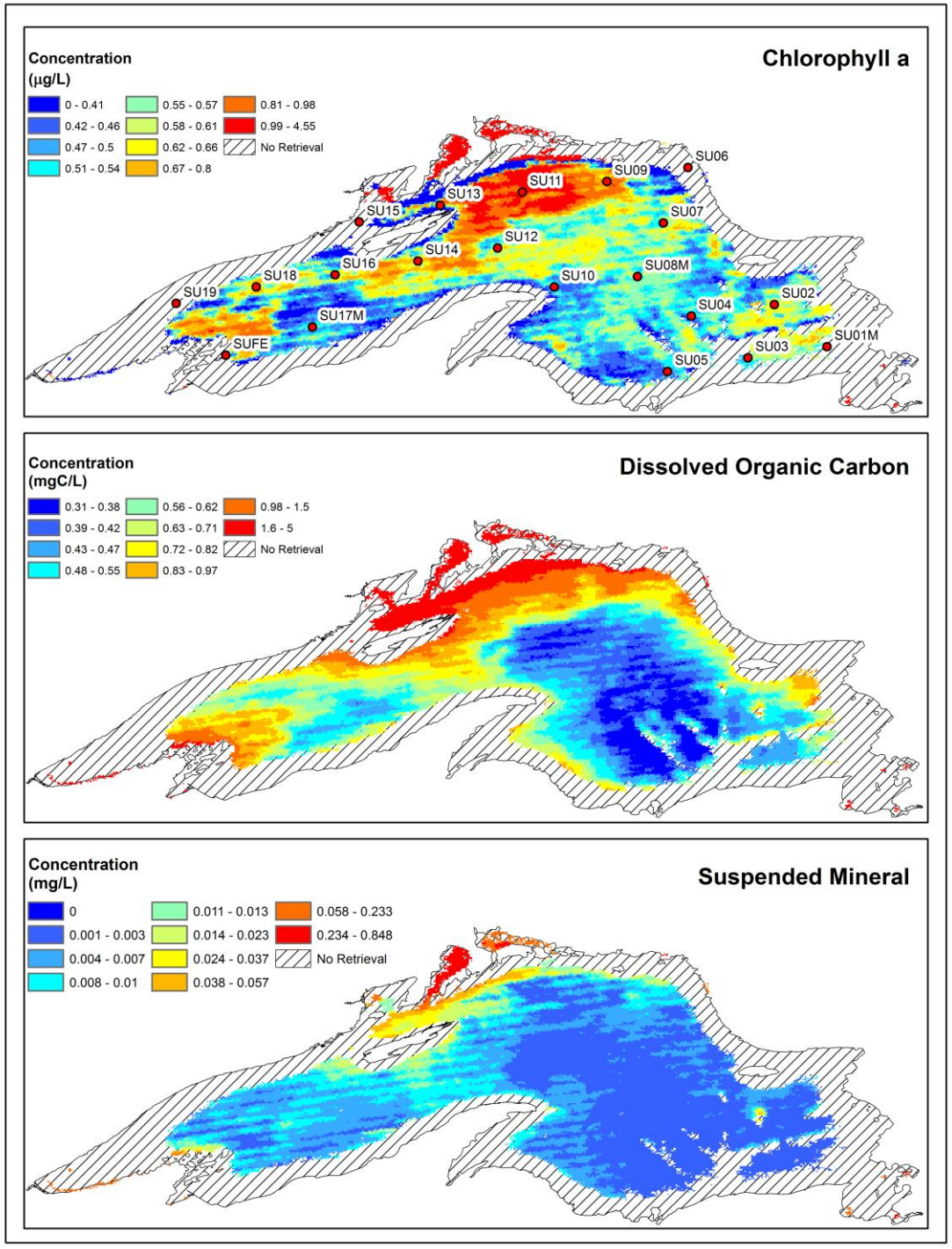
Lake Superior Research Ice Classification



Ice classification from Radarsat-2 image – March 20, 2014



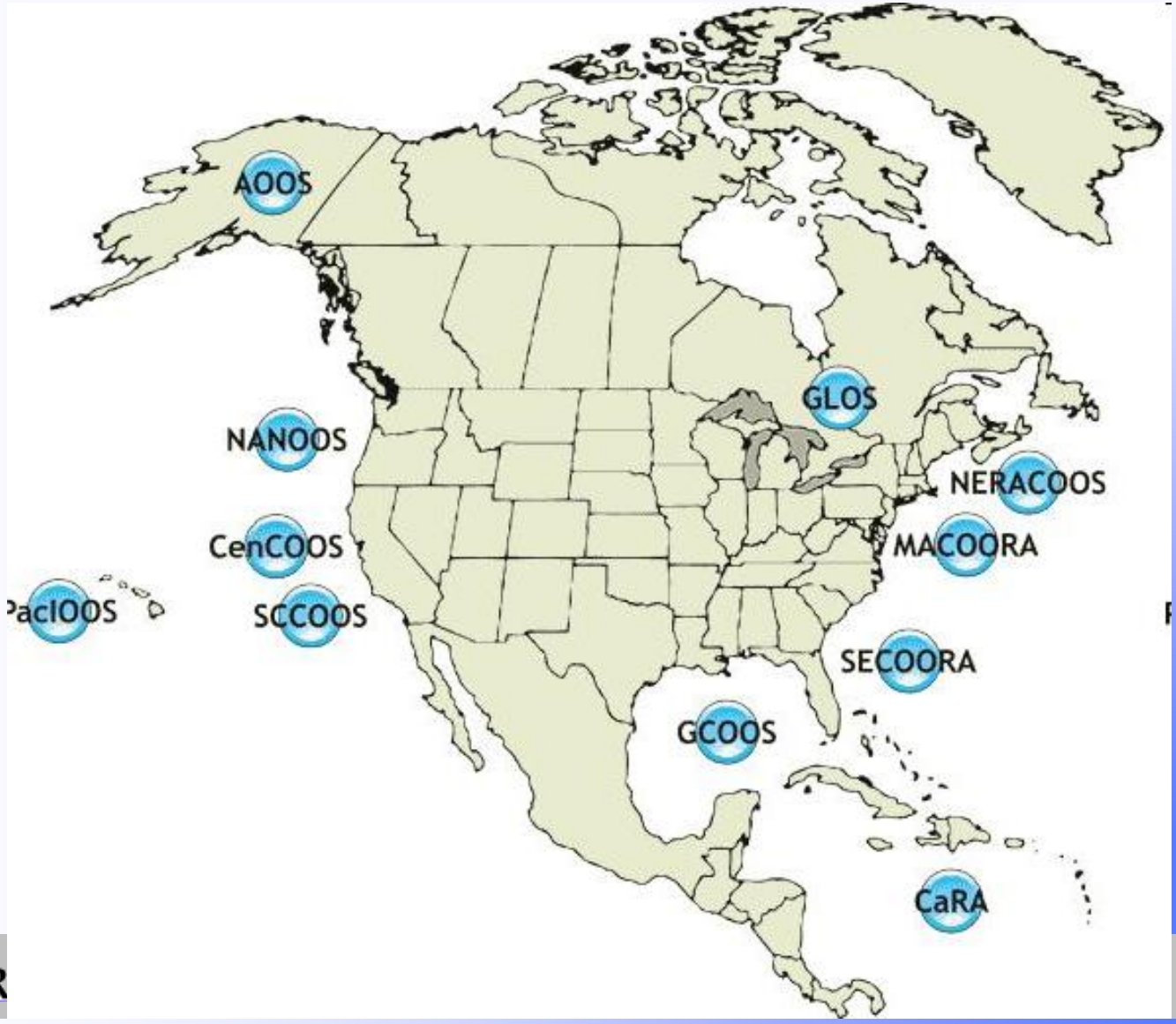
GLERL



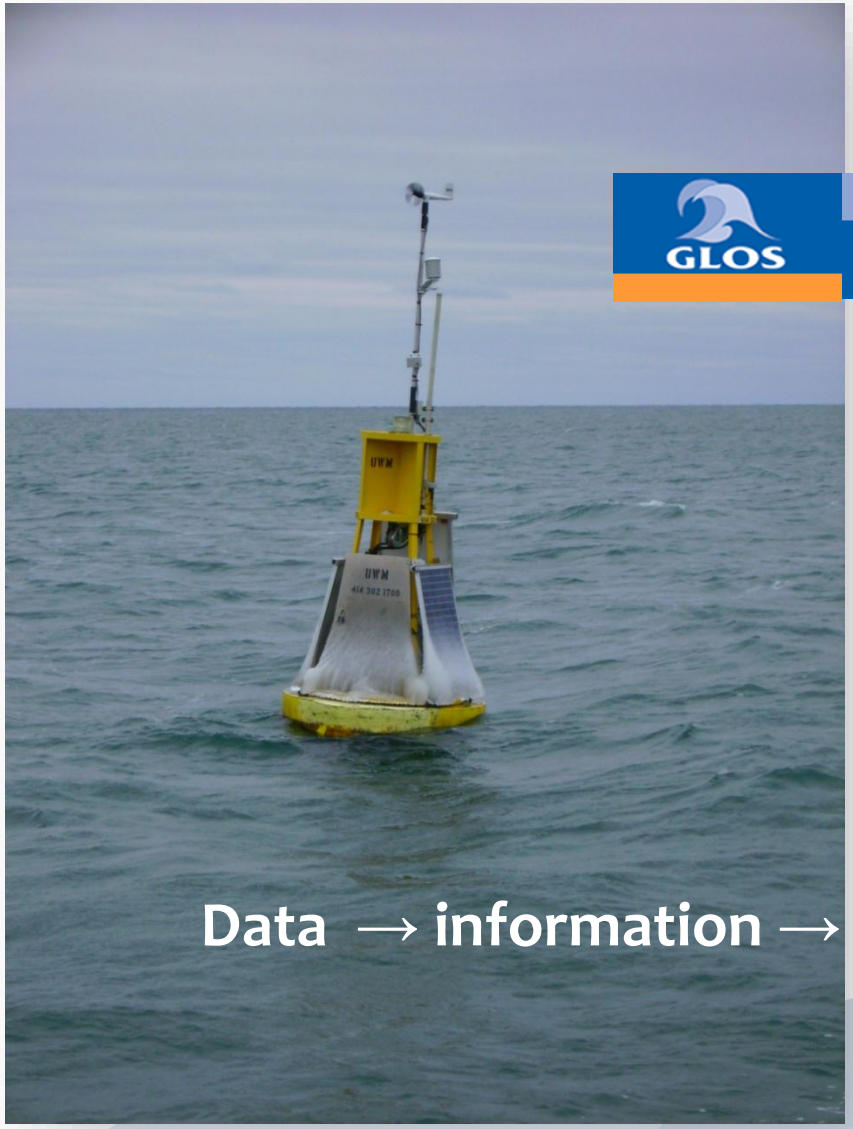
. Remote sensing color producing agents (CPA) retrieval for August 25, 2008 MODIS image.

. Red dots indicate EPA sampling station locations.

Great Lakes Observing System Regional Association



GLER



Report of the obs team:

Great Lakes Observing System

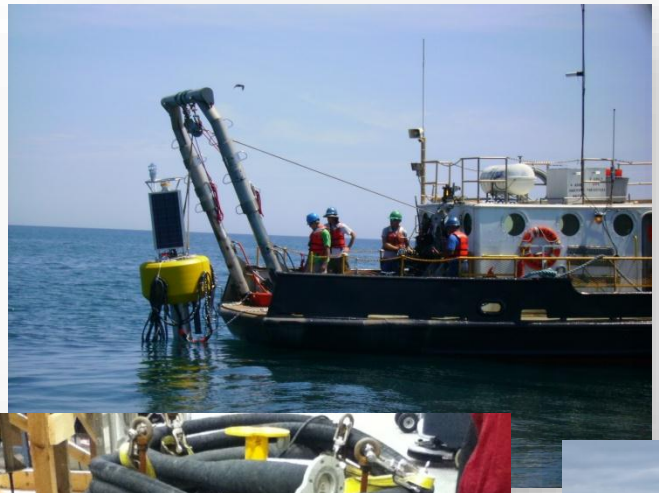
Observational data for the Great Lakes region

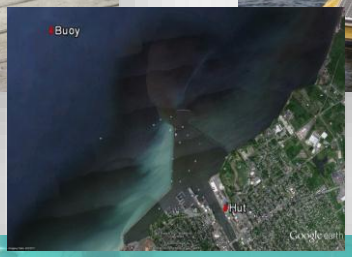
- Michigan Tech Univ.
- Univ. Minnesota – Duluth
- Univ. Wisconsin – Milwaukee
- NOAA GLERL
- SUNY GLRC
- Univ. Michigan – CILER
- Limnotech LLC

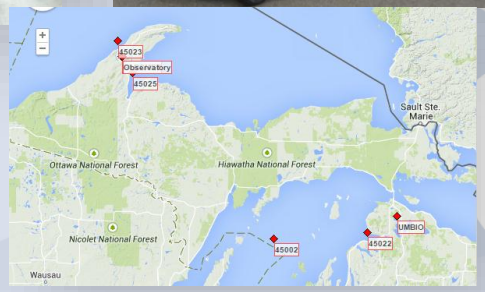
Data → information → understanding → wisdom → action

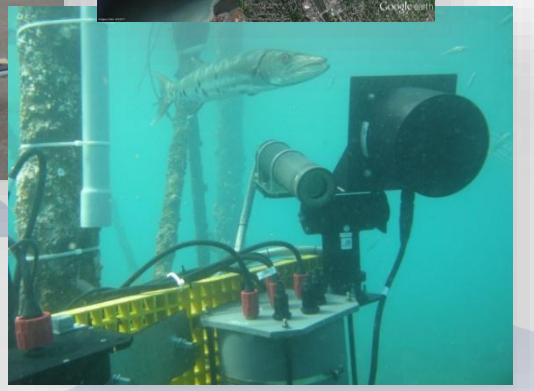
"measure to manage"

GLOS Monitoring Assets

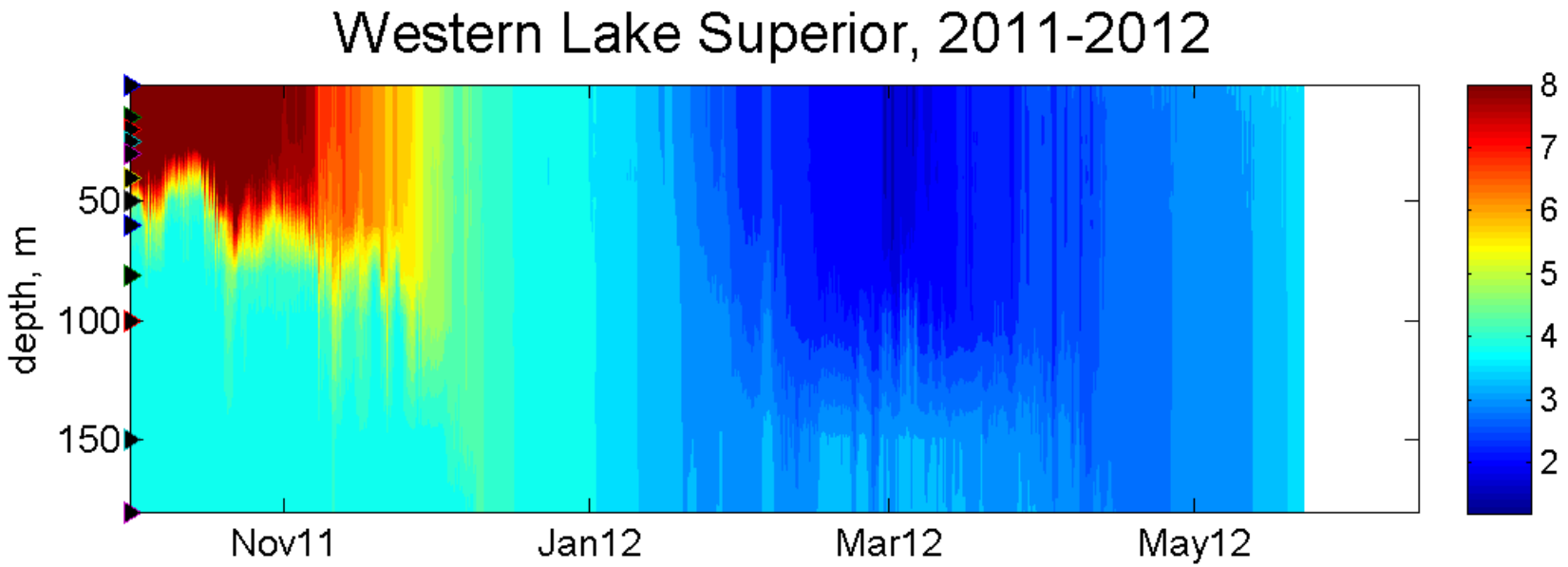


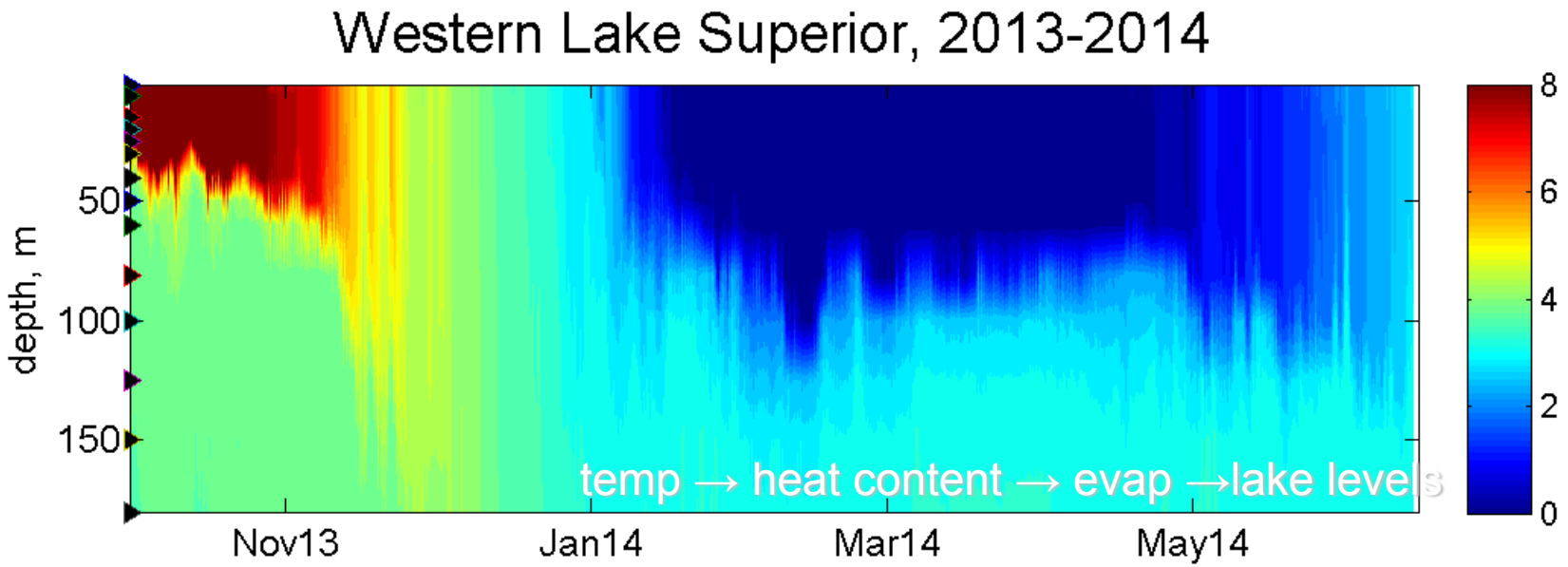


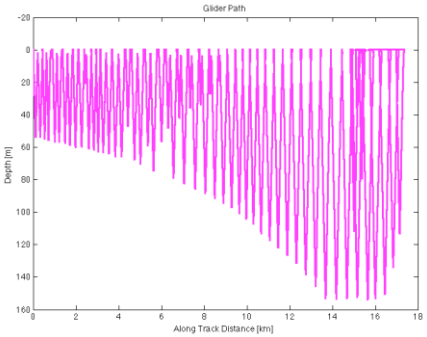


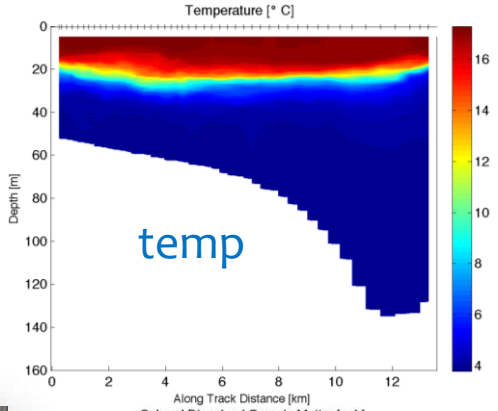


GLOS

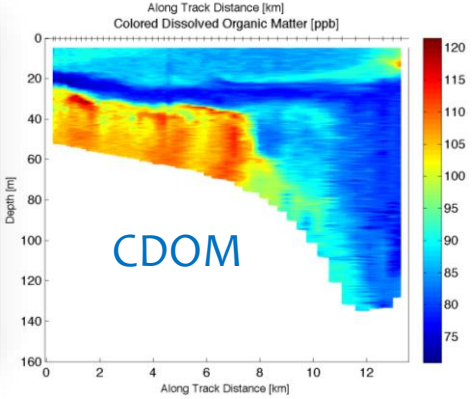

Western Lake Superior, 2011-2012
depth, m
50
100
150
Nov11
Jan12
Mar12
May12
8
7
6
5
4
3
2

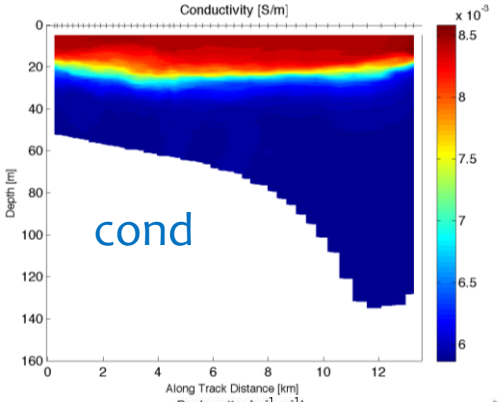

Western Lake Superior, 2013-2014
depth, m
50
100
150
Nov13
Jan14
Mar14
May14
temp → heat content → evap →lake levels
8
6
4
2
0


Glider Path
Depth [m]
Along Track Distance [km]

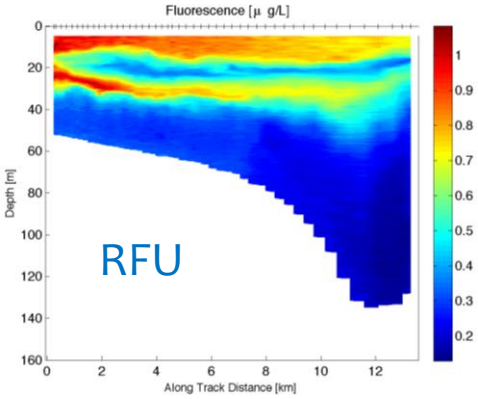

Temperature [° C]
Depth [m]
Along Track Distance [km]
temp

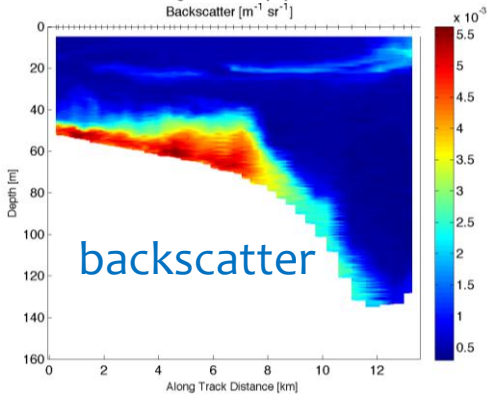
SLOCUM
218 26 8773
SLOCUM


Colored Dissolved Organic Matter [ppb]
Depth [m]
Along Track Distance [km]
CDOM


Conductivity [S/m]
x 10^-3
Depth [m]
Along Track Distance [km]
cond

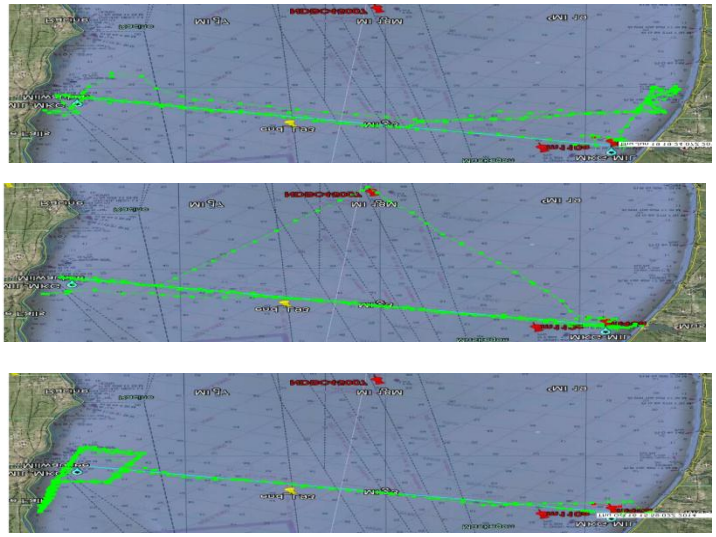
AV Gichigami

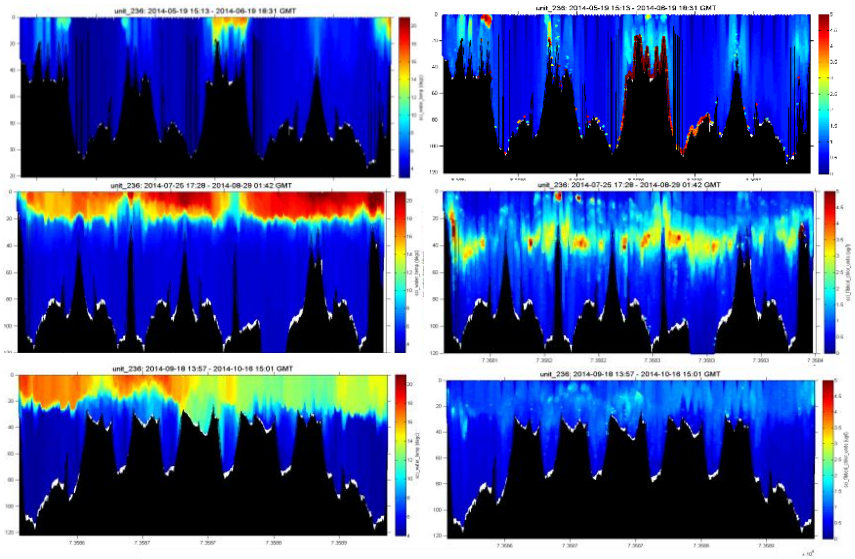

Fluorescence [μ g/L]
Depth [m]
Along Track Distance [km]
RFU


Backscatter [m^-1 sr^-1]
x 10^-3
Depth [m]
Along Track Distance [km]
backscatter

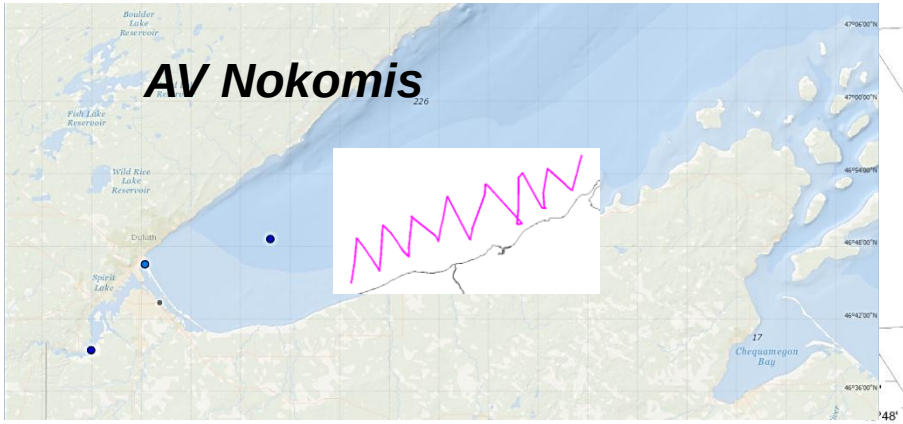
2014 GLOS Glider **O**ps

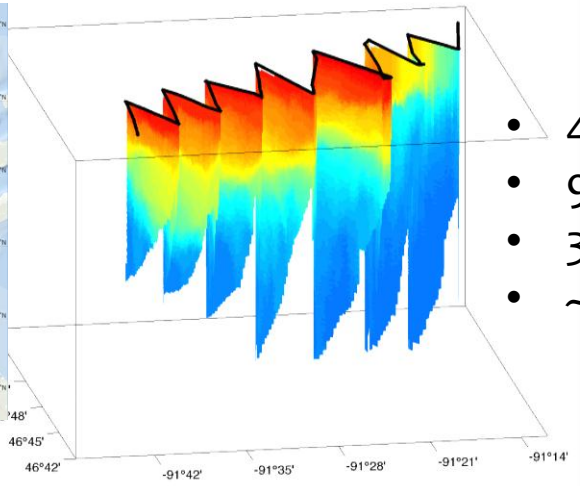
Milwaukee – Muskegon ***submersible express*** – CILER





3100 km
12,000 profiles





- 4 Deployments
- 900 km & counting
- 34 days
- ~3000 profiles

Note: GLOS GLIDER data is being used as a pilot test for the National IOOS GLIDER Database v2.0

Michigan Tech Partnership, 2014

Keweenaw Monitoring

. Long term monitoring

. Plastics monitoring

. Coastal Sediment Exchange

. Remote Sensing Optical Properties