

# Forecasting Harmful Algal Blooms (HABs) in Lake Erie

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# Lake Erie Bulletin, 2011



## Experimental Lake Erie Harmful Algal Bloom Bulletin

2011-008

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National Ocean Service

Great Lakes Environmental Research Laboratory

Last bulletin: 22 July 2011

Bloom  
 from  
 satellite

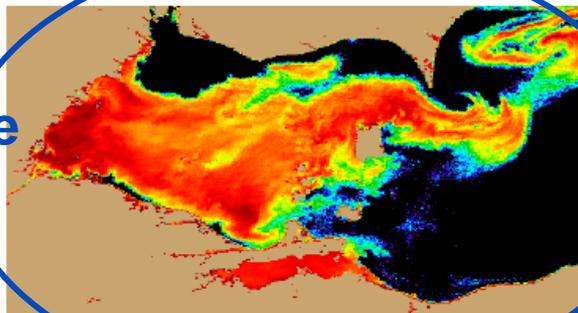


Figure 1. MERIS image from the European Space Agency. Imagery shows the spectral shape at 681 nm from September 03, where colored pixels indicate the likelihood of the last known position of the *Microcystis* spp. bloom (with red being the highest concentration). *Microcystis* spp. abundance data from shown as white squares (very high), circles (high), diamonds (medium), triangles (low), + (very low) and X (not present).

forecast

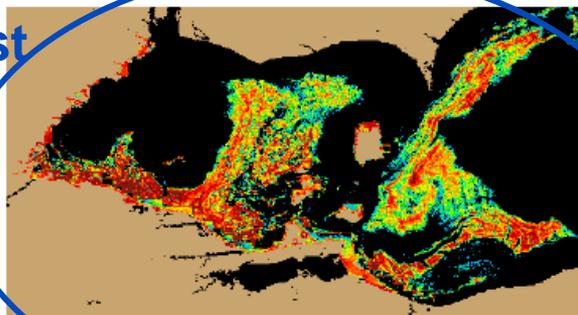


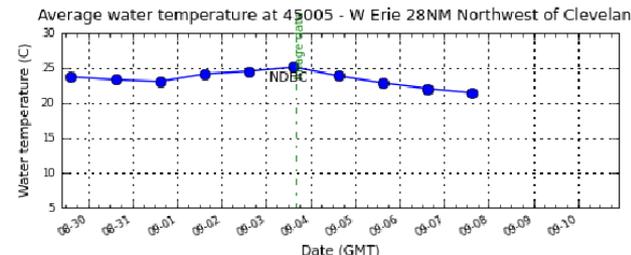
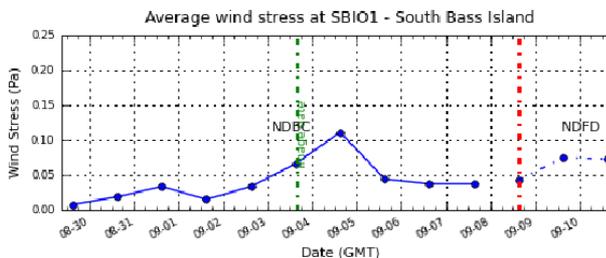
Figure 2. Nowcast position of *Microcystis* spp. bloom for September 08 using GLIFS modeled currents to move the bloom from the September 03 image.

**Conditions:** A massive *Microcystis* bloom persists throughout most of Lake Erie's Western Basin.

**Analysis:** As indicated in satellite imagery from Saturday (9/3/2011), an enormous *Microcystis* bloom was present in western Lake Erie. The southern extent of the bloom was remotely observed along the coast of Ohio from Maumee Bay to Catawba Island. The northern extent of the bloom was observed to be consistent along the Michigan coast from Northern Maumee Bay to the mouth of the Detroit River. The eastern-most portion of the bloom was observed past Point Pelee and to the northeast up into Rondeau Provincial Park.

At the mouth of the Detroit River, a five day nowcast shows a southward suppression of the western-most portions of the bloom. However, the bloom is likely to still persist in much of the Western Basin. The nowcast also suggest the bloom has spread to the east of Sandusky and into the Cleveland area. (Note: Due to a lack of clear imagery the bloom has not been remotely observed in the Cleveland area.) A three day forecast also suggests that the bloom will persist to the north of Cleveland through the weekend. Water temperatures remain above 20 degrees Celsius and are forecast to decrease into the weekend; however, conditions remain favorable for bloom growth.

### Bridge Winds



# GREAT LAKES ECHO

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## Satellite system warns swimmers, treatment plants of harmful algae

JUL 12 2011 SHAHEEN KANTHAWALA 3 COMMENTS

Satellite images of Lake Erie sent right to your inbox can warn you about harmful algae in the lake before you decide to visit.

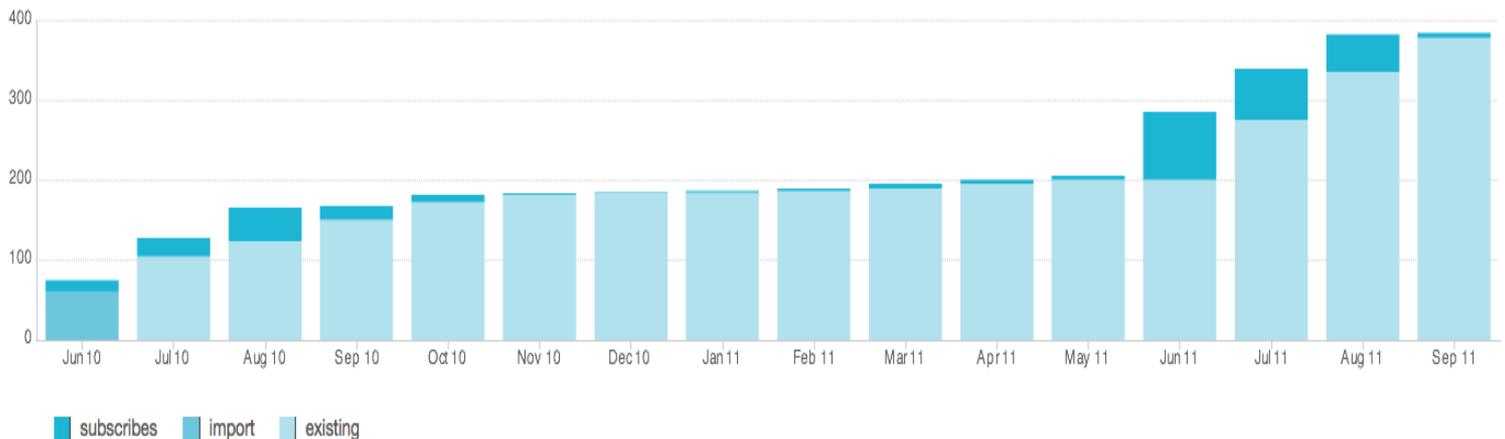
People can [sign up](#) for the emailed bulletin that was developed at the Center of Excellence for Great Lakes in Human Health at the National Oceanic and Atmospheric Administration.

They'll learn where waves, winds and currents are expected to move algal blooms, said Sonia Joseph Joshi, Excellence for Great Lakes in Hur



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### List Growth

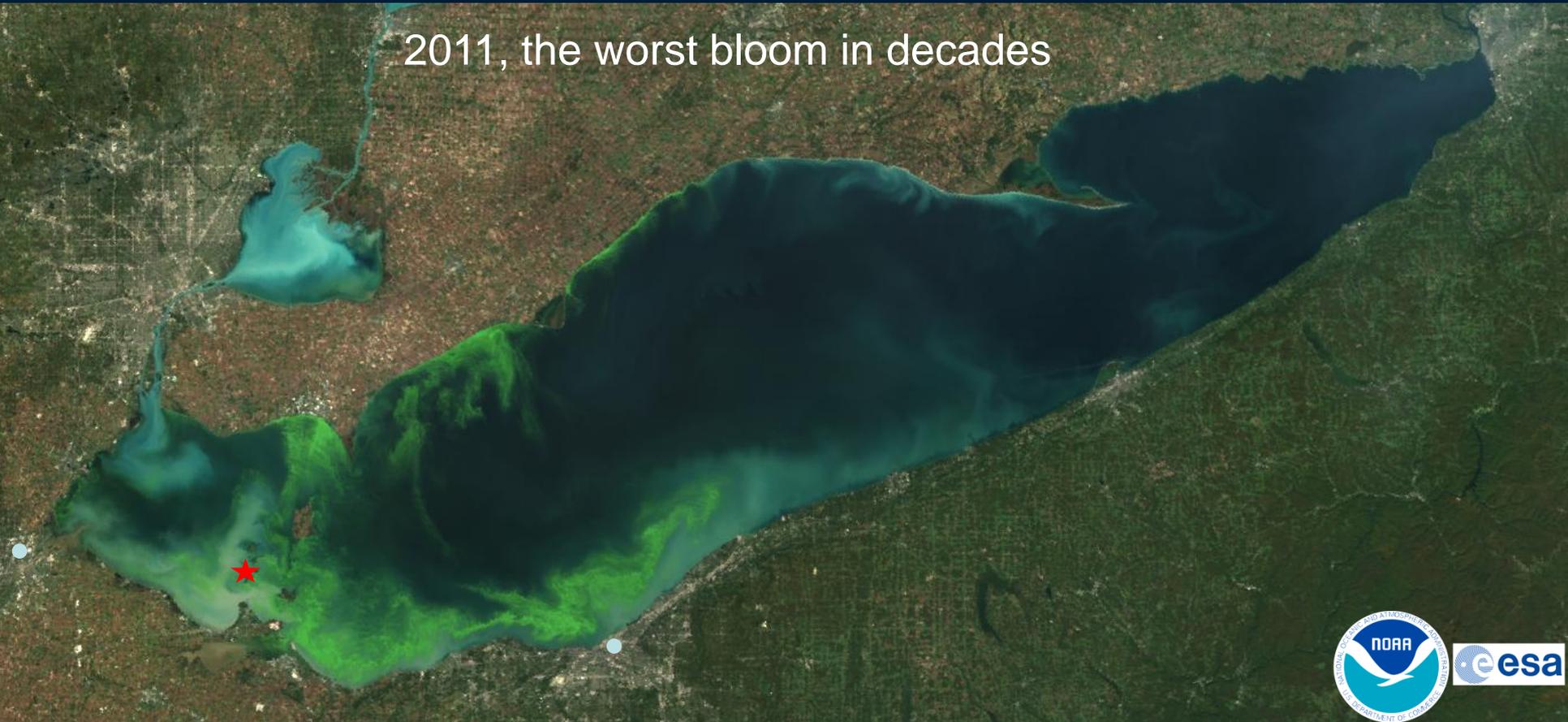


# Broad Interest in bulletin

## 2012 over 500 subscribers

# 2011 cyanobacteria bloom

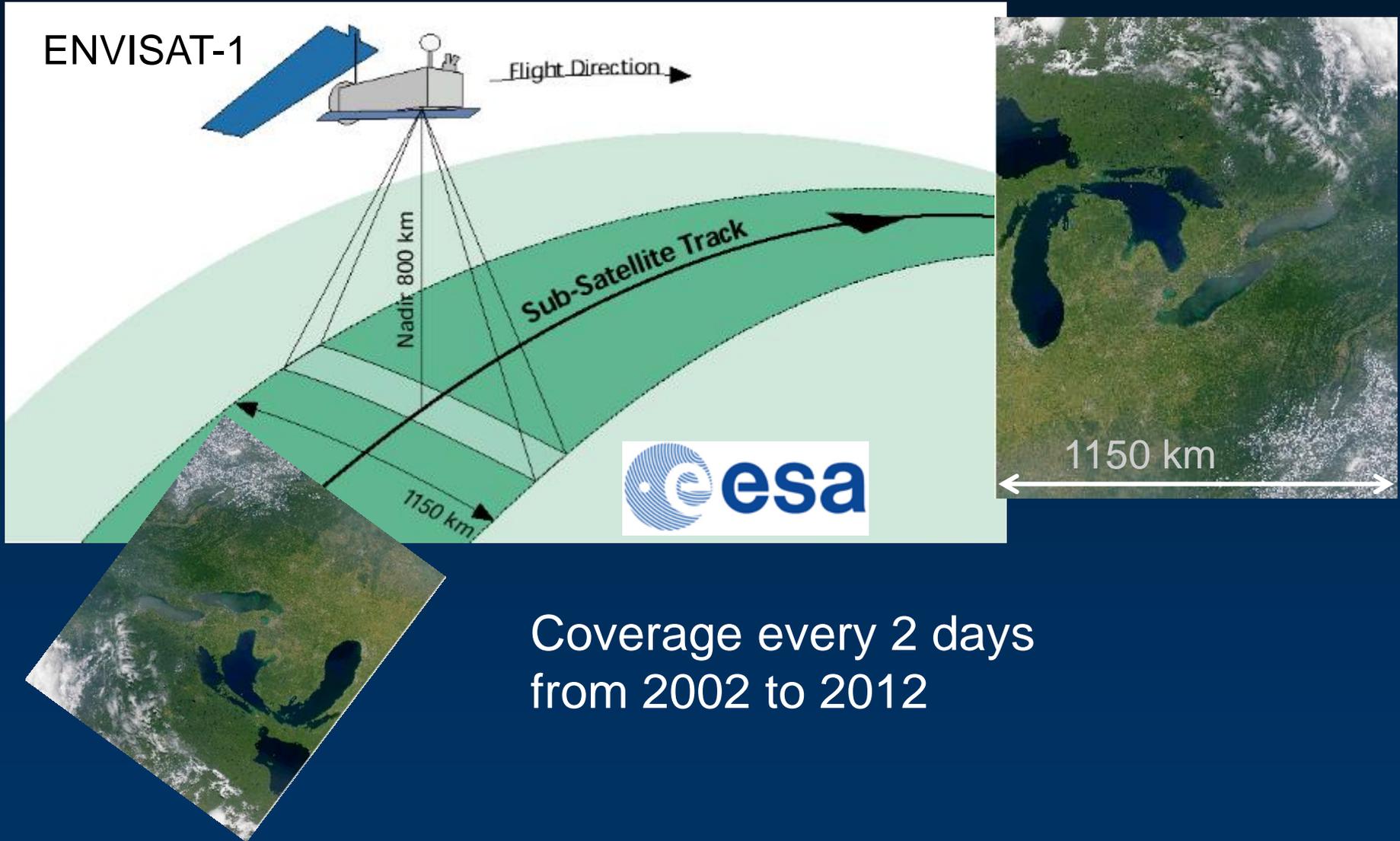
2011, the worst bloom in decades



09 October : Data from MERIS  
(European Space Agency)

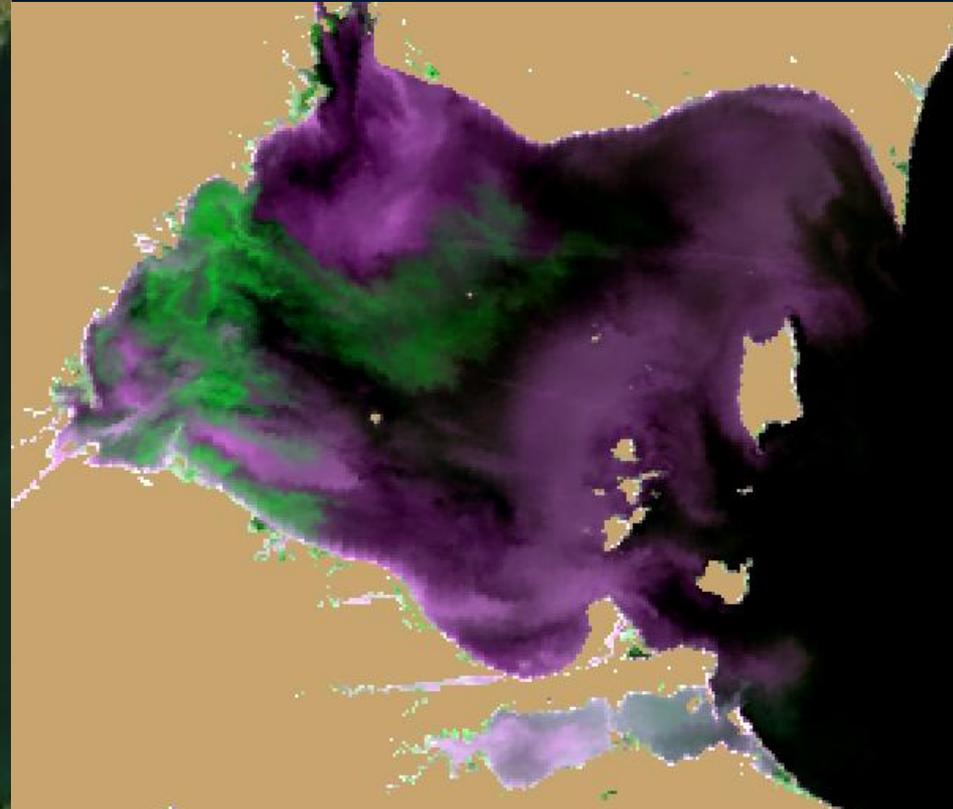
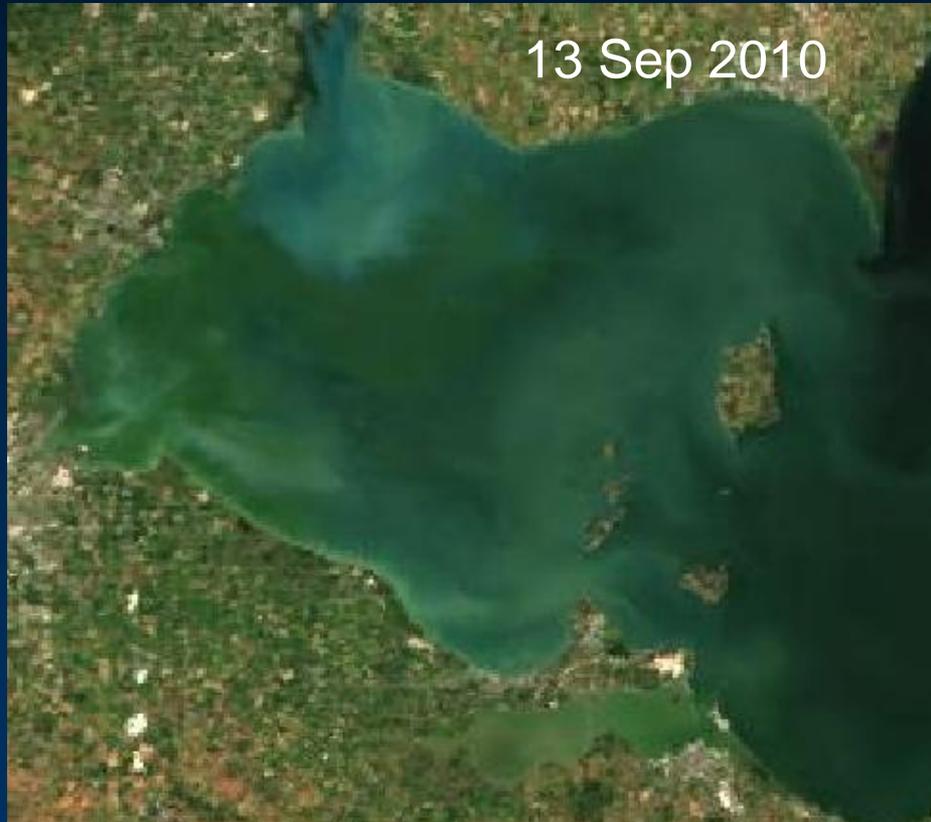


# MERIS on the ENVISAT-1 satellite



Coverage every 2 days  
from 2002 to 2012

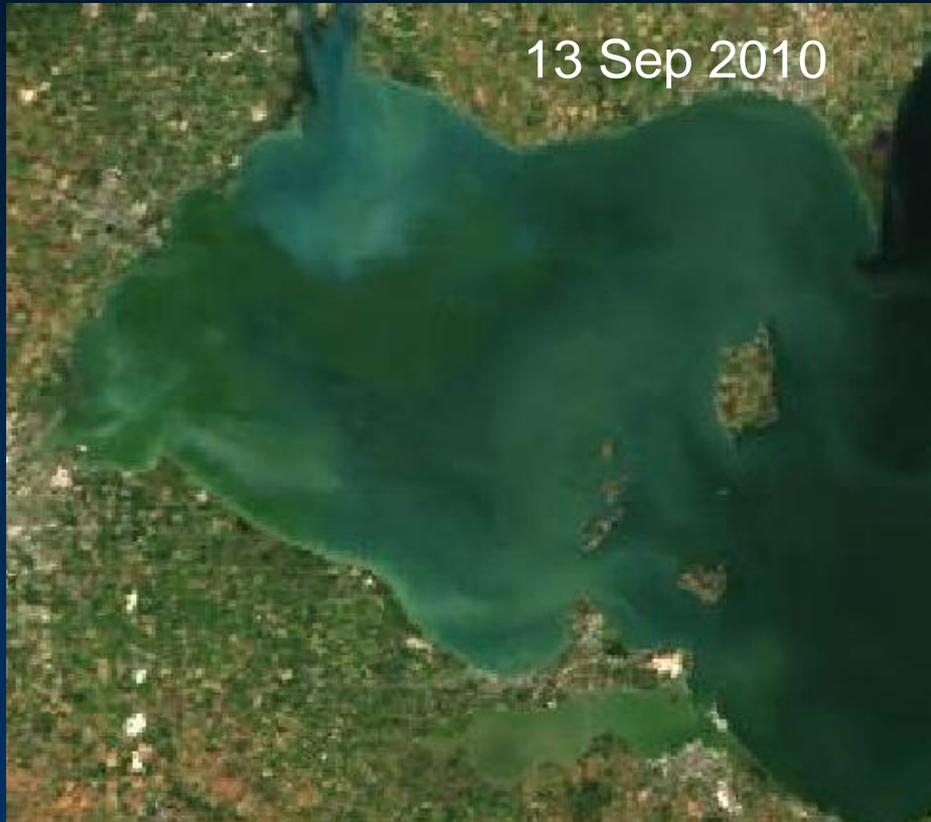
# MERIS can see more wavelengths of light, allowing us to detect and quantify blooms



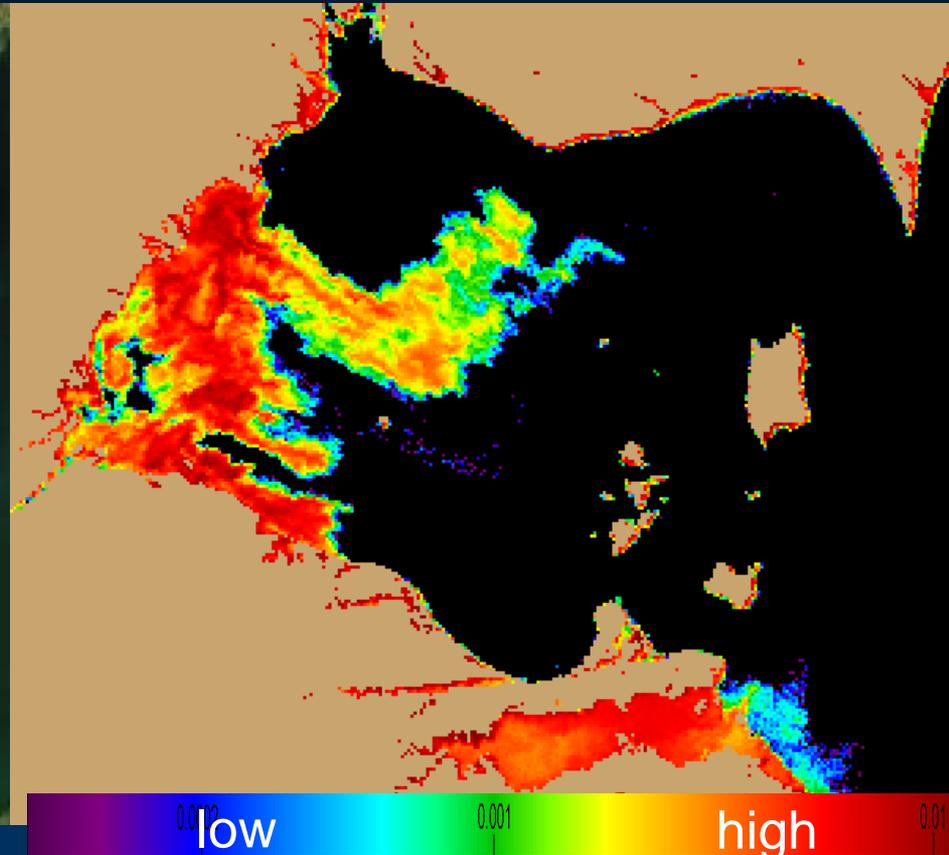
True color, difficult to identify and quantify

Red and near-infrared wavelengths help

# This information gives a cyanobacteria index, "CI", which equates to concentration

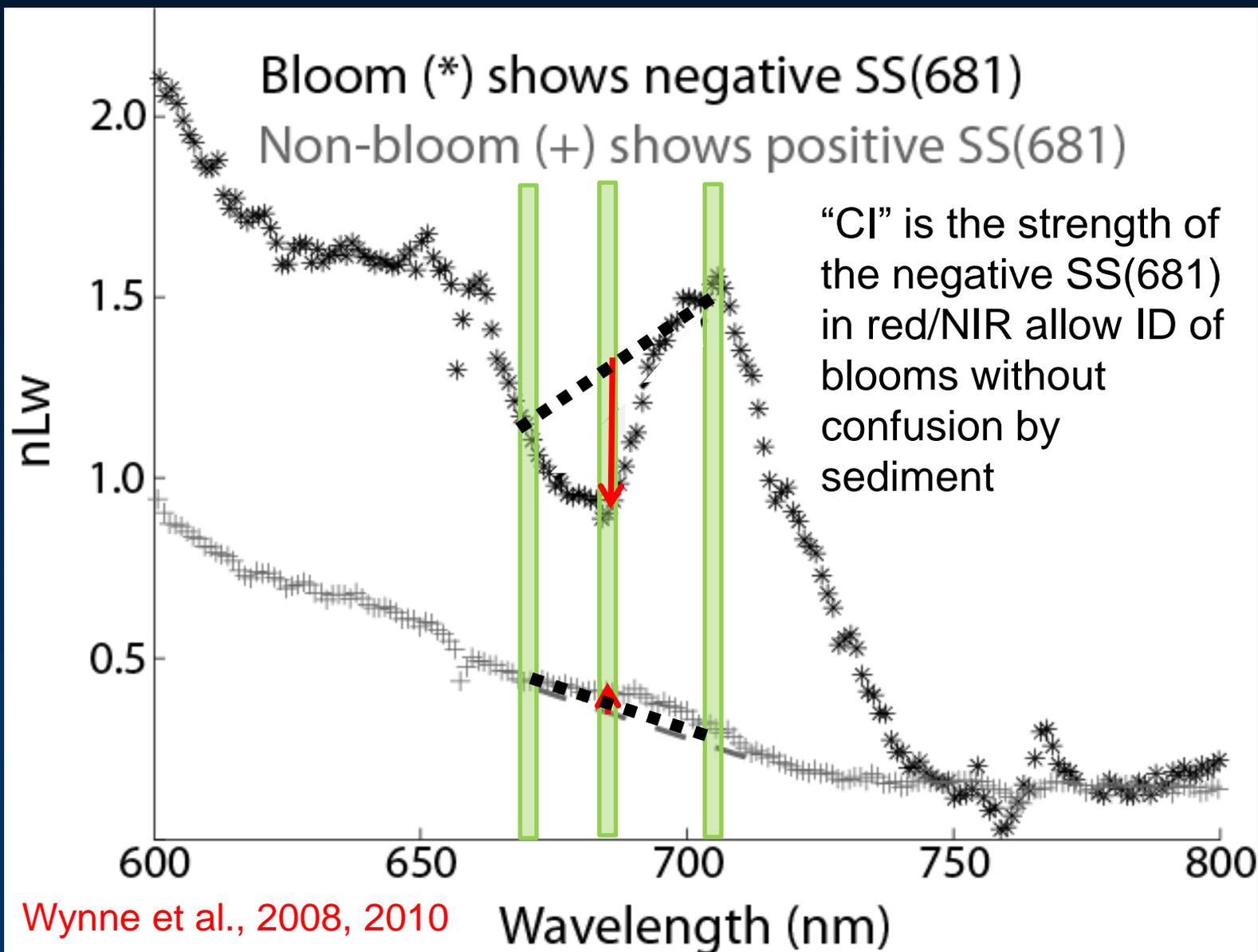


True color

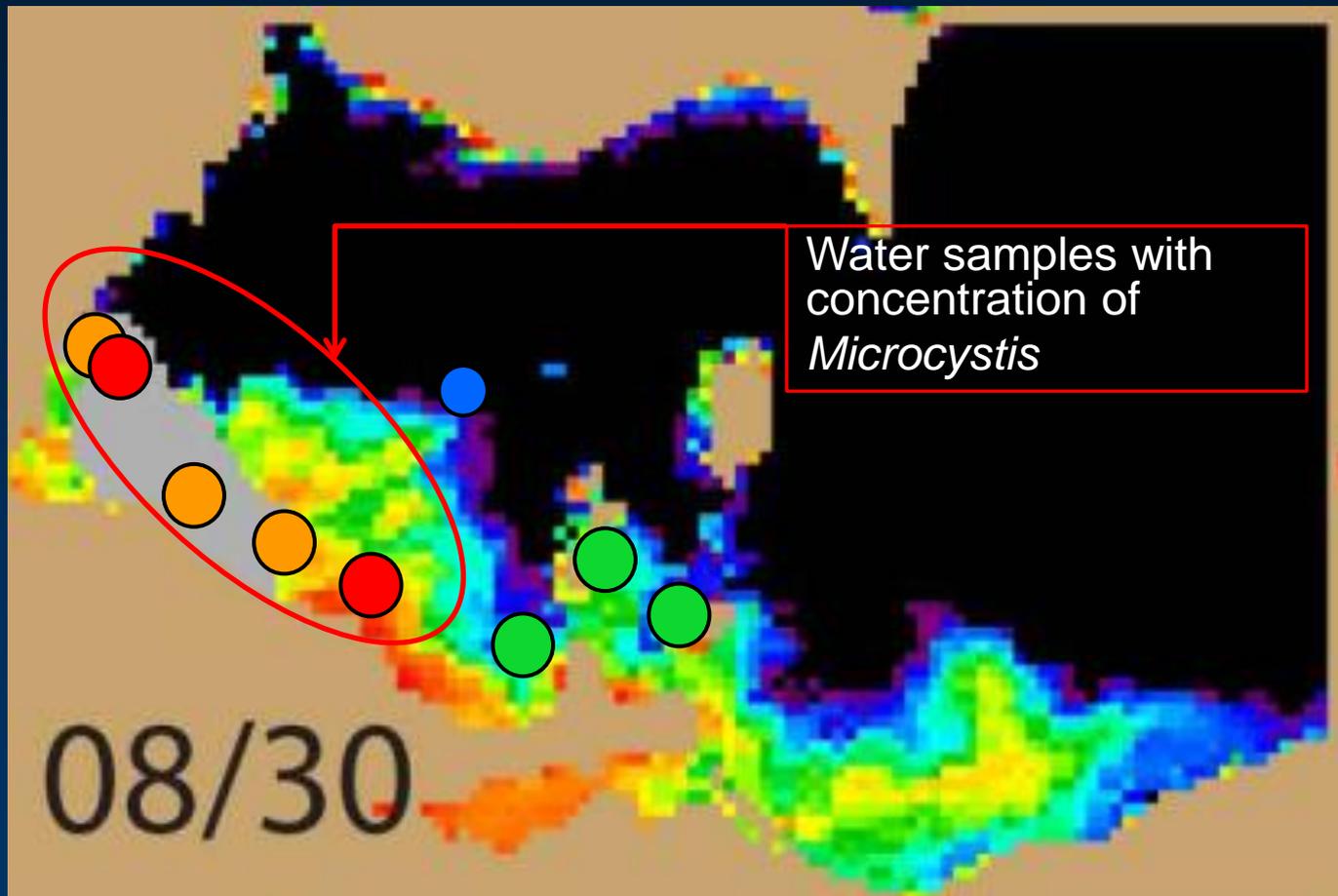


Cyano Index (CI)

# Algorithm for MERIS remote sensing

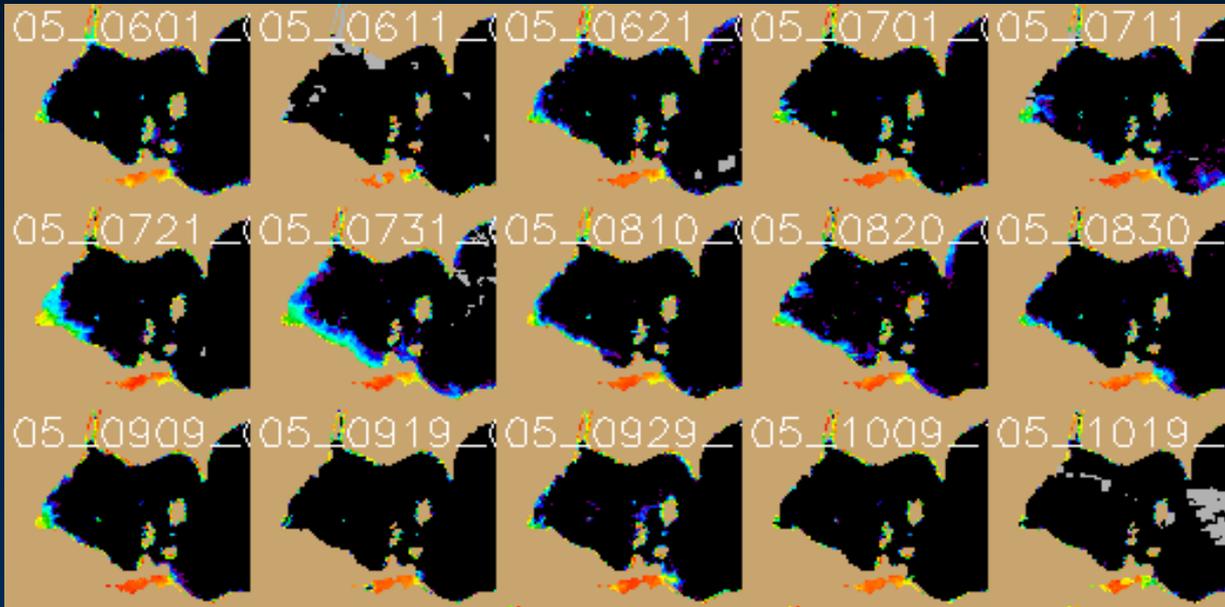


# Confirm and quantify bloom in field (role of OSU Stone Lab this summer)



MERIS data from ESA

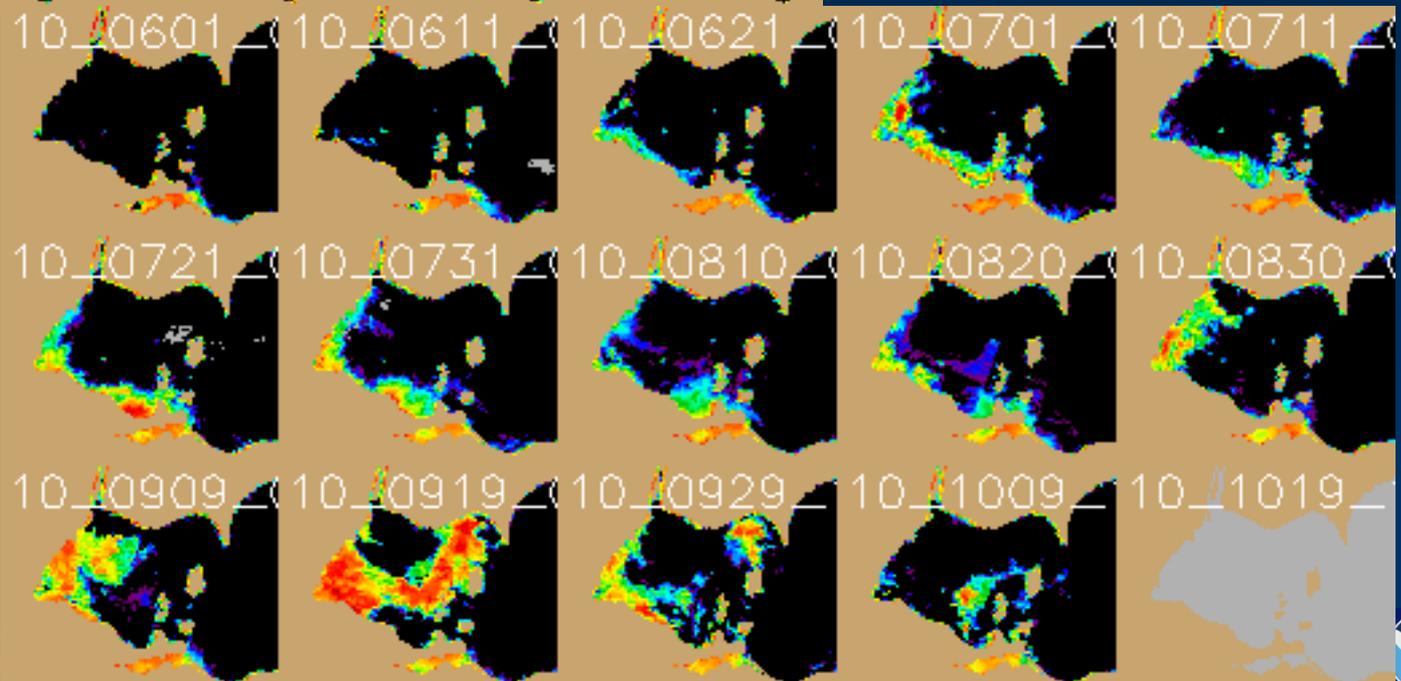
# Development of climatology to assess bloom



2005 mild

- Ten day composites to remove gaps in data coverage
- Shows variability between years
- Reduces mixing events

2010 severe

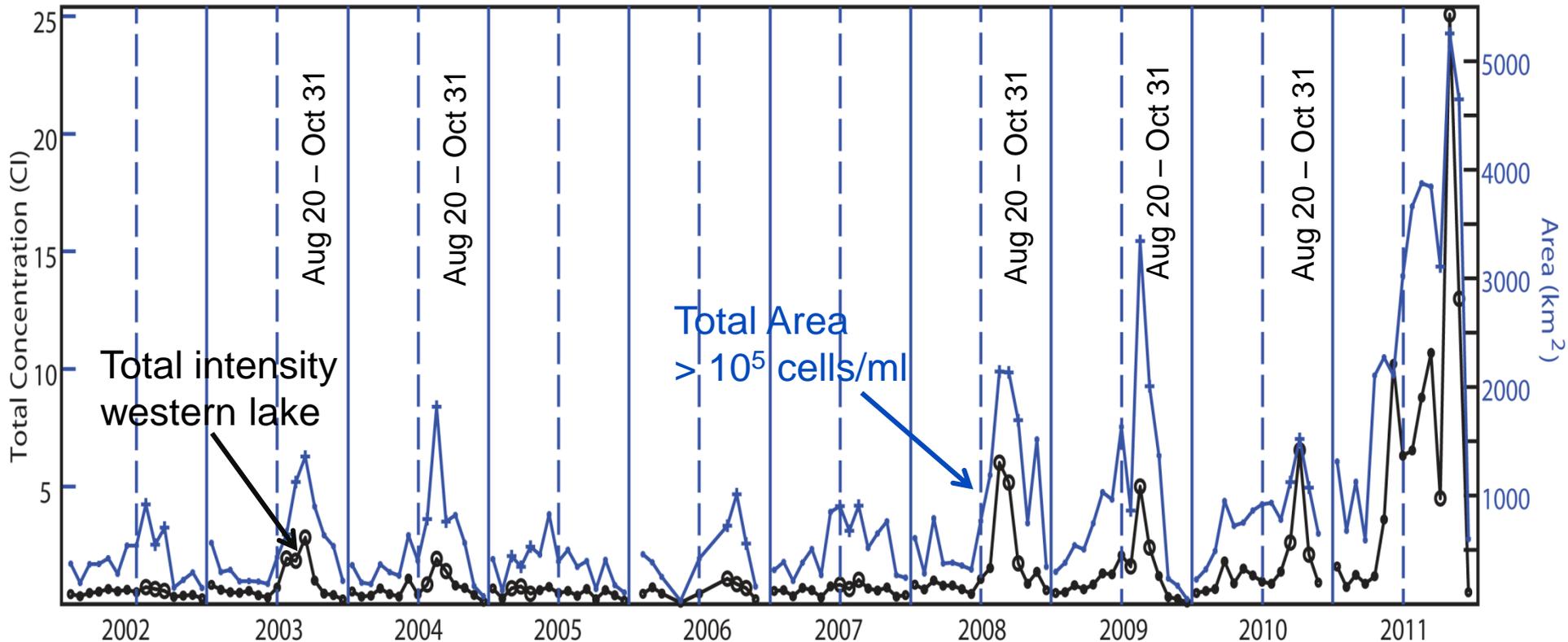


To consider:

- Maumee River load
- Temperature
- Precipitation

# Area and intensity, 10-day intervals

## Blooms peak in late summer



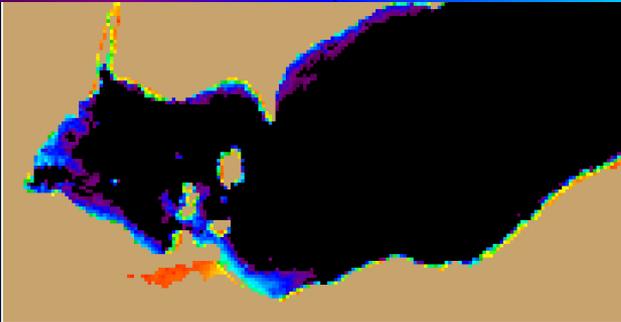
# 10 years of MERIS data, we can map the peak of bloom for each year

0.0002

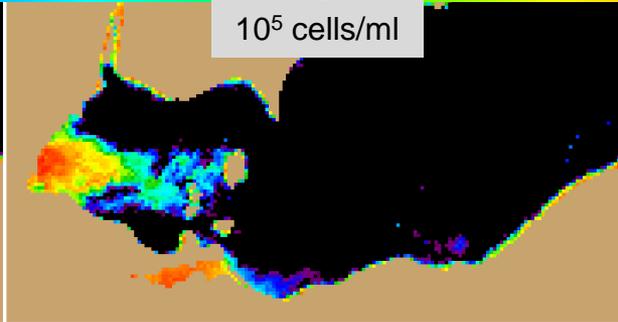
0.001

0.01

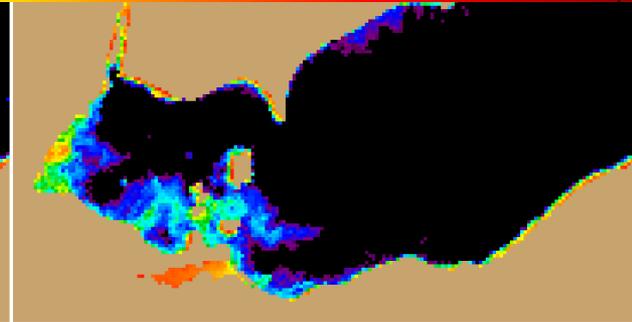
$10^5$  cells/ml



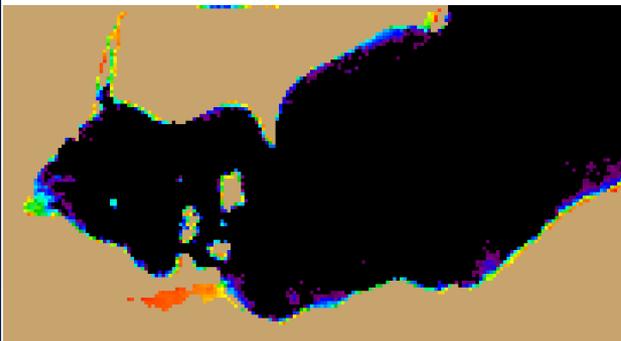
2002



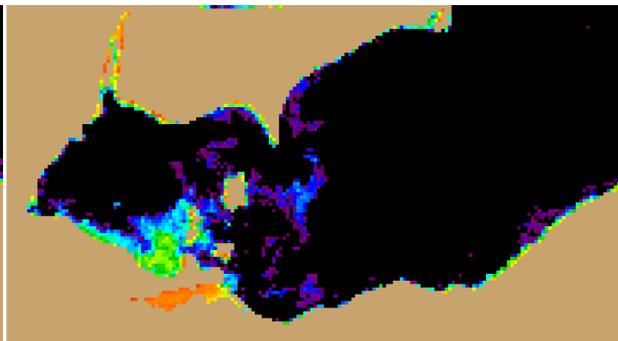
2003



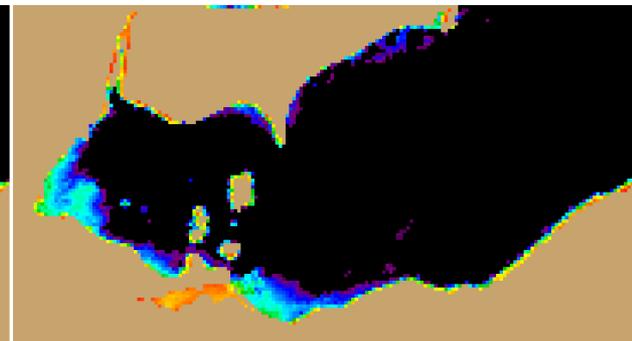
2004



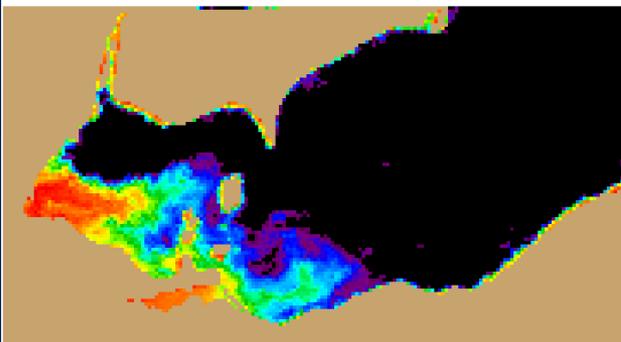
2005



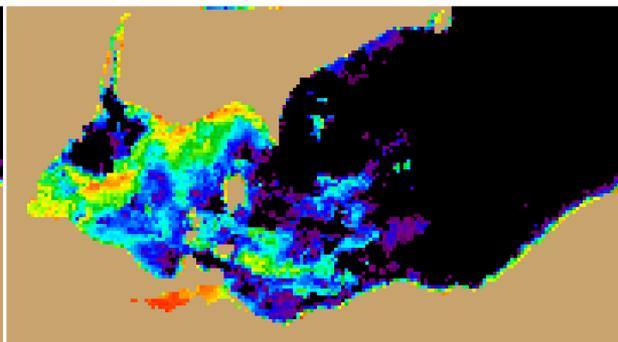
2006



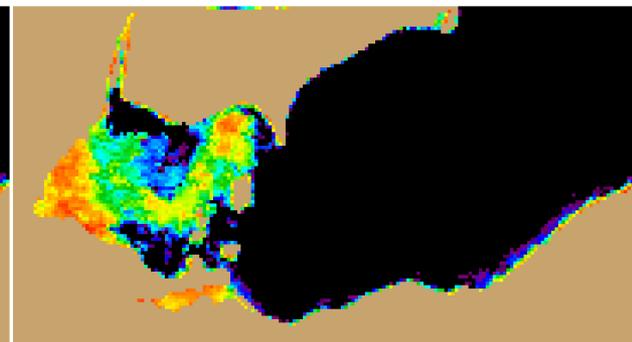
2007



2008



2009



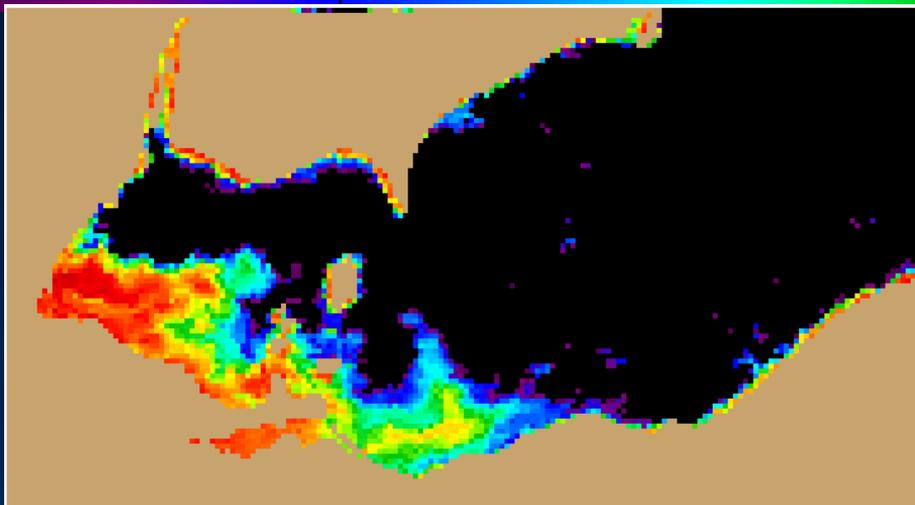
2010

# Peak of bloom, four worst years: 2008-2011

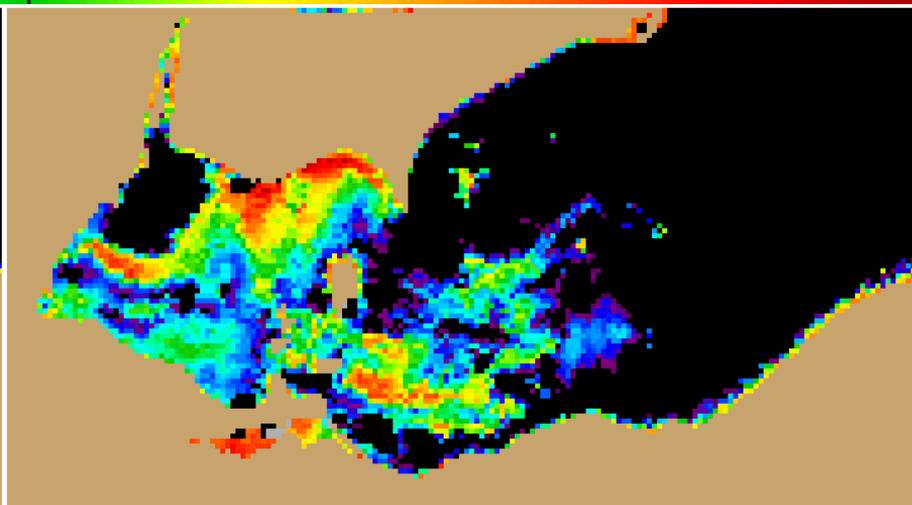
0.0002

0.001

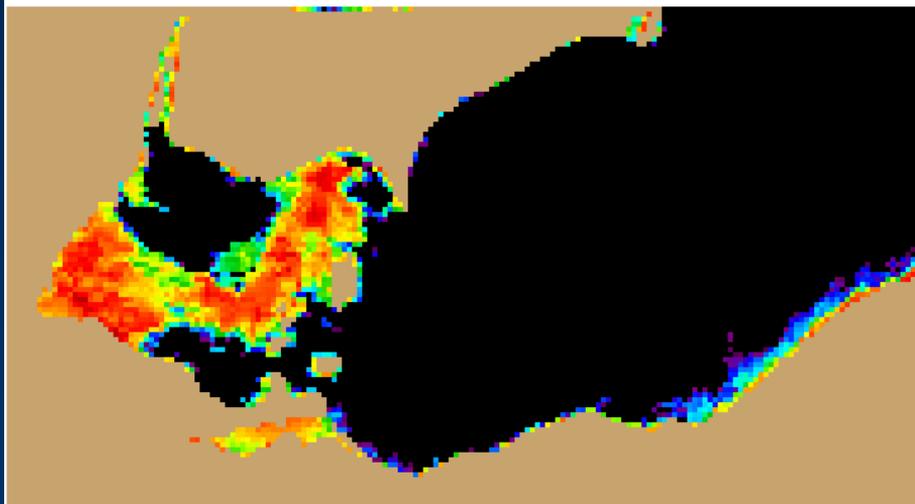
0.01



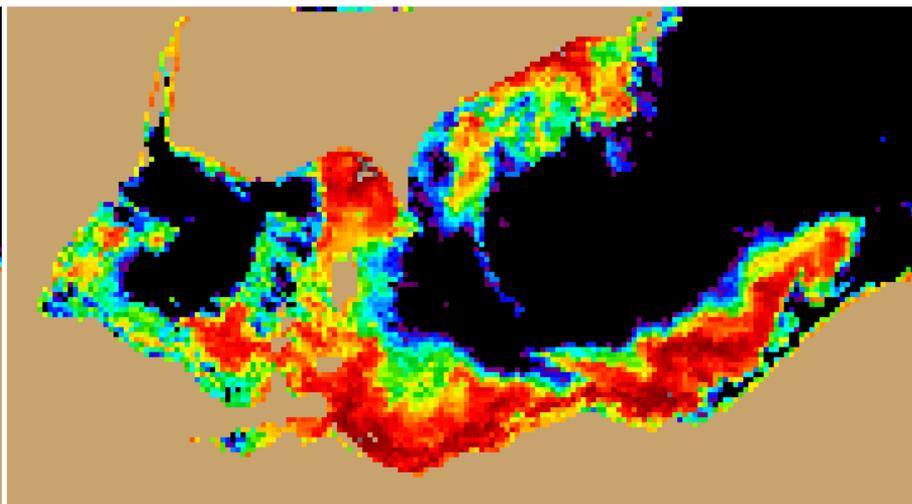
2008



2009

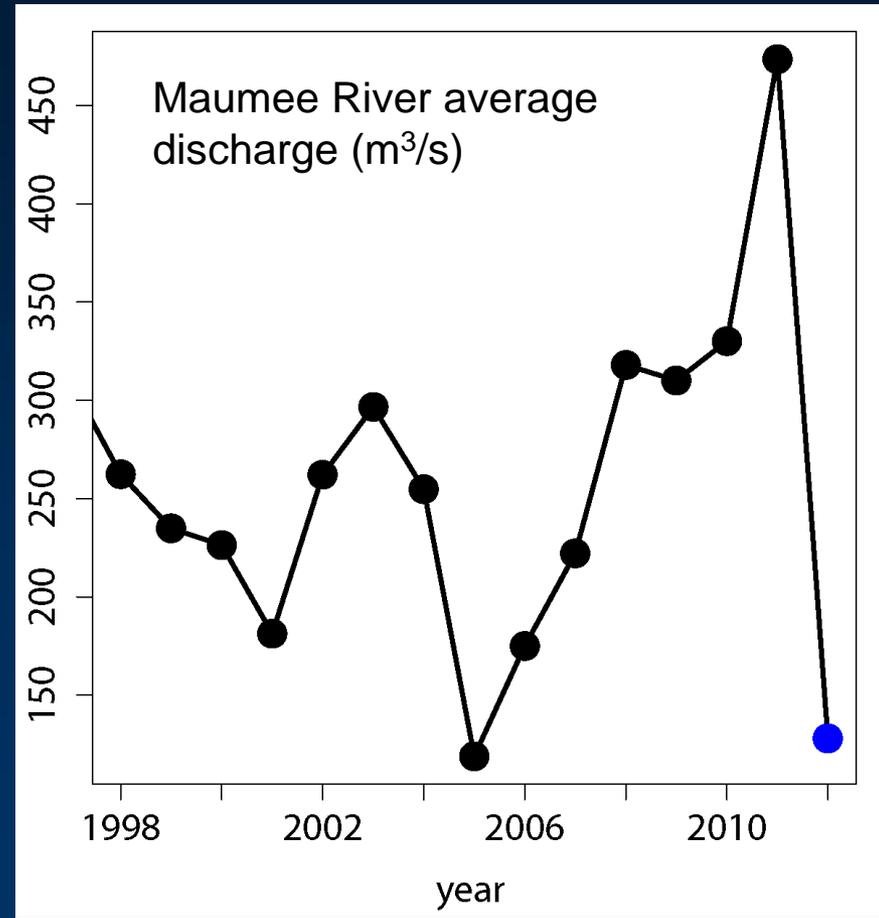
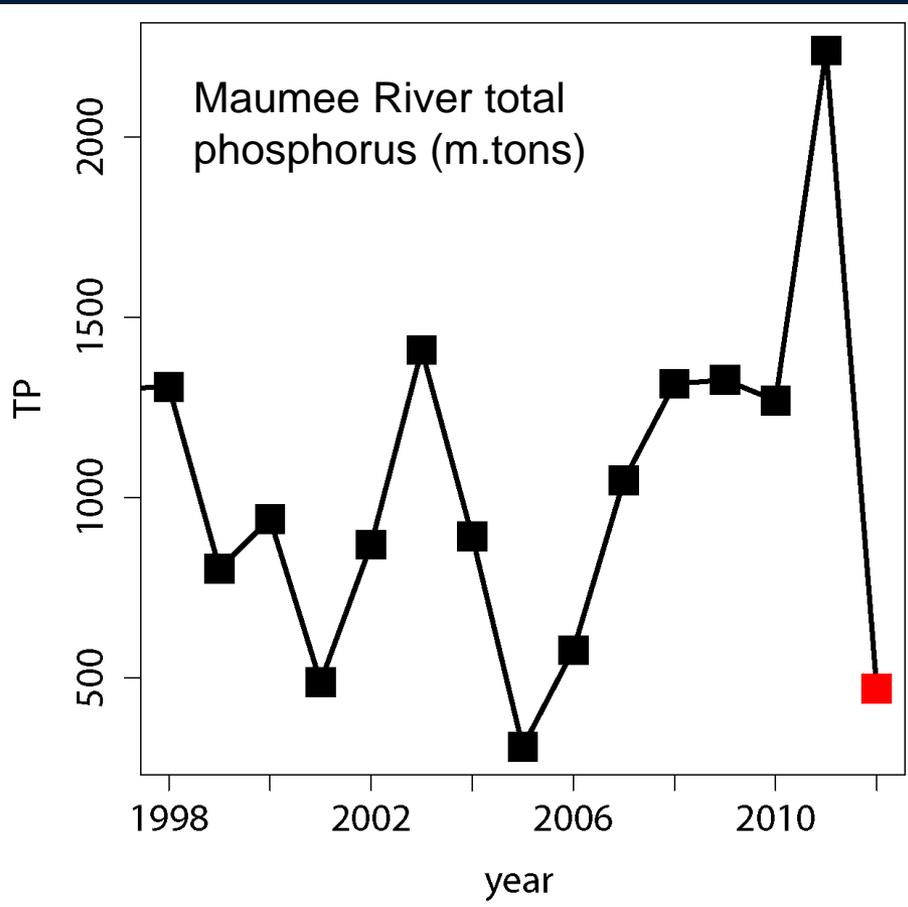


2010



2011

# 2012: dry spring and low loads Equivalent to 2005 to 2007



# 2012 Forecast: Mild bloom and observed.

