

# **Optical Properties of the Great Lakes**

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## **Overview**

This project focuses on measurement and quantification of the visual (optical) properties of the Great Lakes. These measurements not only documented optical properties of the lakes, they are important for hydro-optical model development to be used for satellite retrieval of major color producing agents (chlorophyll, CDOM, SM).

## **Objectives**

Increase number of regional, coastal, and marine ecosystems delineated with approved indicators of ecological health and socioeconomic benefits that are monitored and understood.

Analyze measurement data collected on Lakes Michigan, Huron, Erie, and Ontario.

## **Proposed Work**

- Analyze measurement data collected in 2008 on Lakes Michigan, Huron, Erie, and Ontario and start writing manuscript on optical properties.
- Analyze measurement data collected in 2007 on Lakes Ontario
- Plans for measurements in Lakes Michigan and Lake Huron

## **Accomplishments**

2007 collaboration with the Upstate Freshwater Institute included measurements of optical properties of Lakes Ontario and western Lake Erie using surface and profiling instruments with concurrent water samples

## **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)

## **Governmental/Societal Relevance**

This project will produce a robust algorithm for the satellite detection and monitoring of water quality parameters including phytoplankton chlorophyll, suspended minerals, and dissolved organics in the Great Lakes. This data will be used to produce quantitative estimates useful to other ecological system modelers and forecasters. If the three major color producing agents (chlorophyll, dissolved organics, and suspended minerals) can be monitored from satellite data, the public, managers, and the scientific community will have near real-time data. Data will provide insight into current water quality, ecosystem vitality, economic and recreational potential, and quantitative estimates of primary productivity, transport and availability of toxic materials.

## **Relevance to Ecosystem Forecasting**

Providing near real-time mapping of chlorophyll, dissolved organic carbon, and sediment minerals can improve ecosystem forecasting in a number of areas including:

- improved prediction of primary production
- aid in the assessment of impacts of DOC and sediments in protecting harmful (*E. coli*) bacteria from UV radiation which impacts their demise
- help to track and evaluate the impacts of annual and inter-annual changes to ecosystems caused by episodic events and climate changes

Additional and enhanced measurements of optical properties of the lakes can improve the accuracy of hydro-optical models used in satellite retrievals