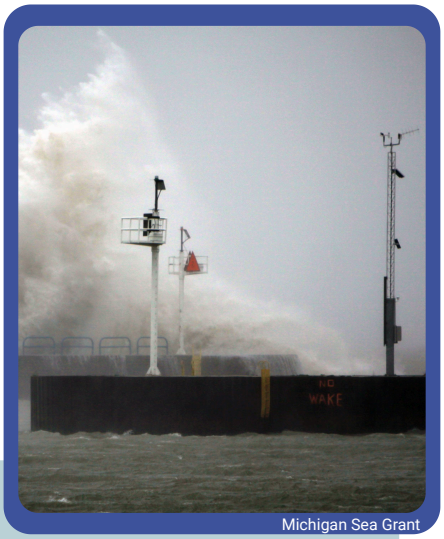
Tracking Water Level Fluctuations in the Great Lakes

Building Capacity to Measure and Assess Offshore, Full-Frequency Water Level Variations to Support Coastal Hazard Observation and Prediction

Background

- Water level fluctuations are known to create dangerous situations.
- Coastal communities can be severely impacted by these water-borne hazards such as rip currents, inundation, and meteotsunamis.
- Awareness of these hazards comes from a limited set of in-lake (or in-situ) observations, remote sensing capabilities, and forecast products.
- The observations along the coast are limited to surface wind-wave buoys, on-shore or inland water gauges, and coastal webcams.
- National forecast models also fail to capture this water level fluctuation gap, which means they cannot reliably predict the hazards.
- Thus, there is a gap in water level fluctuations data.



Michigan Sea Grant

Project Goals

Increase lake observation assets capable of detecting hazards and alerting coastal communities

1) Field deployment, testing and further development of various water level sensors with real-time communication capabilities
2) Development of toolkits for communities to detect and issue warnings for high-frequency water level fluctuations-induced coastal hazards
3) Engage communities in developing a water level warnings toolkit and transition the operations of the new water level monitors

Project Timeframe

The project started on **September 1, 2024.**

First deployments begin **Spring 2025** (given the seasonal alignment with ice on the Great Lakes).


Michigan Sea Grant

The Team

The Great Lakes Observing System is leading the project with investigators and collaborators from:

great lakes observing system
Michigan Tech
WISCONSIN UNIVERSITY OF WISCONSIN-MADISON
SCHOOL OF MINES 1874 COLORADO
IOOS Integrated Ocean Observing System
NOAA CO-OPS
SOFAR

This is an Ocean Technology Transition (OTT) grant project from NOAA's Integrated Ocean Observing System (IOOS).

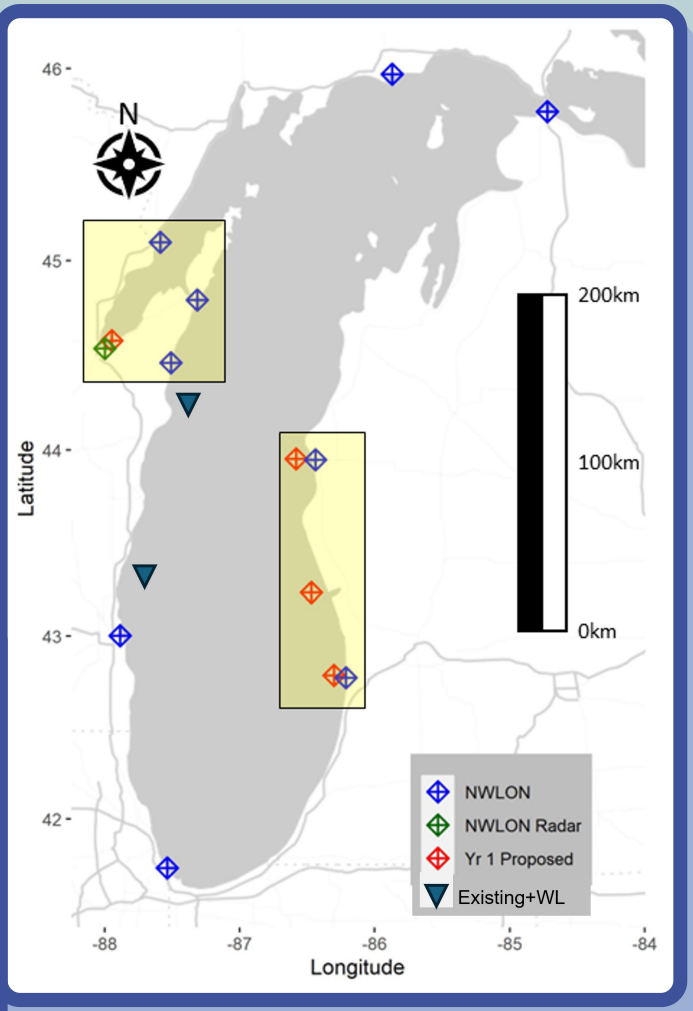
Project Locations

A novel high frequency water level observation network is being established for Lake Michigan, as part of this project. It will utilize shore-based gauges and buoy-based sensors.

The shore-based water level gauges are part of the **National Water Level Observation Network (NWLON)** that is operated by NOAA CO-OPS and a crucial component to coastal hazard awareness around the country.

The buoy-based sensors will capture high frequency wave and water level data.

The map (right) indicates existing water level gauges and proposed new buoy locations. Existing water level gauges will increase sampling frequency and some existing buoys will be updated with a water level sensor. Data from the buoys will be available at seagull.glos.org.



The photo (by Greg Cutrell, Limnotech) shows one of the five project Sofar Spotter buoys equipped with water level sensors. It sits off of Ludington, MI, and is managed by Michigan Technological University's Great Lakes Research Center.

Benefits

This project will have direct benefit to
1) coastal communities, who rely on coastal observations to protect life and property;
2) NOAA CO-OPS, which operates and develops coastal observational platforms to protect life and property;
3) commercial and recreational navigational users, who rely on marine observations for safe passage;
4) NOAA National Weather Service forecasters, who use coastal observations to issue beach hazard warnings;
5) NOAA operational forecast model developers, who rely on coastal observations to develop, validate, and verify hydrodynamic forecast guidance.

Currently, all of these users are limited by the existing frequency gap in coastal observations that this project will address by providing a nearshore system that captures full-frequency information and finally fills an observational gap that has historically left communities vulnerable to many kinds of hazards.

Contact: Shelby Brunner at shelby@glos.org
More info: glos.org/projects/coastal_resiliency/

great lakes observing system