Observing and Monitoring Systems in Nearshore Lake Erie

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Introduction

This project aims to expand the existing network of observation buoys deployed in the Great Lakes. A novel system of buoys will be deployed in three nearshore (AoC) areas of Lake Erie. In conjunction with an Automated Underwater Vehicle (AUV), systematic changes in the water quality and hydrodynamics will be monitored at high temporal and spatial resolution. The year round deployment ensures that winter data, including ice thickness, are also collected. The real-time data will be available to stakeholders through a website and will be used to further validate the FVCOM hydrodynamic forecasting model predictions of the impacts of environmental and climate change on Lake Erie and the Great Lakes at large.

Use of Data

The data will be generated in real-time and will provide an unique tool for short and long term basin wide assessments about the health of the Great Lake ecosystems and contribute directly to the development and implementation of a system of science-based indicators. These data will help us better assess and provide accountability and transparency of actions to improve the health of the Great Lakes ecosystems as outlined by the Great Lakes Multi-Year Action Plan [EPA, 2009]. In addition, the data will be used to validate and improve the hydrodynamic portion of the FVCOM model in Lake Erie with particular emphasis on the interaction of tributary and neashore/AoC lake waters and under ice winter hydrodynamics by our partners at the University of Michigan. Direct and easy access to summarized data will be made available to stakeholders via a website, with interactive data queries and display. Quarterly reports are available through the GLAS website. This project will provide critical data for managers and other stakeholders and contribute to improved model predictions of the impacts of environmental remediation, and environmental and climate change on Lake Erie and the Great Lakes in general.

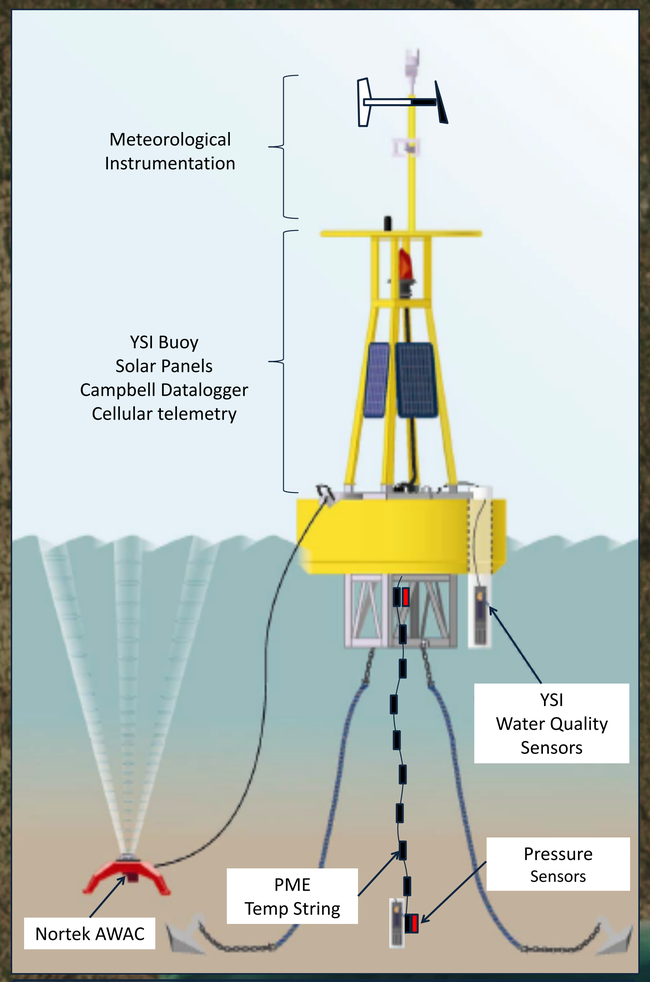

Figure 1. Buoy deployment design

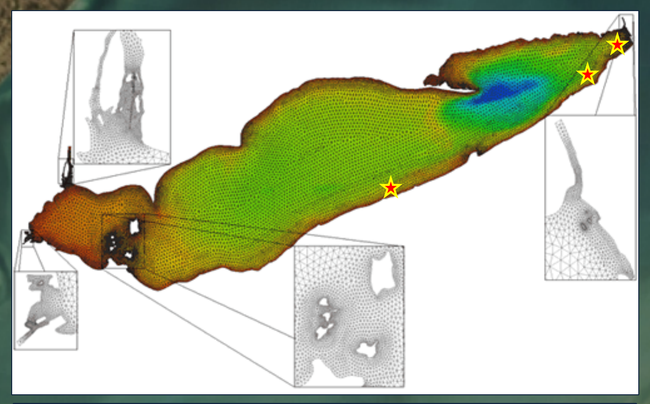

Figure 3. High-resolution unstructured FVCOM grid of Lake Erie for coupled physical-ecological modeling with resolved complex geometry of rivers, islands, and shorelines. Site locations denoted by star.
(source: NOAA/GLERL, Chen et al., 2003)

Acknowledgements

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Figure 2. YSI AUV. This is used for increasing the spatial resolution of nearshore environments inbetween the 3 buoys.

Approach & Instrumentation

Near-real time data collection with cellular telemetry. The buoys each offer: a suite of meteorological instrumentation; two YSI 6000 multisondes with four optical ports including optical DO, Chlorophyll, and CDOM; a PME temperature string with 10 nodes; 2 PAR sensors; and a Nortek AWAC to measure wave dynamics and ice thickness. Data are collected every 15 min. at a frequency of 60Hz in the summer and reduced to 30 min. intervals during the winter. The use of an AUV allows for detailed high resolution mapping of the bottom floor sediments and of the water chemistry and allow for much greater spatial resolution sampling along the nearshore environment.

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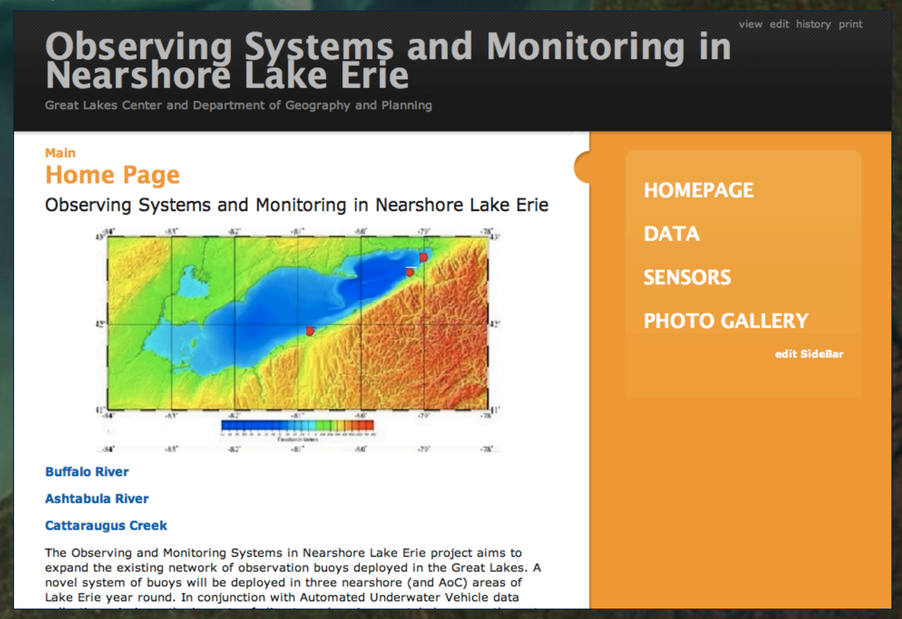

Figure 4. Public data access webpage.

References:

- USEPA. 2009. Status of nutrients in Lake Erie basin, LamPs. http://www.epa.gov/glnpo/lakeerie/erie_nutrient_2010.pdf
- Chen, C., H. Liu, and R. Beardsley. 2003. An unstructured grid, finite-volume, three-dimensional, primitive equations ocean model: Application to coastal ocean and estuaries, *J. Atmos. Oceanic Technol.,* 20(1): 159 – 186
- Photo: courtesy NASA Earth Observatory Collection: Whiting of Lake Erie