TELEDYNE MARINE CASE STUDY

EPA Scientists Bring Underwater Gliders to the Great Lakes to Conduct Underwater Surveys

TELEDYNE MARINE
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Product: **Teledyne Webb Slocum Gliders**

Application: **Great Lakes Water Quality Monitoring**

Project: **Autonomous Underwater Glider Observations in Southern Lake Ontario and Niagara River Plume**

Location: **Lake Ontario and Niagara River Plume, USA**

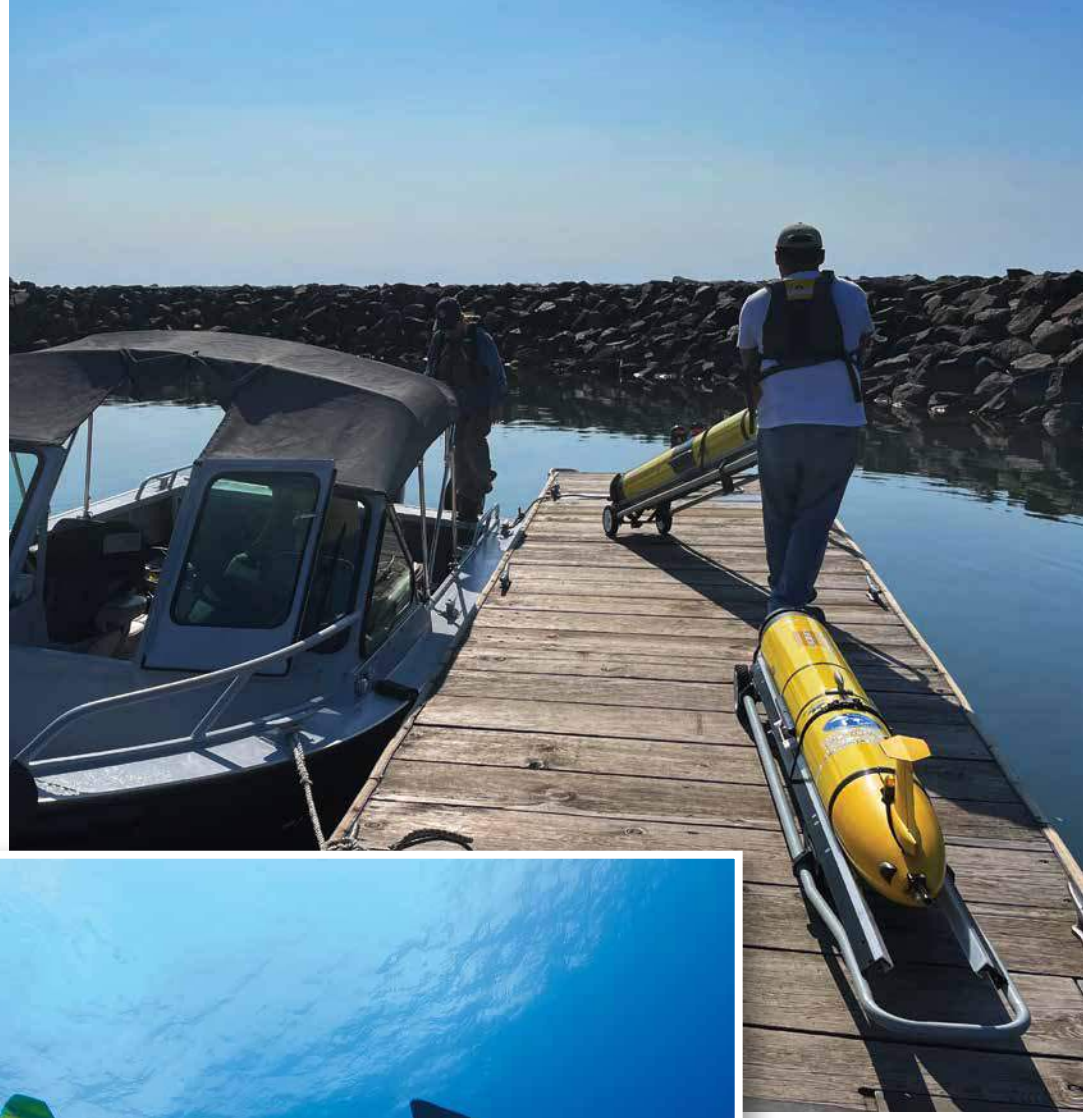
Since 2014, the U.S. Environmental Protection Agency's (EPA's) Great Lakes National Program Office (GLNPO) and Office of Research and Development (ORD) have been using Teledyne Slocum Gliders in over twenty glider missions in all five of the Great Lakes to assess water quality trends and status. The missions have collected more than 60,000 profiles in an area of glider transects encompassing over 7,200 km or almost 4,500 miles. Dr. Paul McKinney, Tom Hollenhorst, and Dr. Joel Hoffman conducted surveys using the Teledyne Slocum Glider to collect data in Lake Ontario and the Niagara River Plume. Through the sharing of data, the EPA aims to gain greater knowledge of the trends and status of the Great Lakes water quality while fostering future collaborations.

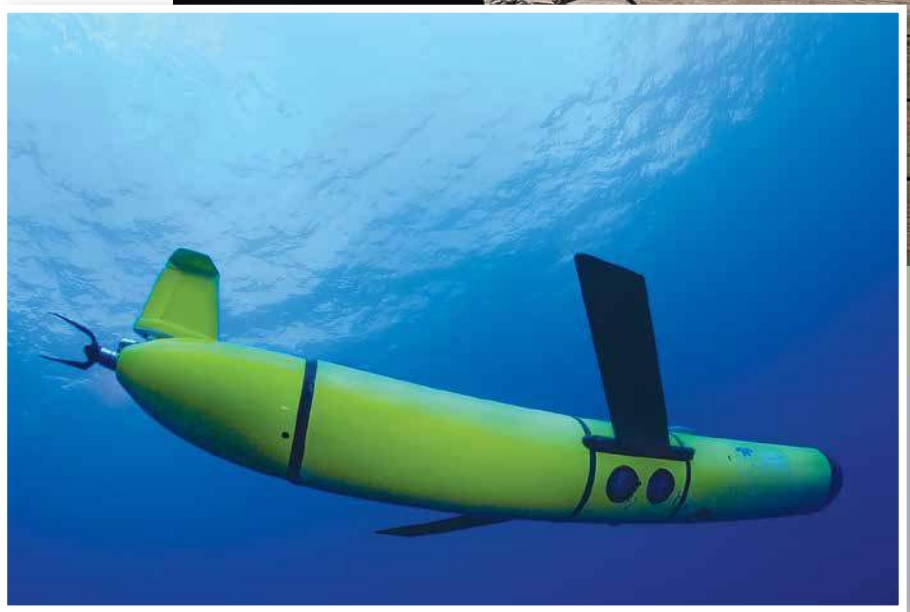
Overview

The Great Lakes are essential for drinking water, recreation, transportation, hydroelectric power, and irrigation. The system provides more than 40 million people with drinking water and generates more than 1.5 million jobs. The lakes are also large enough to help cool nearby communities in summer and warm them in winter. In addition, the Great Lakes provide an ecosystem that is home to more than 3,500 plants and animals, some of which are unique to these environments. Recent declines in water quality, especially those nearshore, have amplified the need to understand the connectivity between nearshore and offshore areas.

The Challenge:

Observations between dynamic nearshore and offshore transitions pose a challenge for traditional observing systems. Some observations have been made using traditional methods, such as ship-based and buoy-based observations. Despite the success of gathering data using traditional methods, there are challenges, including the high cost of ship-based surveys and the infrequent sampling by satellite imagery, both of which are affected by weather conditions.





Field crew load the EPA Great Lakes gliders for deployment in Lake Superior. Coordinated deployments with both gliders improve spatio-temporal resolution of observed features and expand the range of sensors beyond what can be carried by one glider.

Photos by Dr. Paul McKinney

“Unlike most oceanic glider operators, here in the Great Lakes we are most interested in nearshore coastal areas. We are really excited about working with our new Teledyne G3 hybrid glider that provides a way for us to “push” into and out from the nearshore. This is very important for our understanding of tributary nutrient/sediment loads and processing in these critical areas.”

— Tom Hollenhorst
Ecologist, U.S. EPA’s Office of Research and Development

The Solution:

Using the Teledyne Slocum glider, scientists were able to overcome these challenges. In contrast to shipboard observations, the Teledyne Slocum Glider is inexpensive to operate and can continue to collect data while being deployed for weeks at a time. The Slocum Gliders can continuously profile the water column while heading to the next waypoint, collecting high temporal and spatial resolution data using a suite of onboard sensors specific to the mission. Glider observations have a distinct advantage. Because of the glider’s profile in the water column, they can collect data regarding gradients of temperature and the concentration of chlorophyll along with other water quality parameters throughout the survey area. During this survey, the Teledyne Slocum glider completed 3,000 vertical profiles over 1,000 km or 600 miles between early and late summer deployments. Data collected by the glider showed a seasonal difference in from early to late summer in an area of high thermal and chlorophyll gradients. Glider operations were able to expand observations used for water quality monitoring and modeling dramatically.

EPA’s gliders are shown en route to their deployment locations in Lake Superior as part of a coordinated sampling mission focused on algae blooms. Typically deployment and recovery is accomplished using a trailerable boat and small crew, improving flexibility and response time for monitoring water quality events such as algae blooms.

Photo by Dr. Paul McKinney