Sediments of Lake Erie

Primary Investigator: Brian Eadie - NOAA GLERL (Emeritus)

Co-Investigators: Murray Charlton - National Water Research Institute, Environment Canada, David Edgington, Val Klump - Center for Great Lakes Studies Great Lakes WATER Institute, Phil Meyers - University of Michigan Department of Geologic Sciences, John Robbins - NOAA GLERL (Emeritus)

Overview

Sediment-water exchange is important in the cycling and fate of many constituents in the Great Lakes. Since Lake Erie is the most shallow of the Great Lakes, understanding and quantifying the lakes coupling with inventories of chemicals in the exchangeable sediments will be critical in any attempt to build ecosystem simulation/forecasting models. Each of the components of this project contributes to that end.

Plans

There are several sub-projects under this title:

- Completion of our paleo-proxies project with Phil Meyers (U MI Geol). Goal is to compare common sediment paleo-proxies (stable isotopes of organic matter and CaCO3, alkanes and wax ester chain lengths, steroids) with measured climate over Lake Erie during the past 100 years - a test of the utility and robustness of the proxies for future use.
- Complete the analyses of a sediment core collected, September 2003, in the eastern basin reference site (EBRS) - the region of best sediment temporal resolution in any of the Great Lakes. Goal is to develop a reconstruction of anthropogenic impact on Lake Erie and investigate subtle post-depositional geochemical processes.
- Conduct a (published and gray) literature search of the properties and recent accumulation rates of Lake Erie sediments. Goal is to provide the Lake Erie modeling project with best available information on critical sediment-water coupling and determine whether further sample collection will be needed.
- Deploy epi- and hypolimnion sequencing traps in the central and eastern basin to measure particle and constituent fluxes.
- Organize a workshop with the Lake Erie Millennial Group and EPA-GLNPO to present GLERLs’ proposed efforts and build potential collaborations.

Accomplishments

Paleo-proxies

Cores from the same location collected in 1983 and 1991 have been analyzed for geochronology, stable isotopes, carbon, and nutrient concentrations. Analyses of these same constituents plus selected lipid biomarkers are nearly completed on a new core. The core
collected in September 2003 provides data on the effects of the relatively warm temperatures of the 1990s. Data are being processed and will result in a manuscript.

**Eastern Basin Reference Site Cores (EBRS-03)**

Most analyses are completed. A manuscript is in draft form.

**Literature Review**

Literature has been accumulated but the search has not yet been exhaustive. We recovered 3 independent data sets of radionuclide analyses of accumulation rates/inventories. These, (Edgington, 1976 Cs rates + inventories, Robbins 1982 Cs inventories, Edgington and Klump 1991 Cs and 210 Pb rates) combined with the Kemp et al sediment accumulation rates (below) based on pollen and Canadian surveillance data, will allow us to synthesize the data accumulation rates in the lake for modeling and recent accumulations of carbon and nutrients.

**Net Mass Accumulation Rate Lake Erie**

**Trapping**

Canadian Centre for Inland Waters trap samples (May - Oct, 2004) are being analyzed in conjunction with GLERL trap samples from Sep 2004 - Oct 2005 at the center of the central basin and the deep hole in the eastern basin. Mass, nutrient and carbon fluxes are being measured. Two posters were presented at the 2006 Lake Erie Millennium network conference (see below). These data will be incorporated into the sediment accumulation manuscript.
As a major step in developing this Lake Erie program, GLERL hosted a large (over 50 attendees), international workshop on March 4-5, 2004 to identify and discuss three important Lake Erie issues that GLERL scientists thought were within the existing capabilities of the laboratory: anoxia and hypoxia, harmful algal blooms (HABs), and coupling physics with fish forecasts.
This workshop also provided an opportunity:

- for GLERL scientists to learn about ongoing programs by U.S. and Canadian agencies and academics,
- to discuss facilitation of communication and collaboration among GLERL and the other, ongoing research programs in Lake Erie, and
- for improving the focus and approach of GLERL’s Lake Erie coordinated research program whose long-term goal is the development of models and other tools to better understand and forecast changes in the Lake Erie ecosystem.

Several areas of potential and immediate collaboration were identified and mechanisms to implement them were initiated.

**Products**

Lake Erie Research Planning Workshop Final Report

**Posters**


**Presentations**


**References**