



THE GREAT LAKES COASTAL FORECASTING SYSTEM

- A COASTAL PREDICTION TOOL -

February 1995

BACKGROUND

A principal mission objective of the National Oceanic and Atmospheric Administration (NOAA) is to develop and deliver products consisting of data, warnings, predictions, and advice to users of the coastal ocean and Great Lakes. The safe and wise use of coastal waters requires knowledge of the physical characteristics of these waters and a method to anticipate changes in these characteristics. Typically these characteristics include the three-dimensional distribution of temperature and currents, water levels, and surface wave fields. According to the 1989 National Research Council Report on Opportunities to Improve Marine Forecasting, "There exists a common national interest in, and need for, nowcasts and forecasts of oceanic velocity, thermal structure, and related fields. Significant and sustainable benefits to a variety of commercial, military, and recreational oceanic activities are identifiable and are now, for the first time, feasible based on existing ocean science and technology."

The Great Lakes Coastal Forecasting System (GLCFS) is a product being developed jointly by NOAA's Great Lakes Environmental Research Laboratory (GLERL) and Ohio State University (OSU) to provide daily nowcasts and two-day forecasts of the complete physical state of each of the Great Lakes. The forecasting system is computer-based and consists of four components: Data Assimilation, Modeling, Data Display, and Distribution. It uses data input from National Weather Service (NWS) surface and marine observations, satellite (AVHRR) water temperature analyses, water levels, National Meteorological Center wind forecasts, as well as data from other sources, such as municipal and industrial water intake temperatures. Tributary and watershed models are coupled to the lake hydrodynamic model. The conceptual plan is for a system that nowcasts and forecasts physical conditions on each Lake, such as wave height and direction, winds, currents, and temperature structure, on a daily basis for up to two days in advance. In addition, forecasts of environmental parameters such as sediment transport and water clarity, certain water quality indicators, such as chlorophyll and nutrients, and the trajectories of oil and chemical spills could be incorporated into the system if appropriate models are developed.

The forecasting system will have application to: 1) hazard warning, avoidance, and reduction; 2) enhancement of commercial and recreational activity; and 3) natural resource preservation. The output will be a series of maps and alphanumeric products tailored to display specific information based on the requirements of the user(s). For example, the present condition and forecasts of thermocline depth and current velocities will be useful to commercial and recreational fishermen, while water temperature forecasts for sites of municipal and industrial water intakes would be useful to certain industries and municipalities.

ACCOMPLISHMENTS

A prototype coastal forecasting system for Lake Erie was implemented in 1992. In 1993 and 1994 the system produced daily maps of water surface temperature, water level, and currents for the lake. These products were evaluated by scientists at both GLERL and OSU, and distributed to a testbed of potential public and private users. The evaluation showed that the forecast system can provide extremely accurate estimates of lake surface temperature and water level; the accuracy of subsurface temperature estimates and currents is still being evaluated. Public and private sector users were asked to evaluate the products at a workshop held during the fall of 1994. Their response was very favorable and the group expressed high interest for continued Lake Erie products, as well as the desire for expansion of the system into the other four Great Lakes.

STATUS

The prototype Lake Erie GLCFS has been implemented as an operational system, and prototype systems for two more lakes have been partially developed. NOAA has made a commitment to develop a national capability to measure, understand, and forecast coastal environmental phenomena that impact coastal economies, public safety, and environmental management through a network of regional Coastal Forecast Systems. The GLCFS is the prototype for that expanded national network in the Great Lakes region.

During FY 95 we will begin transferring the marine hazard forecasting elements of the Lake Erie GLCFS to the NWS Forecast Office in Cleveland, OH. They will use this system to enhance their operational marine prediction capabilities for Lake Erie.

FUTURE

Research on related projects, such as incorporation of technologies from new satellite sensors, will continue, and will result in improved models and products for the existing GLCFS. However, the additional funding needed for continued development and expansion of the GLCFS into other Great Lakes is not available at this time.

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