

**Coastal Inundation Prediction System (CIPS):
Predicting the Next Storm Surge –
A Regional Prototype to Address a National Problem**

On behalf of a team of government, academic, and private sector partners
in the Chesapeake Bay Observing System

Recent Hurricanes Katrina and Isabel not only demonstrated their immense destructive power, but also revealed the obvious, crucial need for improved storm surge forecasting and information delivery to save lives and property in future storms. Current operational methods and the storm surge and inundation products do not adequately meet requirements needed by emergency managers (EMs) at local, state, and federal levels to protect and inform our citizens.

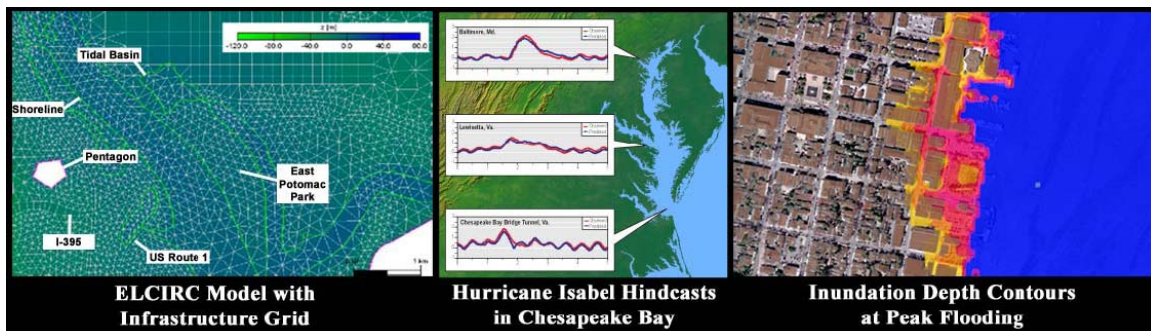
The Chesapeake Bay Inundation Prediction System (CIPS) is being developed to improve the accuracy, reliability, and capability of flooding forecasts for tropical cyclones and non-tropical wind systems such as nor'easters by modeling and visualizing expected on-land storm-surge inundation along the Chesapeake Bay (CB) and its tributaries. An initial prototype has been developed by a team of government, academic and industry partners through the Chesapeake Bay Observing System (CBOS) of the Mid-Atlantic Coastal Ocean Observing Regional Association (MACOORA) within the Integrated Ocean Observing System (IOOS).

For demonstration purposes, this initial prototype was developed for the tidal Potomac River in the Washington, DC metropolitan area. The preliminary information from this prototype shows great potential as a mechanism by which NOAA National Weather Service (NWS) Forecast Offices (WFOs) can provide more specific and timely forecasts of likely inundation in individual localities from significant storm surge events. This prototype system has shown the potential to indicate flooding at the street level, at time intervals of an hour or less, and with vertical resolution of one foot or less. This information will significantly improve the ability of EMs and first responders to mitigate life and property loss and improve evacuation capabilities in individual communities. CIPS will provide an end-to-end prototype inundation forecasting system to facilitate emergency management decision-making in the challenging case of complex, intricate coastlines—semi-enclosed, coastal bays and estuaries. These coastal features can either protect the large population centers they harbor or render them vulnerable to trap and amplify storm surges, as was the case in the Chesapeake Bay with Hurricane Isabel in 2003. The accuracy of forecasts depends critically on small differences in the relative positions of the storm track and the Bay's axis that challenge current forecast models.

The near-term work in CIPS is oriented along two major avenues. First, the technique of ensemble forecasting will be expanded in the atmospheric domain and translated to the hydrodynamic and hydrologic domains. The primary benefits will be improved accuracies and the production of quantitative estimates of forecast uncertainties. Second, CIPS development will build upon the demonstrated prototype visualization, validation, and information-delivery system and assess the value of this system, in conjunction with EMs, not only for their immediate storm response, but also for their advance planning and decision-making during recovery and work with them to integrate CIPS into their operations.

CIPS ultimately will provide an end-to-end system that defines users' needs, integrates the subsystems for observation, forecasting, visualization, validation, data and product development, and communicates high-resolution products through WFOs to EMs, and then to a broad spectrum of users, including the general public.

CIPS initially will be constructed as a working operational prototype for the CB region, but it will be built for efficient transfer to the broader MACOORA and other Regional Associations within IOOS. While inundation support to EMs is the focus in the near-term, the CIPS prototype also can be applied to additional societal needs within IOOS, including maritime operations, national and homeland security, public health risks, maintaining healthy coastal ecosystems, and sustained use of resources.



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