

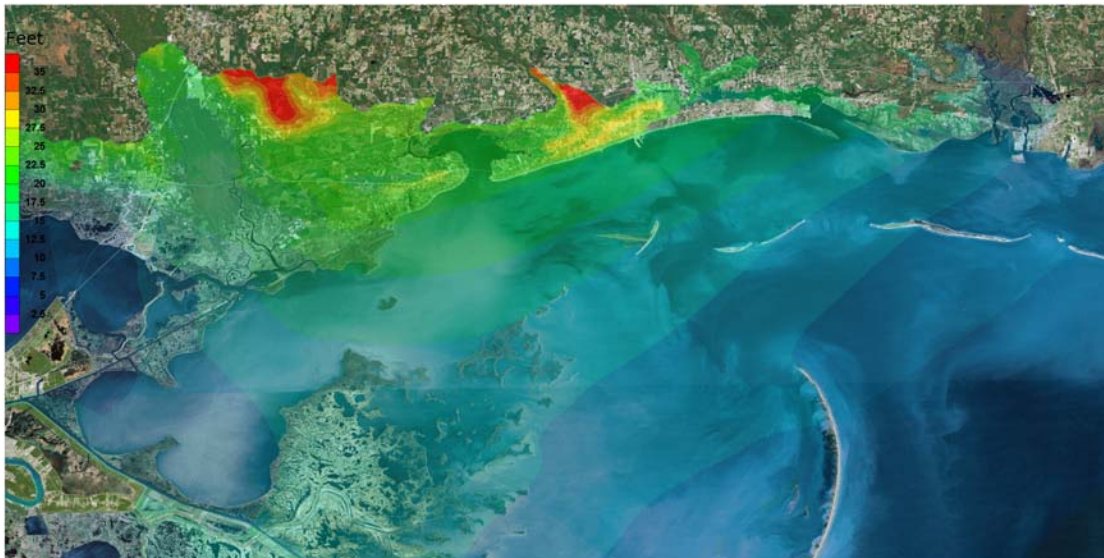


## **ADVANCED SURGE AND INUNDATION MODELING AT THE NAVAL RESEARCH LABORATORY**

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### **A Hindcast Reconstruction of Hurricane Katrina**

NRL began reconstruction of Katrina's storm surge three weeks after the storm focusing on events along the Mississippi Gulf Coast. Software developed at NRL for semi-automated mesh generation was applied to construct an unstructured finite element mesh designed to capture Katrina's storm surge and inland inundation. The mesh consists of 375,479 nodes and 730,431 triangular elements with nodal densities of approximately 225m resolution centered on the northern Gulf Coast region encompassing inland areas. The expansive domain places ocean boundaries in North Atlantic deep waters subject to minimal surge and inverted barometer effects where tidal forcing from a global tide model is readily accepted. The best available wind forcing, NOAA's real-time Hurricane Wind Analysis System (H\*Wind) product, and tides were applied to a hindcast simulation of Hurricane Katrina using the two-dimensional ADvanced CIRCulation model, ADCIRC. At every 1-sec time integration of the model, the water levels and depth-integrated currents are computed at all points in the model domain. Comparisons between model computed water levels and 315 USGS measured high water marks resulted in an average model error of only 1.2 feet.



A map of ADCIRC modeled high water mark values (feet) obtained from evaluations at 10-minute intervals during the hindcast of Hurricane Katrina.

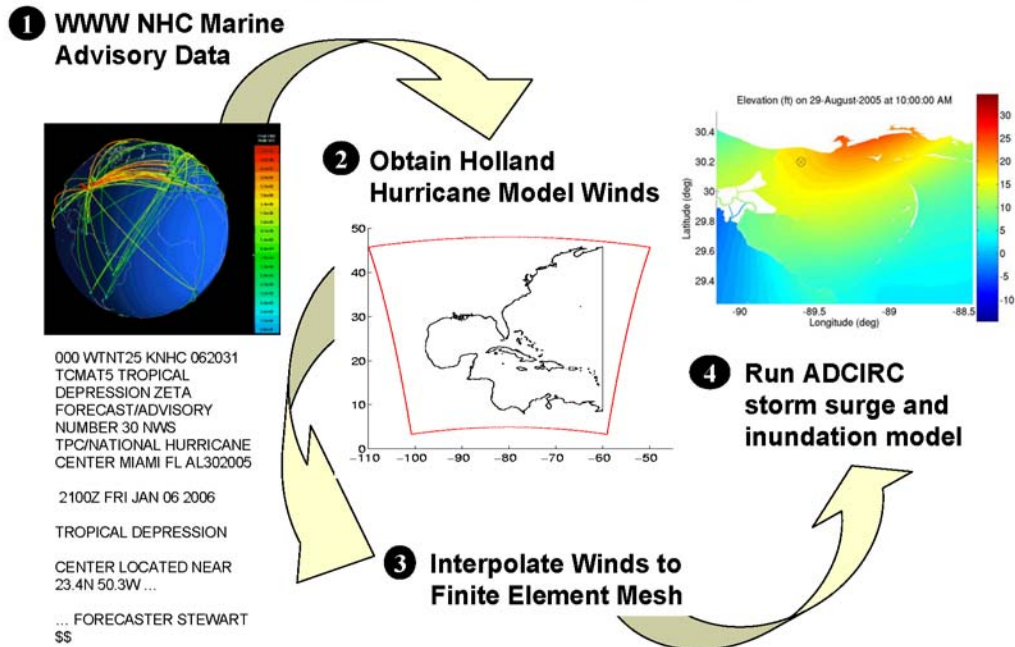
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## The Navy's Operational Surge and Inundation Prediction Capability

The close proximity of Katrina's landfall to the Navy's Oceanographic Operational Center at NAVOCEANO, Stennis Space Center, Mississippi ignited Navy interest in a robust capability for storm surge prediction. Using forecast wind fields from the parametric cyclone model of Holland (1980), a hurricane storm surge prediction system was developed to automate the forecast of surge and inundation in coastal regions (Figure 2). The system can immediately address storms poised to strike the Mississippi Gulf Coast. Analysis and forecast data from the NOAA National Weather Service National Hurricane Center/Tropical Prediction Center forecast/advisory files are automatically read and processed. Extracted data initializes the generation of forecast cyclone winds which in turn provide meteorological forcing for execution of the ADCIRC storm surge model. This system was transitioned to NAVOCEANO on 10 May, 2006 in time for the 2006 Atlantic hurricane season.

### ADCIRC Model Forecast System for Storm Surge and Inundation



A schematic of the developed storm surge and inundation prediction system transitioned to the Naval Oceanographic Office at Stennis Space Center, Mississippi in May, 2006.

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