Investigating freshwater and coastal circulation interaction for extreme events

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NOAA: National Oceanic and Atmospheric Administration
NOS: National Ocean Service
NWS: National Weather Service
ESMF: Earth System Modeling Framework
NUOPC: National Unified Operational Prediction Capability

Abstract Text:
To enable flexible model coupling for simulating compound coastal hydrodynamics (e.g. surge and wave) and inland hydrology, a software system based on ESMF/NUOPC technology under a common modeling framework called the NOAA Environmental Modeling System (NEMS) is being developed. The system enables dynamic interaction among ocean circulation, surface wave and hydrology/inland hydraulic components. We also work towards assembling a geospatial and environmental information that seamlessly traverses contrasting spatial scales from rivers and their tributaries to the coastal waters to ensure that all the physical processes of interest are captured in our coupling effort. Several research projects and collaborations among NOS’ Federal and university partners are on-going to support NOS’ coastal ocean models coupling to inland hydrology/hydraulic model. These include automated mesh generation to accurately resolve river connection to coastal ocean models, automated river forcing preparation based on the inland hydrology river network, dynamical load balancing based on wet nodes and storm progression, inclusion of the volume of the precipitation on the wet part of the computational domain, flood routing in the dry part of the computational domain, baroclinic effects on the total water level calculation in coastal regions as well as developing NEMS interface capabilities for NOS’ operational forecasting models. We will present our progress on evaluating consequences of the compound inland-coastal flooding in the coastal inundation for Hurricanes Irene and Sandy for the Delaware Bay region. We will also lay out our plan for extending the implemented capabilities for the entire U.S. Atlantic coast.

References: