Multi-scale Modeling of Riverine and Porous Coastal Environments In a Hydrodynamic Model

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The Lower Mississippi River and its delta are forced by a range of processes and scales including riverine flows, tides, winds, atmospheric pressure fields and wave fields. This region has been modeled using the Southern Louisiana SL16 unstructured mesh, which utilizes a large domain encompassing the U.S. Gulf Coast, the Gulf of Mexico, the western North Atlantic Ocean and the Caribbean Sea. This large domain allows simple and well established boundary conditions to be applied. A wide range of resolution (from 30m to 25 km) has been applied within the domain, particularly in Louisiana, where there are significant wave-breaking zones; large bathymetric gradients due to the continental shelf; and large swaths of coastal wetlands that cause large localized gradients in surface elevation, current and wave fields. Significant resolution is placed within the Mississippi River and its delta for improved riverine and tidal flow, as well as hurricane surge propagation.

The SL16 unstructured mesh will be used with the ADCIRC Coastal Circulation and Storm Surge Model in the validation of riverine flows and hurricane surges in the Lower Mississippi River. A study of riverine stage-discharge relationships will be shown, with comparisons to the previous SL15 unstructured mesh and to measured riverine stages at various stations along the River. In addition, discharges at various distributaries in the River delta will be compared to measured discharge information at the same locations, and previous simulations with the SL15 computational mesh. The coupled SWAN+ADCIRC model will be used to highlight surge propagation along the River during various hurricane events.

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