Multi-Dimensional Modeling

Team Leaders: Ehab Meselhe, Water Institute of the Gulf (CPRA), and Gary Brown, Engineer Research and Development Center (USACE)

Team Participants: USACE New Orleans District, USACE Engineer Research and Development Center, University of New Orleans, Coastal Protection and Restoration Authority of Louisiana, the Water Institute of the Gulf

Purpose: Apply a suite of numerical models (FLOW-3D, Delft-3D, FVCOM, ADH/SEDLIB) that can accurately simulate the pertinent physical processes in the river and adjacent basins. The output from these models contributes to the engineering, design, operation, and management of proposed river diversions and enhances our understanding of the potential influence that diversions will have on river and wetland morphology.

Objectives:

- Develop tools that can reflect existing and future conditions of:
  - Hydrodynamics and bed shear stress
  - Sediment transport and fate
  - Sediment sorting and armoring
  - Sediment diversion dynamics
  - Morphologic change in the river and receiving basins
  - Salinity effects (stratification, sediment flocculation)
- Focus on sub-sections of the Lower Mississippi River (LMR), with a focus on event and annual time scale simulations, as well as specific stage/flow conditions, such as peak or low flow.
- The modeling tools must be capable of representing both the existing conditions of the river (to establish the relative significance of various governing physical processes) as well as the local and system-wide changes due to proposed restoration strategies.
- Use inter-model comparisons to enhance confidence in the conclusions drawn from the collective model results, and to minimize risks from decisions made based on these results.

Challenges:

- Accounting for Local Subsidence and Sea Level Rise
- Wide range of temporal and spatial scales of relevant physical processes
- Complex water-sediment dynamics in the LMR

Status:

- Model computational grids have been constructed.
- Calibration and validation using observational data is in progress.
- Model refinement and project modeling runs will continue through FY14.

Anyone seeking additional information on the MRHDM Study can visit the LCA program website at ***www.lca.gov***, at the New Orleans District LCA website at ***www.mvn.usace.army.mil/Missions/Environmental/LouisianaCoastalArea.aspx***, or the CPRA website at ***http://coastal.louisiana.gov***

Mississippi River Hydrodynamic and Delta Management Study

U.S. ARMY CORPS OF ENGINEERS **BUILDING STRONG®**

Multi-Dimensional Modeling

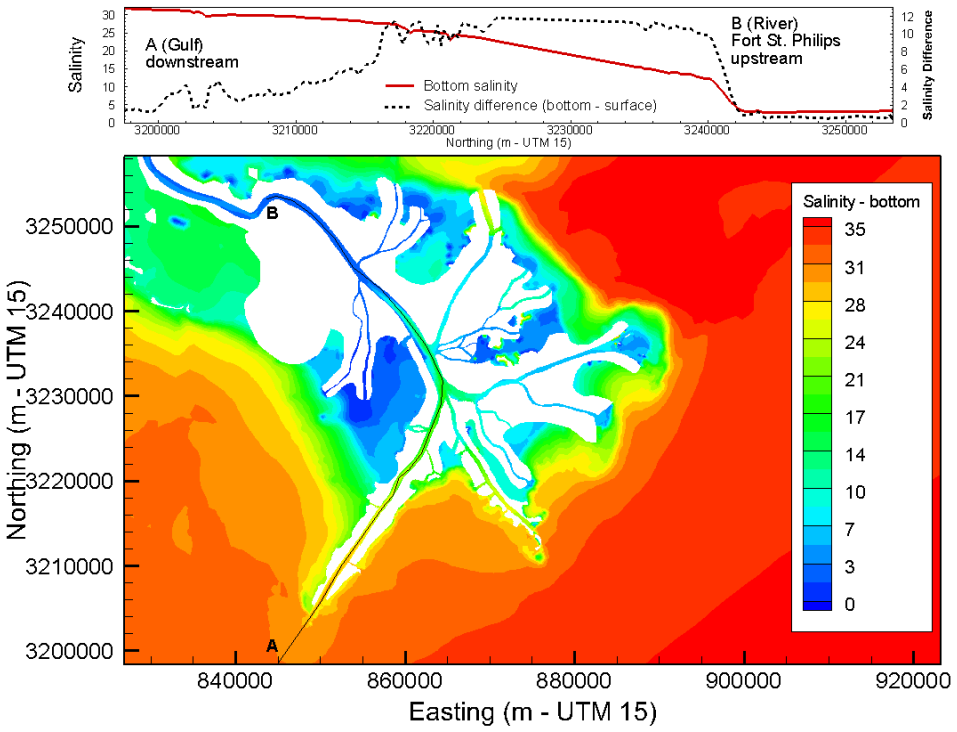

Fig. 1 FVCOM-3D model output showing salinity gradients in the lower river and bird's foot delta.

The focus of this model is on hydrodynamic, sediment and salinity processes in the reach from Empire to the Gulf. The model domain integrates the lowermost river with the bird's foot delta and receiving basins. This model is designed to track the upstream movement of the salt wedge and to simulate the impacts of the multiple existing and proposed diversions on salt wedge dynamics.

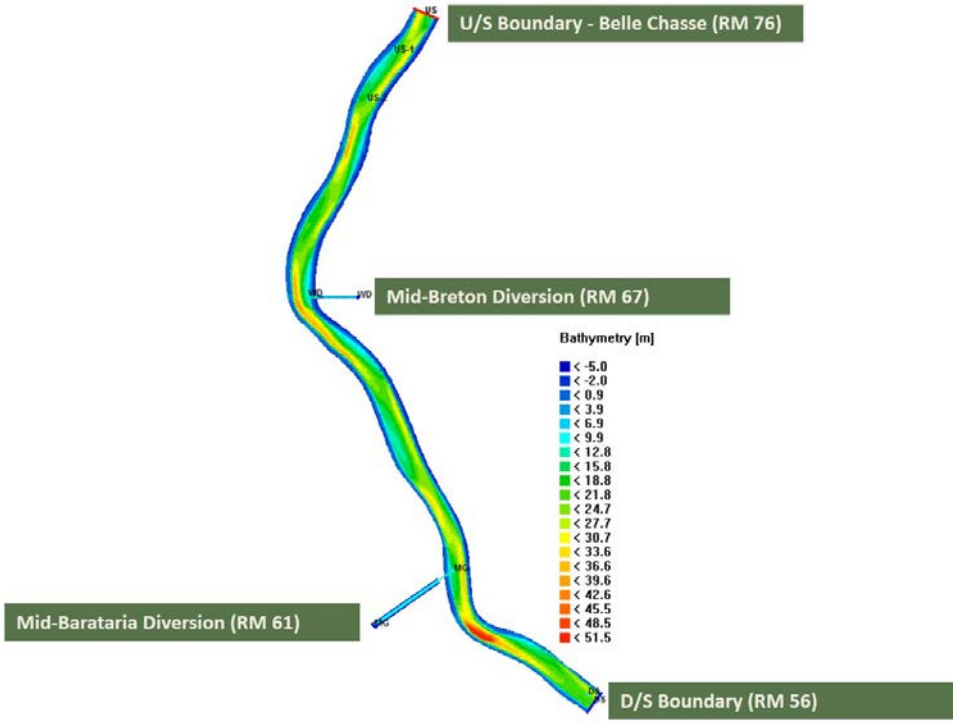

Fig. 2 FLOW-3D Model Domain and location of the proposed Mid Barataria and Mid Breton Sound Diversions.

This model focuses on high-resolution sediment and water details around selected diversion intakes. It is used to optimize the location of intake structures and optimize diversion channel alignment to maximize the benefits (sediment capture and delivery) of proposed diversions. It also produces water-sediment diversion coefficients that are used as input for the regional 1-D HEC6-T model.

U.S. ARMY CORPS OF ENGINEERS – NEW ORLEANS DISTRICT
7400 LEAKE AVENUE, NEW ORLEANS, LA 70118
Visit the following links to follow us on Facebook, Twitter and Flickr:
http://www.facebook.com/usacenola
http://twitter.com/teamneworleans
http://www.flickr.com/photos/teamneworleans

LOUISIANA COASTAL PROTECTION AND RESTORATION AUTHORITY
450 LAUREL STREET, BATON ROUGE, LA 70808
http://coastal.louisiana.gov