HAGEN, LSU

DHS Coastal Resilience Center

Research Project Work Plan

1 /1/2016—12/31/2017

1. **Project Title**. Development of an optimized tide and hurricane storm surge model for the northern Gulf of Mexico (MS, AL, FL) for use with the ADCIRC Surge Guidance System.
2. **Principal Investigator**. Scott C. Hagen, Professor. Louisiana State University, Department of Civil & Environmental Engineering / Center for Computation & Technology.
3. **Other Research Participant/Partner**. Stephen C. Medeiros, Research Assistant Professor. University of Central Florida, Civil, Environmental & Construction Engineering Department, Coastal Hydroscience, Analysis, Modeling and Predictive Simulations Lab.
4. **Short Project Description**. This study will develop a semi-automated mesh de-refinement method designed to optimize a research grade tide, wind-wave, and hurricane storm surge model so that it can be used in real-time surge guidance operations. The resulting model will be capable of producing accurate predictions within the ADCIRC Surge Guidance System (ASGS) forecast time frames and will include advanced terrain analysis and lidar-based surface roughness parameterizations.
5. **Abstract**.

   This project will advance state-of-the-art model development by introducing novel terrain analysis techniques and lidar-based surface roughness parameterization at the regional scale. These advanced techniques will also be used to develop intelligent, stable, and semi-automated mesh de-refinement methods for optimizing a research grade (i.e., high resolution) storm surge model to reduce computational time to the point where it can be run within reasonable real-time forecast time frames (e.g., ~1-2 hrs). We will use a protocol based on emphasizing hydraulically significant embankment or valley features to optimize a research grade model of the MS, AL, and FL Panhandle. Since the purpose of ASGS is the provision of real-time hazard guidance, we will emphasize the accurate capture of the timing and magnitude maximum water levels. This will be achieved by employing mesh development techniques such as: running preliminary simulations to define active floodplain and removing unnecessary elements (relevant because the research grade model was developed to accommodate up to two meters of sea level rise); employing accelerated element relaxation moving outward from significant vertical features; and enforcing stricter criteria for vertical feature inclusion (especially for channels). Objective error metrics will be used to assess model performance. The final outcome/deliverable will be an accurate, optimized hurricane storm surge model of the northern Gulf of Mexico (MS, AL, & FL Panhandle) that is suitable for use with the ASGS including improved surface roughness parameterization from our lidar-based technique. In addition, this high resolution ADCIRC+SWAN model will serve as a benchmark for validating future versions that may incorporate less resolution or smaller regional focus.