CRC 1st Annual Meeting: March 2-3, 2016
Chapel Hill, NC

The Incorporation of Rainfall into Hazard Estimates for Improved Coastal Resiliency

Donald T. Resio – University of North Florida

Bruce A. Ebersole – Jackson State University

Hugh J. Roberts – Arcadis U.S., Inc.

Project Overview

- **Increasing Threat to Coastal Communities**: Rising Sea Level, climate variability, growing coastal populations, locations of critical infrastructure
- **Increasing threat to Coastal Ecosystems:** Coastal evolution and expanding development are impacting ecosystems in the U.S., particularly in large urbanized/suburbanized areas
- **Decision-making for improved resilience and sustainability require accurate information**: Improving resilience requires accurate information
- **Present information sources treat coastal and hydrologic flooding separately**: In many areas the "backwater" effect of coastal inundation events significantly increases flood levels over either hydrologic flooding or coastal surges alone
- **This project will develop an improved methodology for incorporating rainfall/hydrology flooding into coastal events**: Moreover, this will be done in a fashion to remain computationally feasible for FEMA and other major inundation mapping studies

Project Relevance

- **DHS Goal 1.3 – Manage Risks to Coastal Infrastructure, Key Leaders, and Events**: Past events have demonstrated threat threats posed to inland areas is often underestimated, with damages due to inland flooding comparable to areas at the coast . This project will help remediate this deficiency, thereby enhancing our capabilities in this area.
- **DHS Goal 5.1 – Mitigate Coastal Hazards and :** Multidisciplinary teams will be utilized to develop improved hazard maps in coastal areas that will disperse the burden more equitably.
- **DHS Goal 5.3 – Ensure Effective Emergency Response** : Our project is intended to provide improved quantitative patterns of event hazards, which will be very valuable to emergency responders.
- **DHS Goal 5.4 – Rapidly Recover from a Catastrophic Event**: This project will provide accurate information on the interaction of hazards with critical infrastructure and the patterns of these individual hazards during individual events, as needed for effective post-disaster planning.

Technical Approach

- **Develop Effective ADCIRC-HEC Interface (one-way coupling or one iteration)**
- **Quantify interaction of pre-existing conditions and event-related rainfalls with coastal inundation**
- **Develop statistical basis for rainfall patterns affecting coastal inundation**
- **Develop statistical approach to combine hydrologic and coastal inundation within computational limits**
- **Provide system to JSU and other groups for educational learning and system testing**
- **Test overall system in Norfolk-Hampton Roads area**

Major Milestones

- **Report on rainfall patterns in hurricanes relevant to coastal flooding – July 2016**
- **Draft report on quantifying rainfall patterns and model coupling for initial system design – February 2017**
- **Final report on complete statistical system with model coupling and rainfall effects included**
- **Final report on complete JPM system for incorporation of rainfall and antecedent conditions– December 2017**
- **Final report on system performance in Norfolk – Hampton Roads area and impacts on flooding estimates – December 2017**

- **Transitional Activities**: (*Overall effort headed by Bruce Ebersole (JSU)*)
  - Educational opportunities – student exchanges and investigation into regions where the interactions of hydrologic and coastal inundation sources are significant
  - Maintaining communications with end users throughout project
- **End Users/Transition Products:**
  - FEMA Risk Map applications
  - USACE Coordination with ongoing USACE R&D and applications (ERDC-CHL)
  - NOAA would like expanded collaboration between their ongoing efforts and this project (NOAA- EMC-Marine Modeling and Analysis)
  - USCG would like to see elements of this effort expanded to include development of scenarios for Coast Guard guidance during and after disasters
  - NGA-POC – expressed a desire to incorporate our research into their maritime mission.
  - NSF – "Big Data" – is sponsoring a project to investigate the incorporation of Big Data methods into coastal resilience (UNF is part of a collaborative proposal under this program)

Images King Tide and Rainfall only – Norfolk /Hampton Roads