JOHNS HOPKINS
Center for Environmental
& Applied Fluid Mechanics

Friday, September 20, 2019
3:00 PM, 132 Gilman Hall

"Wave-Current-Surge Modeling System for a Shallow Lagoon-Inlet-Coastal System"

Presented by Prof. Meng Xia
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Department of Natural Sciences
Hosted by Prof. Joseph Katz (Mechanical Engineering)

A coupled wave-current-surge model was calibrated and validated against observational data, and applied to investigate the complex dynamics of the paired inlets in the Maryland Coastal Bays (MCBs) during hurricanes. With the inclusion of wave-current interactions, model performance was significantly improved during Hurricane Irene (2011). Major processes of wave-current interactions include the wave radiation stress-induced setup and currents, and the modulation of depth-induced breaking via water depth variations. In comparison to radiation stress, wave-induced bottom friction and sea surface roughness are of secondary importance on generating nearshore circulations. Further investigations revealed that tidal currents and ocean swells dominated inlet circulations and wave dynamics, respectively. However, wave dynamics in the lagoon and behind inlets are mainly controlled by local winds and modulated by the shallow bathymetry. This coupled wave-current model with the model-nested method can be further applied to similar lagoon-inlet-coastal ocean systems around the US and the world.