

CHALLENGES AND INNOVATION IN CIVIL AND ENVIRONMENTAL ENGINEERING



Assessing the Impact of Future Sea Level Rise and Climate Change on Hurricane Flood Level Statistics

Dr. Jennifer Irish

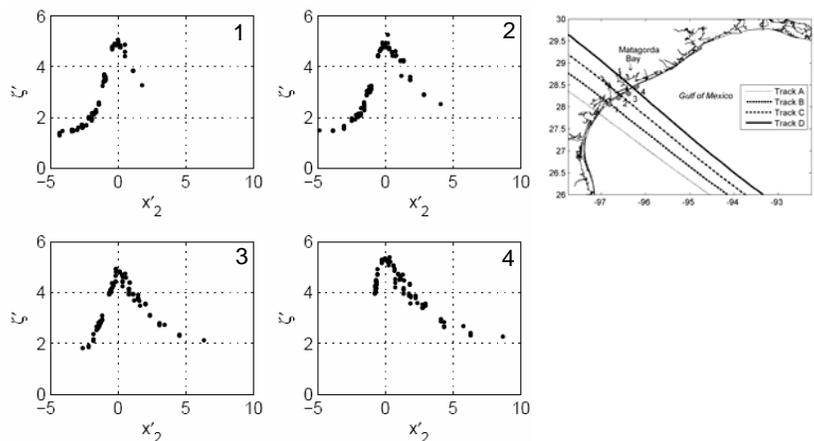
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138 DeBartolo Hall, 3:30pm

Reliable extreme-value hurricane flooding estimates are essential for effective coastal risk assessment and engineering. Recent studies suggest that in the future sea level rise (SLR) may accelerate and major hurricanes may intensify. Here, methods will be presented for incorporating both SLR and time-varying hurricane conditions into extreme-value flood statistics. Dimensionless scaling laws developed from a limited set of hydrodynamic simulations are used with a joint-probability approach to rapidly define time-varying continuous probability mass functions for hurricane flood elevation. It will be demonstrated that these scaling laws can account for the dynamic coupling between surge generation and changes in mean depth in shallow coastal regions, e.g., bays and estuaries, with SLR without loss in surge-prediction accuracy. It will also be shown that by using a joint-probability approach with scaling laws, a time-varying natural upper bound to the cumulative probability distribution can be established, based on projected future hurricane meteorological statistics and sea level rise.

Dr. Irish's expertise is in physical response at the coast due to extreme weather events like hurricanes. She is a licensed professional engineer with 15 years of experience in coastal engineering, and prior to starting a faculty position in 2006, she was a regional technical specialist and research engineer with the U.S. Army Corps of Engineers. Dr. Irish has expertise in storm surge dynamics, storm morphodynamics, vegetative effects, coastal hazard risk assessment, and general coastal engineering. In 2008, Dr. Irish received the Superior Civilian Service Award from the Department of the Army in recognition of her scientific contributions to determining hydrodynamic response and flood risk in the New Orleans region as part of the Interagency Performance Evaluation Taskforce. She is Secretary of the Coasts, Oceans, Ports, and Rivers Institute Governing Board of the American Society of Civil Engineers. At Texas A&M, Dr. Irish teaches coastal engineering, estuarine hydrodynamics, fluid dynamics, and laboratory and field methods in coastal engineering. Dr. Irish currently leads research on hurricane surge parameterization, hurricane extreme-value and forecast statistics, vegetated wave dynamics, levee design, beach and barrier island response to hurricanes, and impacts of climate change on coastal flooding and damages.



Dimensionless surge response functions in the vicinity of Matagorda, Texas
(from Irish et al. 2009)

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