

## ADAPTATION OF COASTAL COMMUNITIES AND NATURAL ECOSYSTEMS IN A CHANGING CLIMATE

*Y. Peter Sheng, Vladimir A. Paramygin, Adail Rivera-Nieves, et al.*

University of Florida, Gainesville, FL, USA

Coastal communities in many parts of the world are subject to increasing coastal inundation risk due to compound impacts of intensifying tropical cyclones, accelerating sea level rise, extreme precipitation, and changing land use features. Here we present a dynamic process-based approach to assess the compound coastal flooding risk in two coastal regions in the U.S. – one along the New Jersey and New York coasts where Superstorm Sandy caused catastrophic flood damage, and another in southwest Florida (SWFL) where Hurricanes Irma and Wilma caused disastrous flood damage. Both regions have extensive coastal wetlands with tidal marshes in NJNY region and mangroves in SWFL.

Here we assess the current and future coastal flood risk in these regions by using a three-dimensional vegetation-resolving surge-wave model, a loss model with extensive field data and the Joint Probability with Optimal Sampling (JPM-OS) statistical method. We found the future probabilistic coastal flood hazards in both regions are expected to more than double by 2100. While coastal wetlands are found to have reduced flood-induced structural loss during past storms, their values are highly dependent on the storms and local topographic, wetland, and property conditions (*Sheng et al., Scientific Reports, 2021*). The flood protection value of coastal wetland will change over time but is likely to be retained by 2100.

For adaptation of coastal communities and natural ecosystems and communities, it is essential to consider the impact of changing climate on the 1% flood in coastal regions instead of a single tropical cyclone. We present a novel approach to incorporate the joint probability density functions of the five characteristic of tropical cyclones and the sea level rise. (*Yang et al., Natural Hazards, 2019; Sheng et al., Submitted, 2021*).

**PRESENTER BIO:** Dr. Sheng is a Professor Emeritus and Adjunct Research Professor in the Civil and Coastal Engineering Department of the Engineering School of Sustainable Infrastructure and Environment, University of Florida. He has been the PI of the Piermont Marsh project funded by the NERR Science Collaborative and the ACUNE project funded by NOAA. Dr. Paramygin is a Research Assistant Scientist in the same department with extensive experience in coastal modeling. Adail Rivera-Nieves is a Ph.D. candidate in the same department at University of Florida. We have too many contributors to list their names here.