

## **Lifetime Reliability of Structures Vulnerable to Hurricanes in Marine Environments**

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**Abstract:** Coastal and marine structures are susceptible to substantial threat from hurricanes. Future climatic change can further amplify this threat due to the increasing frequency and intensity of hurricanes as well as higher storm surge due to hurricanes with greater precipitation rates. On the other hand, socioeconomic growth keeps driving higher population density and property values in coastal regions, leading to accruing exposure and consequences to hurricanes. The challenge is further compounded by the deep uncertainties stemming from the complexity of climatic and socioeconomic systems and the ambiguity of future policy scenarios. This keynote lecture presents several aspects of climate change impact on the lifetime reliability of structures vulnerable to hurricanes in coastal and marine environments. It is intended to draw some imperative attention from the wind engineering community on the need for multi-hazard and robust approaches to effective climate adaptation actions of coastal structures.

This lecture also presents a systematic framework for the optimal adaptation of residential buildings at regional scale under various climate change scenarios. Different adaptation strategies are investigated to ensure adequate structural performance and to mitigate the damage loss and adverse consequences to society. A genetic algorithm-based optimization process is adopted to determine the optimal adaptation types associated with buildings within an investigated region. The framework considers the probabilistic occurrence models of hurricanes, structural vulnerability of typical residential buildings, possible climate change scenarios, and optimization of various climate adaptation strategies in a lifecycle context. The proposed approach is applied to a residential community in Florida.