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Ph.D. DISSERTATION DEFENSE

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Degree:	Doctor of Philosophy
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Date and time:	**August 10 at 1:00 PM EDT**
Location:	711 Hudson St, Hoboken, NJ, **ABS Lab**, Third Floor **Room 301**
Title:	Assessing the Impact of Hurricane Climatology Change and Sea Level Rise on Extreme Wave Hazards Using Physics-based Models
Chairpersons:	*Chairman:* Prof. Reza Marsooli, CEOE. *Co-Chairman:* Prof. Jon Miller, CEOE.
Committee Members:	Prof. Muhammad R. Hajj, CEOE. Prof. Peter Ruggiero, College of Earth, Oceanic, and Atmospheric Sciences, Oregon State University.

ABSTRACT

Hurricane-induced wind waves are among the major natural hazards that threaten coastal regions. Previous studies suggest that the frequency and intensity of major hurricanes would increase in a warmer climate, consequently increasing the frequency and magnitude of extreme wave hazards. Sea Level Rise (SLR) would further intensify the effects of extreme waves on coastal areas. A deeper near-shore zone would allow larger waves to approach shorelines, which would cause more intense storm-induced coastal erosion, wave overtopping, and flooding. Focusing on the New Jersey barrier islands, this study quantifies climate change effects on historical wave hazards and the response of beach-dune systems to hurricane-induced erosion and wave overtopping under future Hurricane Climatology Change (HCC) and SLR scenarios. Using a rigorous sensitivity analysis, a suite of numerical models is calibrated to accurately simulate extreme wave hazards to beach-dune systems. The calibrated models are implemented to simulate the morphodynamic changes, wave runup, and overtopping due to a large number of synthetic major hurricanes for a historical period in the late-20th-century and a future period in the late-21st-century under the RCP8.5 emission scenario. The results indicate that future coastal erosion and overtopping will increase due to HCC and SLR. The increase in coastal erosion was larger in the southern parts of the New Jersey Barrier Islands than in the northern parts. Beach-dune system characteristics play an important role in the effect of climate change on wave hazards. Neglecting storm-induced morphological changes results in significantly misrepresented wave hazards.