Hurricane Florence numerical simulations of waves and storm surge using different wind forcing products

Student: Angelos Papandreou

Faculty: Isaac Ginis

COE/Program: Coastal Resilience Center/Coastal Hazards Modeling

Abstract

Tropical cyclones can cause intense winds, waves, and storm surge in coastal areas. For this reason, the Department of Homeland Security needs to be equipped with the best scientific knowledge for predicting hazards from hurricanes. This study aims to improve the ADCIRC Prediction System modeling capabilities by evaluating the impact of two new hurricane wind products developed by NOAA and URI on storm surge and wave predictions. For this purpose, numerical simulations of Hurricane Florence are performed using a coupling between the ADCIRC storm surge model and the SWAN wave model. In the first simulation, the model is forced by the wind from NOAA's HWRF reanalysis, whereas in the second simulation the URI's HBL wind is applied. The results show that the significant wave height (SWH) is affected by the size of the hurricane. The HBL wind has higher maximum wind speeds than the HWRF wind. However, the SWH is higher in the simulation with the HWRF wind because of the hurricane's larger size. Furthermore, the TWD is affected by the SWH. In the simulation with the HWRF wind, the surge near the coastline is higher in a more extended area at the right side of the hurricane than the simulation with the HBL wind. Moreover, there are similar differences between the SWH observations and simulations, with the observations being closer at times to the results from the model run that was forced by the HBL wind than to the results of the model run that was forced by the HWRF wind. Finally, in both simulations, the maximum TWD is underpredicted in most of the analyzed locations, which is partially related to the smaller TWD compared to the observation after the ADCIRC spin-up. These results are preliminary and will be evaluated further in more detail in the near future.