FORECASTING OF COASTAL INUNDATION RISK IN CURRENT AND FUTURE CLIMATES

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Coastal communities worldwide are subject to increasing inundation risk due to rapidly accelerating sea level rise, more intense and frequent storms, and extreme precipitation under a changing climate. Florida communicates have suffered catastrophic flood induced losses during several major hurricanes in the last two decades. For example, southwest Florida was hit by Hurricane Irma in 2017, then again by Hurricane Ian in 2022. Data showed that these hurricanes underwent very rapid intensification prior to landfall due to the much warmer ocean and atmospheric temperature induced by climate change. The very rapid intensification of hurricanes not only resulted in much higher damages but also made the forecasting of hurricanes highly uncertain. To enhance the resilience of coastal communities, it is necessary to significantly improve the capacity to provide timely and accurate forecasting of potential coastal flooding and flood losses prior to the hurricane landfall.

This talk will present a robust coastal inundation forecasting system, built upon the coupled CH3D-SWAN surge-wave modeling system, and the simulation of coastal inundation in southwest Florida during Hurricane Irma and Ian. While the forecasting system is highly accurate, it takes a few hours to complete a forecast cycle. To enable rapid (within one minute after a hurricane track becomes available) forecasting of coastal inundation, we have developed a Rapid Forecasting and Mapping System (RFMS). The RFMS has been used for forecasting several recent hurricanes (Wilma, Charley, Michael, Irma, and Ian) along the Florida Gulf coasts. The RFMS is being further improved by using machine learning algorithms.

To represent the current and future inundation risk in coastal communities, we will showcase probabilistic (1% annual chance) coastal flood maps with and without the effect of inland flooding for 2020 and 2100. These maps can be used by coastal communities for building resilience.

PRESENTER BIO: Dr. Paramygin is a Research Assistant Scientist with extensive experience in coastal processes and modeling. He has been responsible for the modeling effort of several projects on the current and future coastal flood risk, including the development of a real time Florida-wide forecasting system of water level, currents, and salinity.