Abstract

A team of researchers at the University of Hawaii (UH), in collaboration with the Pacific Disaster Center (PDC), is developing a computer simulation package to model and predict coastal wave processes and flooding due to combined effects of storm waves and surge generated during tropical cyclones. For Pacific insular environments, commonly characterized by a steep offshore bathymetry, high waves can inundate areas well beyond the storm water level due to wave run-up and cause severe damage. The package, once fully developed, will provide a comprehensive tool for coastal planning and emergency management.

The simulation package is composed of four models implemented at different geographic scales and resolutions, synchronized to perform simulations of actual or hypothetical storm events. The main inputs to the simulation package are bathymetric and wind field data. At the base level the model covers a large ocean region. As a tropical storm moves across the ocean surface, a wave generation model, WAM (WAve Model), coupled to a storm surge model is used to calculate the storm water level and wave heights. The results are then used to create boundary conditions for a more resolved simulation that covers a smaller coastal region of interest. SWAN (Simulating WAves Near-shore) is used to model wave transformation processes as they propagate towards shore. In the surf zone, a nonlinear computer simulated Boussinesq model uses wave field spectra generated by SWAN to simulate near-shore processes and run-up onto dry land.

This presentation will highlight how the components are being synchronized to communicate in a reasonable and effective manner and operate together as a comprehensive simulation package. Verification studies for each component are being conducted separately to further validate the model. Measured water elevation and inundation levels on Kauai during Hurricanes Iwa and Iniki are compared to those predicted by the simulation package and used to calibrate the model.