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A PARAMETRIC STUDY OF METEOROLOGICAL FORCING IN STORM SURGE MODELING: A CASE STUDY IN COASTAL MISSISSIPPI

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With the constraints of limited computing resources and aggressive deadlines for coastal engineering problems, the engineer needs to find the optimal balance between accuracy and efficiency while dealing with these constraints. For this study on the effects of hurricane storm surge on coastal Mississippi were examined using the Advanced Circulation (ADCIRC) finite element hydrodynamic model. Three sensitivity studies were conducted at the onset of the project to determine if any time saving measure could be gained without losing accuracy. The key questions were 1) how large buildings in urban areas would be represented, 2) how tidal forcing will be represented in the model and 3) what should be optimum length of meteorological forcing. The first test compared two ADCIRC test grids where in one case buildings were not included in the grid and in the other case these areas were included to determine if it was possible to accurately model the surge around buildings with friction coefficients. The second test compared the storm surge heights along the coast from a non-linear setup where the tides and winds were run coupled in the ADCIRC model with the linearly added results from two separate model runs, first with the winds as the only forcing and then with the tides as the only forcing. For the final sensitivity test reported in this paper, the full wind and pressure fields were shortened to determine the effect on that the length of the storm setup period would have on the storm surge.

Interesting results were obtained from the study. First, the tests comparing a grid with buildings modeled as no-flow boundaries compared to a grid with elements covering completely over the buildings showed little difference in surge elevations. This helped in reducing the size of the grid (instead of having to increase the elements and number of boundaries to model each building individually). Second, the tests comparing the effects of the linear and nonlinear combination of wind and tide forcing showed that it was possible to save time by adding the tidal effects onto the winds-only model runs. Finally, the third test compared the length of the wind record used in the storm surge model. Although cutting of more than 2.5 days of the front of the wind record resulted in significantly lowered surge elevations, it was possible to preserve the surge and reduce the length of the model run, which saved run time.

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