Forecast of Nearshore Wave Parameters Using MIKE-21 Spectral Wave Model

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ABSTRACT

Shallow-water wave transformation strongly depends upon coastal geomorphology and bottom sediment characteristics. Accurate prediction of wave parameters is vital for the coastal infrastructure developments and other activities. MIKE 21 SW is a new generation spectral wind wave model based on unstructured meshes. The model simulates the growth, decay and transformation of wind generated waves and swell in offshore and coastal areas. The entire Gulf of Mexico was selected for the present modeling study. Along the northern Gulf Coast the grid resolution used was ~2 km while for the rest of the boundary a coarser grid of 30 km was used. Fine-scale bathymetry data (6 arc-second resolution) were used for the northern Gulf and coarse bathymetry for the rest of the basin. The data used were compiled and distributed by the National Geophysical Data Center (NGDC) of the National Oceanic and Atmospheric Administration (NOAA). The input for the model, forecast wind data, was downloaded from the National Centers for Environmental Prediction (NCEP) of NOAA database daily (36-hr forecast). A fully spectral approach was used for the computation of the wave parameters.

The model computed the wave parameters using the forecast wind input. Synoptic maps of significant wave height (Hs), wave period, wave direction, *etc*. were generated. For calibration purposes, output was also generated for the NDBC buoy locations and Wave-Current-Surge Information System (WAVCIS) stations located off the Louisiana coast. During fair weather conditions the predicted wave parameters show a strong correlation with measured wave parameters. During extreme weather conditions (hurricanes and tropical storms) predicted values typically were lower than observations. This discrepancy can be attributed to the scale and accuracy of the input wind data.