

High-resolution, nearshore application of WAVEWATCH III

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There is an increasing drive to apply WAVEWATCH III[®] (Tolman et al. 2002, WW3) in coastal regions at significantly smaller spatial scales than for ocean basin applications. One example of this is NCEP's Nearshore Wave Prediction System (Van der Westhuysen et al. 2013), to be implemented at coastal forecasting offices throughout the USA. A challenge in this regard is the explicit spatial propagation schemes of WW3, which result in small CFL time steps when resolving coastal domains at high spatial resolution. In order to reduce the computational time, a number of approaches are investigated, including: (i) applying an overall model time step of well beyond the CFL spatial time step - hence maintaining model stability, but speeding up the simulation (potentially at the expense of accuracy), (ii) use of a relatively large minimum source term integration time step – hence reducing computational time at the expense of potentially invoking the action balance limiter at higher frequencies, (iii) application of the new quasi-stationary version of WW3 (Van der Westhuysen and Tolman, 2011), and (iv) application of the new implicit spatial propagation scheme available in the unstructured grid mode of WW3. These tests are performed both on ideal, fetch-limited growth cases, as well as a field case featuring the coastal waters of the southern Florida Peninsula and Keys. Results are compared in terms of computational speed-up and potential loss of accuracy.

References

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