DOCTOR
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SENSITIVITY OF A NAVY REGIONAL OCEAN MODEL TO HIGH-RESOLUTION ATMOSPHERIC MODEL AND SCATTEROMETER WIND FORCING

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As the focus of Navy attention shifts to littoral regions, higher resolution and re-locatable nested models have been developed to improve shallow-water operations for ocean prediction. One of the scientific and technical challenges is to determine accuracy of ocean models on high-resolution grids needed to meet operational requirements for ocean prediction. A series of 14-day experiments are performed to evaluate the sensitivity of a regional ocean model to low-resolution Navy Ocean Global Atmospheric Prediction System (NOGAPS) versus high-resolution Coupled Ocean Atmospheric Model Prediction System (COAMPS) wind forcing that includes scatterometer data from synthetic QuikSCAT (quick scatterometer mission) observations. Atmospheric model wind stress/wind stress curl and Pacific West Coast ocean model (PWC) surface and subsurface current/temperature model results are compared and analyzed. The results show that there is significant sensitivity in sea surface current and wind stress variability to the choice of atmospheric model grid resolution and the insertion of high-resolution satellite data. In coastal areas, increasing atmospheric model resolution produces a finer depiction of the variability observed near capes and promontories. Insertion of QuikSCAT data produces a statistical difference but no significant difference in the model fields. The ocean model runs have the expected climatological features and variability. The higher wind stress in COAMPS causes the ocean model to predict higher velocity currents and better-defined eddies near capes and promontories. However, comparisons to observations show that using models with the same high-resolution for all regions may not be an efficient use of computer resources.

KEYWORDS: Sigma Coordinate Model, NOGAPS, COAMPS, Scatterometer, High-resolution