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Surface wave effect on the upper ocean in marine forecast

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An Operational Coupled Forecast System for the seas off China and adjacent (OCFS-C) is constructed based on the paralleled wave-circulation coupled model, which is tested with comprehensive experiments and operational since November 1st, 2007. The main feature of the system is that the wave-induced mixing is considered in circulation model. Daily analyses and three day forecasts of three-dimensional temperature, salinity, currents and wave height are produced. Coverage is global at 1/2 degreed resolution with nested models up to 1/24 degree resolution in China Sea. Daily remote sensing sea surface temperatures (SST) are taken to relax to an analytical product as hot restarting fields for OCFS-C by the Nudging techniques. Forecasting-data inter-comparisons are performed to measure the effectiveness of OCFS-C in predicting upper-ocean quantities including SST, mixed layer depth (MLD) and subsurface temperature. The variety of performance with lead time and real-time is discussed as well using the daily statistic results for SST between forecast and satellite data. Several buoy observations and many Argo profiles are used for this validation. Except the conventional statistical metrics, non-dimension skill scores (SS) is taken to estimate forecast skill. Model SST comparisons with more one year-long SST time series from 2 buoys given a large SS value (more than 0.90). And skill in predicting the seasonal variability of SST is confirmed. Model subsurface temperature comparisons with that from a lot of Argo profiles indicated that OCFS-C has low skill in predicting subsurface temperatures between 80m and 120m. Inter-comparisons of MLD reveal that MLD from model is shallower than that from Argo profiles by about 12m. QCFS-C is successful and steady in predicting MLD. The daily statistic results for SST between 1-d, 2-d and 3-d forecast and data is adopted to describe variability of Skill in predicting SST with lead time or real time. In a word QCFS-C shows reasonable accuracy over a series of studies designed to test ability to predict upper ocean conditions.