

Improved Oceanic Component within the NCEP GFS

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Abstract

In the current Numerical Weather Prediction (NWP) systems, the oceanic component is represented by a single thermal variable, the Sea Surface Temperature (SST).

In the atmospheric prediction and analysis, the time dependent SST is a combination of an independent analysis at the initial time, the SST climatology with seasonal variability, and possibly a decay factor of the initial SST anomaly.

The oceanic component has been improved within the NCEP GFS.

In the new scheme, the oceanic component is extended from SST to NSST (Near-Surface Sea Temperature), which is the T-Profile due to diurnal warming layer and sub-layer cooling layer. The new oceanic analysis variable, the foundation temperature, is analyzed together with the atmospheric variables. The satellite radiance of AVHRR, AMSRE and in situ sea temperature observations are newly introduced into GSI (Gridded Statistical Interpolation), the atmospheric assimilation system in NCEP GFS.

NSST model, including a diurnal warming model, which is based on COARE V3.0 (Fairall et al, 1996) but with more physical processes, and a sub-layer cooling model of COARE V3.0, and the radiative transfer model together make it possible to relate all the observations, including wave length dependent satellite radiance and depth dependent in situ sea temperature, to foundation temperature, and therefore to assimilate all the observation directly.

The cycling run has been done for one summer and one winter season. The verification against the own analysis and observation has shown the improvement in the analysis and prediction of SST. The impact on atmospheric prediction is neutral in northern and southern hemisphere, and positive in tropics.

The verification of the momentum flux and heat fluxes at the air-sea interface, the analysis of the function of the SST climatology suggest an oceanic prediction model should reduce the error growth of SST.

A scheme has been proposed to combine the NSST and current NCEP CFS (Climate Forecasting System) towards a coupled data assimilation and prediction system for weather forecasting and climate prediction.