

Improvement of SST analysis and near sea-surface atmospheric predictions in the coupled atmosphere-ocean data assimilation system in JMA/MRI

Toshiyuki Ishibashi¹, Yosuke Fujii¹, Ichiro Ishikawa¹

¹Japan Meteorological Agency/ Meteorological Research Institute

Abstract

JMA has developed a coupled atmosphere-ocean data assimilation system in which four-dimensional variational (4D-Var) atmosphere and oceanic data assimilation systems are combined using a weakly coupled data assimilation approach. We conducted short-term analysis and subsequent prediction experiments with this coupled system and compared the results with those obtained from the original uncoupled atmosphere data assimilation system. The experiments demonstrated that the coupled system produces more accurate analyzed SST fields than the SST objective analysis used as the oceanic boundary condition in the uncoupled atmospheric system.

Coupling improved the global prediction accuracy of lower-tropospheric temperatures for up to 5-day forecasts. While consistent with previous studies, these gains were uniquely achieved without SST relaxation. In the Southern Hemisphere, although the SST analysis showed reduced consistency with buoy observations due to strong winter-hemisphere baroclinicity and small-scale oceanic disturbances, lower-atmospheric forecast accuracy still improved. This suggests the WCDA effectively corrected background errors emerging from atmosphere-ocean interactions.