Numerical Weather Prediction Experiments using a Coupled Atmosphere-Ocean Data Assimilation System in JMA/MRI

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An atmosphere-ocean coupled data assimilation system (CDAS) has been developed at the JMA/MRI to investigate feasibility of a CDAS as a future DAS for seamless numerical prediction including both numerical weather prediction (NWP) and numerical seasonal climate prediction (NCP), and for reanalysis of the atmosphere-ocean. Our CDAS (**MRI-CDA1**) has two features.
1) It composed of the JMA operational systems, the global atmospheric DAS (MRI-NAPEX) based on 4D-Var, the global ocean DAS (MOVE-G2) based on 3D-Var, and the atmosphere- ocean coupled global forecast model (CGCM: JMA/MRI-CGCM2).
2) Coupling strategy is “weak coupling” with two different data assimilation window lengths for the atmosphere and ocean. Here, “weak coupling” denotes the approximation that ignores correlations of atmosphere and ocean background forecast errors.

In this paper, we report basic property of MRI-CDA1 in NWP such as analysis increment structure and short range forecast accuracy. We have conducted single data assimilation experiments and one month cycle experiments using MRI-CDA1. Results of the single assimilation experiments show that information of assimilated ocean (atmosphere) observation data flow into the atmosphere (ocean) in short range forecasts by the outer CGCM. Results of the cycle experiments show that accuracy of forecasts with a non-coupled atmosphere model started from coupled analyses generally degrade forecast accuracy in comparison with those from uncoupled analyses. However, forecast root mean square errors (RMSEs) of temperature in a planetary boundary layer, and forecast biases of sea surface pressure are significantly improved. Verification results of forecasts with the CGCM and another basic property of CDAS such as impacts of each observation data type, also will be presented in our presentation.

Keywords: data assimilation, atmosphere-ocean coupled data assimilation, numerical weather prediction

