Geophysical Research Abstracts
Vol. 15, EGU2013-6938, 2013
EGU General Assembly 2013

A study on the characteristics of retrospective optimal interpolation using an Observing System Simulation Experiment

Shin-Woo Kim, Nam-Kyu Noh, and Gyu-Ho Lim
Seoul National University, Korea, Republic Of (sinukim1@gmail.com)

This study presents the introduction of retrospective optimal interpolation (ROI) and its application with Weather Research and Forecasting model (WRF). Song et al. (2009) suggested ROI method which is an optimal interpolation (OI) that gradually assimilates observations over the analysis window for variance-minimum estimate of an atmospheric state at the initial time of the analysis window. The assimilation window of ROI algorithm is gradually increased, similar with that of the quasi-static variational assimilation (QSVA; Pires et al., 1996). Unlike QSVA method, however, ROI method assimilates the data at post analysis time using perturbation method (Verlaan and Heemink, 1997) without adjoint model. Song and Lim (2011) improved this method by incorporating eigen-decomposition and covariance inflation. The computational costs for ROI can be reduced due to the eigen-decomposition of background error covariance which can concentrate ROI analyses on the error variances of governing eigenmodes by transforming the control variables into eigenspace. A total energy norm is used for the normalization of each control variables. In this study, ROI method is applied to WRF model with Observing System Simulation Experiment (OSSE) to validate the algorithm and to investigate the capability. Horizontal wind, pressure, potential temperature, and water vapor mixing ratio are used for control variables and observations. Firstly, 1-profile assimilation experiment is performed. Subsequently, OSSE's are performed using the virtual observing system which consists of synop, ship, and sonde data. The difference between forecast errors with assimilation and without assimilation is obviously increased as time passed, which means the improvement of forecast error with the assimilation by ROI. The characteristics and strength/weakness of ROI method are also investigated by conducting the experiments with 3D-Var (3-dimensional variational) method and 4D-Var (4-dimensional variational) method. In the initial time, ROI produces a larger forecast error than that of 4D-Var. However, the difference between the two experimental results is decreased gradually with time, and the ROI shows apparently better result (i.e. smaller forecast error) than that of 4D-Var after 9-hour forecast.