Geophysical Research Abstracts
Vol. 17, EGU2015-8207-1, 2015
EGU General Assembly 2015

A Three-Dimensional Variational Data Assimilation System on a Cubed Sphere Grid

In-Hyuk Kwon (1), Hyo-Jong Song (2), Jihye Kwun (1), Sangil Kim (1), and Ji-Hyun Ha (1)

(1) Korea Institute of Atmospheric Prediction Systems (KIAPS), Seoul, Korea, Republic Of (ihkwon2k@gmail.com), (2) State University of New York, Albany, NY, USA

A 3DVAR system has been developed for a cubed-sphere grid (CSG) model and recently implemented to Korea Institute of Atmospheric Prediction systems (KIAPS) Integrated Model based on HOMME dynamical core (KIM-SH). We devised a spectral transformation method which enables spherical harmonic functions to be represented on the CSG points without horizontal interpolation. The 3DVAR system contains a background error covariance model which generates a static or ensemble background error covariance to represent uncertainty of background. In the background error covariance modeling, the spectral transformation and Eigen decomposition play roles as horizontal and vertical filters, respectively. The parameter transformation using linear and nonlinear balances and Helmholtz decomposition is conducted directly on CGS as well. As a result of the parameter transformation, the model variables such as zonal wind, meridional wind, temperature, specific humidity and surface pressure are respectively transformed to control variables such as streamfunction, velocity potential, unbalanced temperature, specific humidity, and unbalanced surface pressure.
To evaluate the performance of the 3DVAR system, observing system simulation experiments (OSSEs) were conducted using KIM-SH with ne30np4 (about 1 degree resolution). We assumed that the model run of KIM-SH with a year spin-up is true and designated as a nature. The root mean square differences (RMSD) between model results and the nature show significant reduction in the analysis compared to the background, and the results also show better forecast skill during 72 h forecast period. The assimilation results of real observation with conventional data such as Sonde, surface wind, temperature and pressure, and aircraft also will be represented at conference.