EMS Annual Meeting Abstracts
Vol. 11, EMS2014-269, 2014
14th EMS / 10th ECAC

Adjoint-based observation impact and optimization of error covariances in the Korea Meteorological Administration Unified Model-4DVAR system

Sung-Min Kim (1), Hyun Mee Kim (1), Sang-Won Joo (2), Yoonjae Kim (2), Dongjoon Kim (2), and Eun-Jung Kim (2)

(1) Yonsei, Atmospheric Science, Seoul, Korea, Republic Of (mdrizzle@yonsei.ac.kr; khm@yonsei.ac.kr), (2) Korea Meteorological Administration, Seoul, Korea, Republic Of (jsw@kma.go.kr; dayk@korea.kr; djkim@korea.kr; skydorothy@kma.go.kr)

In this study, the effects of observations on numerical weather forecasts are evaluated by the adjoint-based method in the Korea Meteorological Administration (KMA) Unified Model (UM)-4DVAR system. Using the adjoint-based forecast sensitivity to observation (FSO), the forecast sensitivity to error covariance (FSR) is calculated for July 2012. The FSR indicates that reducing observation error covariance and increasing background error covariance help to reduce the forecast error. The optimized error covariances are calculated using the multiple linear regression of the sensitivity data of July 2012, and then applied to calculate the forecast error reduction for August 2012. Consistent with the FSR, the multiple linear regression method diagnosed that the background error covariance needs to be inflated by 30%, whereas most of the observation error covariances need to be deflated. Because both FSO and FSR for ATOVS data are large, the observation error covariance of ATOVS data is reduced in the experiment. The forecasts using the reduced ATOVS observation error covariance in the 4DVAR system show better results compared to the operational forecasts in the observation space. More detailed results will be presented in the conference.