Development of a chemical data assimilation system using a local ensemble transform Kalman filter

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The purpose of this study is to develop an effective system for assimilating ozone and related species into a global chemical transport model (CTM), for use in the atmospheric transport, air quality, and climate studies. A local ensemble transform Kalman filter (LETKF, Hunt, 2005) is applied for a global CTM (CHASER, Sudo et al., 2002). The performance of the LETKF for chemical data assimilation was assessed in an ideal setting by assuming that the CTM provides a perfect representation of the true state of chemical constituents. The true state obtained from the CTM simulation was used to generate the initial ensemble and artificial observations. The meteorological fields were obtained from a nudged general circulation model to realistically drive the CTM. In the perfect model experiments, sensitivities to parameter values (localization length scale, covariance inflation factor, and ensemble numbers) were investigated. In addition, the sensitivity of observational network to the performance of the LETKF was assessed with observational system simulation experiments.