5.045 Data assimilation for chemical transport model using an ensemble Kamlam filter.

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Abstract:

Data assimilation provides a consistent physical state, which aims to present the truth-value by blending imperfect model predictions and noisy observations. This technique has been mainly applied to numerical weather prediction and ocean modeling. As more chemical observations are becoming available, data assimilation is expected to make more contributions to air quality problem.
In this study, we investigate the feasibility of data assimilation for chemical transport model using the ensemble Kalman filter (EnKF), which is easy to implement on an existing system and gives flow-dependent corrections. The observations used in this study were from hourly collected data in ground-based stations. Various numerical tests were conducted to optimize the ensemble system. One of the most important parameters in EnKF system is the number of ensemble, which should be large enough to represent the model error statistics. Since the calculation time, however, almost linearly increases with that number, it is important to find an optimum size of the ensemble considering its efficiency. Other parameters such as the emission factor, the deposition rate, and the photolysis rate were also optimized by means of the spatial distribution. We confirmed that EnKF data assimilation leads to significantly positive effects on the quality of forecasts, but also found that a more precise construction for the model error is needed in the future studies.