Implementation of the ensemble Kalman filter into the BASCOE stratospheric chemistry model

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The local ensemble Kalman filter assimilation method is applied to the BASCOE (Belgian Assimilation System for Chemical ObsErvations) stratospheric chemistry model. We use a stochastic version of the EnKF, i.e. with perturbed observations. The EnKF developed in BASCOE accounts for two adjustable parameters: a parameter α controlling the model error term and a parameter r controlling the observational error. The EnKF system is shown to be markedly sensitive to these two parameters, which are adjusted based on the monitoring of a χ^2-test measuring the misfit between the control variable and the observations. The model includes 57 chemical species with a full description of stratospheric chemistry. The application of the EnKF to the full-chemistry model requires a careful tuning procedure of the error covariances for each chemical species. The performance of the EnKF method was estimated through the assimilation of Aura-MLS observations during an 8-month period which includes the formation of the 2008 Antarctic ozone hole.