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Ensemble-based data assimilation for stratospheric chemistry

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Chemical transport models (CTM) are broadly used to forecast chemical species concentration or analyze the tropospheric pollution. As more chemical observations become available, the use of data assimilation methods, integrating observational data with model predictions to obtain an optimal state of the atmosphere, plays an essential role in air-quality forecasting as far as deriving information about unobserved species, support the measurement techniques etc. Since several years the Belgian Assimilation System for Chemical ObsErvations (BASCOE) consisting in a 3-dimensional chemistry transport model and 4-dimensional variational (4DVar) data assimilation approach has been successfully employed to assimilate stratospheric chemistry species. In this work we implement an ensemble Kalman filter (EnKF) into the BASCOE system to assess its performance and compare it with our 4DVar technique. We analyze different issues affecting the data assimilation process and consider a procedure to avoid the divergence of the filter applied to ozone concentration using assimilation of real data.