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.