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Comparison of EnKF and 4DVar methods in the context of stratospheric chemistry data assimilation

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In this work, we present an ensemble Kalman filter (EnKF) assimilation method applied to the stratospheric chemical transport model of BASCOE (Belgian Assimilation System for Chemical ObsErvations). BASCOE was developed originally with a 4DVar assimilation method and is providing near-real-time analyses for the European project MACC-II. 4DVar method demonstrates high accuracy however requires the development and maintenance of an adjoint model. Unlike 4DVar, the ensemble Kalman filter requires no tangent linear or adjoint model. The EnKF background error is parametrized approximately by means of ensemble and evolves in time, whereas 4DVar uses constant background error covariances. We assess the performance of the EnKF recently set up into the BASCOE system and compare it with our 4DVar assimilation method in the context of a univariate data assimilation using ozone Aura-MLS data and the same initial error statistics: the formulation of spatial correlations in the spectral space.