Ensemble Kalman Filter for surface ozone data assimilation, application to the regional Chemistry-Transport Model (RCTM) CHIMERE

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An Ensemble Kalman Filter (EnKF) has been coupled with the Chimere RCTM for the assimilation of the surface ozone observations. The main objective consists in correcting the simulated ozone fields by analysing the model error which is due to uncertainties associated with processes parameterizations, but also to inputs such as chemical boundary conditions, emissions or meteorology. In this approach, the use of an ensemble allows the assessment of flow-dependant error statistics. Initially, a pseudo-random normal perturbation (spatially correlated) is applied to the ozone state vector to generate the ensemble. Although it is possible to control the ensemble dispersion by adding a sufficient level of noise, it does not ensure a good representation of the background covariance error spatial structure. In this work, we focus specifically on the design of a physically based ensemble by perturbing the main parameters and/or inputs that are controlling the model error budget. The characteristics of this "physical" ensemble as well as its impact on the ozone analysis will be presented for a summertime period. We also present the methodology that has been followed to define a sound set of observations (from airbase database) used for the assimilation and the validation.