Bayesianity of Ensemble Variational Assimilation

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Ensemble estimation methods are becoming more and more used for atmospheric and oceanic science. Recently, Ensemble Data Assimilation (EnsDA) schemes have seen significant development as assimilation of observations (ensemble Kalman filters (EnKf) and its variants, particle filters (PF)) and as prediction.

The ensemble-based variational data assimilation (Ens/4D-Var) has been objectively evaluated as an ensemble estimator. In the absence of a general test of Bayesianity, the much weaker property of reliability has been substituted in order to have an objective evidence as to the impact of the non-linearity and non-Gaussianity on the Bayesian character of the estimation.

Results of numerical tests are discussed. The conclusion is that weak model non-linearity significantly degrades the Bayesianity of the ensembles (while non-Gaussianity has no significant effect).