

Evaluation of Model Errors using Data Assimilation

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We wish to demonstrate how data assimilation techniques can be used to quantify model errors. Model error on a case by case basis is unknowable, as the governing equations cannot be solved completely and some processes cannot be represented by equations. However, information about the statistics of model error can be inferred from the observations.

In order to achieve this, we incorporate a stochastic representation of model error which can be calibrated. This can be physically based, for instance the stochastic backscatter scheme, or be represented by a simple covariance model as used in the operational data assimilation. We then carry out a stochastic data assimilation using an ensemble DA method. The model in the ensemble is augmented by the stochastic term. The ensemble is then run on into a forecast. The predictions are verified by testing the hypothesis that the truth is a member of the population represented by the ensemble.

Results are shown using an ensemble of 4dVars and comparing the stochastic backscatter and other physically based model error representations with that given by using a simple covariance model. These results can be used to inform the design of ensembles. They also give a measure of the quality of the deterministic model because the size of the model error is estimated independently of the uncertainty in the initial data.