



An Efficient Data Assimilation Algorithm Based on the Ensemble Kalman Filter

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In the report an ensemble-based algorithm for data assimilation is proposed and compared with the Kalman filter algorithm. The EnKF is a technically sophisticated algorithm operating with high order matrices. In the report an efficient algorithm of data assimilation for nonlinear models based on the EnKF is considered (ensemble π -algorithm). The basic idea is taken from the automatic control theory. In the report the main idea of derivation of formulas of the ensemble π -algorithm is presented. The peculiarity of the algorithm is the introduction of an equation for the estimation error. Its solution is used to evaluate the analyses error covariances.

The operation count of the algorithm is close to that of the Local Ensemble Transform Kalman Filter (LETKF), but its formulas differ from the LETKF ones. In particular, the ensemble π -algorithm does not require calculating an ensemble that corresponds to the analysis error covariances since it is done automatically. The basic arithmetic operations are carried out with matrices of the same order as the dimension of the ensemble. The operation count of the algorithm is close to that of LETKF. The algorithm can be realized locally for groups of grid points. In the report a comparative analysis of the π -algorithm and LETKF is made.

To reduce the false correlations at long distances so-called localization is used in EnKF algorithms. One of the ways of localization in implementing the ensemble - algorithm is shown. The results of numerical experiments on modeled data assimilation with the Lorenc model are presented.