Geophysical Research Abstracts
Vol. 13, EGU2011-6803, 2011
EGU General Assembly 2011

Domain localization in ensemble based Kalman filter algorithms

Tijana Janjic (1), Lars Nerger (1), Alberta Albertella (2), Jens Schroeter (1), and Sergey Skachko (3)
(1) Alfred Wegener Intitute for Polar and Marine Research, Bremerhaven, Germany (t.janjic@jacobs-university.de), (2) Institute for Astronomical und Physical Geodesy, Muenich, Germany, (3) University of Quebec in Montreal, Montreal, Canada

Ensemble Kalman filter methods are typically used in combination with one of two localization techniques. One technique is covariance localization, or direct forecast error localization, in which the ensemble derived forecast error covariance matrix is Schur multiplied with a chosen correlation matrix. The second way of localization is by domain decomposition. Here, the assimilation is split into local domains in which the assimilation update is performed independently. Domain localization is frequently used in combination with filter algorithms that use the analysis error covariance matrix for the calculation of the gain like the ETKF and the SEIK filter. Further, domain localization methods are used with method of weighting of the observations, or localization of the observation error covariance matrix.

In this work we focus on explaining the effects of domain localization in ensemble based Kalman filter algorithms and in particular effects of weighting of observations. We introduce a new method for the localization and compare it first to the already existing methods on Lorenz 40 system. On this simple example, the method of weighting of observations is less accurate than the new method, particularly if the observation errors are small.

We apply our finding to assimilation of geodetic dynamical ocean topography (DOT) data into the global finite element ocean model (FEOM) using the local SEIK filter. The geodetic DOT was obtained by means of the geodetic approach from carefully cross-calibrated multi-mission-altimeter data and GRACE gravity fields. We show that, depending on the correlation function used for weighting, the spectral properties of the solution can be improved.