Geophysical Research Abstracts, Vol. 7, 05718, 2005
SRef-ID: 1607-7962/gra/EGU05-A-05718

Numerical studies of the Maximum Likelihood Ensemble Filter with a 2D shallow water model.

S. Fletcher and M. Zupanski

Cooperative Institute for Research in the Atmosphere, Colorado, USA
(fletcher@cira.colostate.edu / Fax: 001 970 491 8241)

One advantage of the Maximum Likelihood Ensemble Filter (MLEF) is it combines techniques from both a 3D Variational (VAR) data assimilation scheme and the Kalman Filter. As a consequence the statistics required for the updates, given a set of observations, come from not considering the mean of the ensembles but from the model state that minimises a non-linear cost function similar to that used in 3D VAR. From this the square root analysis covariance matrix is calculated in ensemble space and its columns used to initialise the ensembles for the next data assimilation cycle.

There is the problem of how to initialise the MLEF scheme so that we may generate the analysis covariance matrix at the initial time. This can be achieved through random perturbations to the initial states at some time in the past but this leads to quite noisy analysis increments at the end of the first data assimilation cycle. An alternative method which is employed here is to consider solutions to the Kardar-Parisi-Zhang (KPZ) equation which are the Lyapunov vectors of the system. This solutions are then smoothed through a compactly supported error covariance with a prescribed correlation length to allow some structure to the initialisation of the filter.

In this paper we are considering the MLEF with Colorado State University's 2-D shallow water equations model which uses a spherical geodesic grid. The model is initialised through different Rossby-Haurwitz (RH) waves. These waves generate different types of flows some near geostrophic balance and some with faster more rapidly changing motions. Given these waves we perform experiments with ensemble size and the correlation lengths used to initialise the scheme with different RH waves. The performance is assess through considering the root mean errors, the chi squared statistic and the probability density function (PDF) of the innovation vectors.