

Interactive comment on “Application of a hybrid EnKF-OI to ocean forecasting” by F. Counillon et al.

F. Counillon et al.

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We have repeated the referee comments in black and provided our responses in red, in the file attached.

Interactive comment on Ocean Sci. Discuss., 6, 653, 2009.

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We have repeated the referee comments in black and provided our responses in red.

Professor Jiang Zhu (Referee)

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General comments The paper “Application of a hybrid EnKF-OI to ocean forecasting” by Counillon, Sakov and Bertino addressed an important issue of how to improve the computational efficiency of EnKF without losing its performance significantly. Though the idea of combining the dynamical ensemble and the static ensemble is not new, they conducted systematic experiments to examine the benefits of the hybrid EnKF-OI over the EnOI with a large size ensemble and the EnKF with a small size dynamical ensemble. Also they showed the behavior of the optimal blending coefficient β^* in the term of the percentage of the number dynamical ensemble. These are novel results. The paper is well written and should be published after some minor revisions.

Specific comments:

A recent paper by Liyin Wan et al (in press of Advances in Atmospheric Science: a URL of the paper is

http://www.iapjournals.ac.cn/aas/ch/reader/download_new_edit_content.aspx?file_no=2007114000002&journal_id=aas

) also tested another hybrid method that “dresses” a small size dynamical ensemble by a large size static ensemble. Since the work is relevant, some mention and a reference should be added.

We agree with you. Reference are now given in the introduction with the following sentence:

Note also that another approach is proposed in Wan et al. (2009), where instead of combining the covariance matrix, the dynamic and the static ensemble are “dressed”.

There are several ways of defining a static ensemble. For example, one can take some snapshots from a long-term model run (used in this paper). Or one can use a static ensemble that is taken from a long-term model run but is in the same season of the assimilation time. In the previous case, the static ensemble will be dominated by seasonal variability in most oceans and in the later case the interannual variability is dominated. Authors should mention that their results are only based on one way of defining the static ensemble.

There are many more ways to define a static ensemble. There is e.g. your suggestion of selecting a centered historical ensemble, Peter Oke’s way where the static is postprocessed for removing seasonal variability, Alexander Barth’s way, where the ensemble is created from an ensemble run perturbed with idealized atmospheric forcing ...

Although seasonal variability is not large in the Gulf of Mexico, we agree that some difficulties could have been avoided using another way of creating our static ensemble. This is now addressed in page 7:

“The problem of seasonal variability when using a static ensemble is rather common, and can be tackled e.g. by filtering out the seasonal signal (Oke et al., 2005), but this was not applied here because seasonal variability in the GOM is not large.”

Fig. 1.