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Discussions**

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Interactive comment on "Ensemble smoother for optimizing tidal boundary conditions by assimilation of high-frequency radar surface currents – application to the German Bight" *by* A. Barth et al.

Anonymous Referee #3

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General comments

The authors presents an original application of the Ensemble smoother previously introduced by Van Leeuwen and Evensen (MWR 124 p2898, 1996) and tested by Van Leeuwen (JGR 104(C1) p1393, 1999) where only the boundary conditions are corrected by the assimilation process. This "Ensemble perturbation smoother" is applied to improve the modelling of tides in the German Bight with a regional model. The paper is basically composed of a description of the observations, the assimilation

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method, and a presentation of a few results of the application. The paper has several assets: the ES method is relevant for the problem posed; the experiments are performed with real data. To my opinion, it is also somewhat incomplete and requires some major revisions before publication.

Specific comments

Major comments:

- A detailed presentation of the methodology is provided. One would expect that this methodology be compared with others, such as ES including the correction of the state (at least).

- The originality lies in that only the forcings are corrected. The authors justifies this approach in the introduction (correcting the state itself generates noise) but do not provide the least evidence of such behavior in their system.

- The corrections are never illustrated. How large are the corrections to the forcings?

- The authors propose an original application of the ES. They test it but do not find very convincing improvements over the free model when they compare the simulated fields with the observations (e.g. Figures 11 and 13). What must be concluded about the method?

- The conclusion does not really conclude.

Minor comments:

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- section 2.2 (EOT): Is it a climatology or a time dependent dataset?

- section 4.1: The constraints are exposed clearly but not the sampling method. Is there some vector randomly sampled here? Which one, and how?

- section 4: What is actually perturbed initially to form the ensemble? The initial state and the forcings (lateral and atmospheric) all over the time window? What is corrected precisely by the assimilation? Is the initial state corrected here? This must clarified.

- section 4.2: the data assimilation expert would feel more comfortable if the method is summarized as "the ES of Van Leeuwen and Evensen (1996) in which only the forcings are corrected" (or another sentence equivalent or more appropriate). This is somewhat lost in the text, in lines 16-22.

- I do not really see the need of the parallel with 4Dvar throughout the paper.

- section 5: I expected to find some considerations about the length of the time window. 60 days seem a long period and I doubt the observations at the end of the interval have any impact on the corrections of the forcings (and initial state?) at the beginning of the interval. If the impact is significant, is it reliable? Are 51 members able to correctly represent correct error cross-correlations between two vectors separated by 60 days? Probably not.

- section 5.1 and figure 8: the conclusion is optimistic. It seems the assimilation of EOT data affects very poorly the current velocities but there is no interpretation of this in the text.

Interactive comment on Ocean Sci. Discuss., 6, 2423, 2009.