

Geosci. Model Dev. Discuss., referee comment RC2  
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## Comment on gmd-2022-3

Anonymous Referee #2

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Referee comment on "Hybrid ensemble-variational data assimilation in ABC-DA within a tropical framework" by Joshua Chun Kwang Lee et al., Geosci. Model Dev. Discuss., <https://doi.org/10.5194/gmd-2022-3-RC2>, 2022

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General comments:

A hybrid ensemble-variational DA algorithm is described here for the ABC model.

The manuscript is mostly written clearly, and I enjoyed reading it.

The main aspect that is currently lacking, in my opinion, is a description of this study's importance, and the motivation. I think this is a critical part of any manuscript, and currently it is too much left for the reader to guess.

Specific comments:

1. As stated in the general comments above, I think the main change that is needed here is a clear description of this study's importance, and the motivation. It is needed in both the Abstract and Introduction.

What is the problem that you are trying to address? Why is it important to publish this manuscript?

A reader might guess, from what is currently written, that hybrid ensemble-variational DA algorithms are promising but relatively new, and that more studies are needed to understand implementation choices, properties, and performance. Any additional

documentation of studies is then a valuable contribution to the literature.

Is that correct? If so, could you please add some description like this to the Abstract and Introduction? If not, could you please describe what, in your view, is the importance of this study, and the motivation for it?

The Summary section seems to include some statements along these lines, at Lines 626-630: "Given the rapid adoption and broad shift towards hybrid ensemble-variational methods in convective-scale numerical weather prediction, we hope that the ABC-DA system can prove useful in providing further insights and highlight other potential issues that may arise in such methods. Particularly for the tropics, further work is required to better understand the characteristics of the ensemble-derived background errors, such as disentangling its flow-dependency or designing the localisation to isolate or identify important multi-variate relationships."

That type of information from the Summary section should be made very clear to the reader in the Abstract and Introduction. Do not make your reader guess. Tell the reader exactly what you have in mind for the importance and motivation of your study.

2. I would not refer to your ABC model as a "toy" model. When I hear the phrase "toy" model, especially in the context of forecasting, I think of very low-degree-of-freedom models, often just ordinary differential equations, such as the Lorenz 63 system.

Your model is a model of fluid dynamics. I would not refer to it as a toy.

Because of the word "toy" in the Abstract and Introduction, I did not even realize that you were using the equations of two-dimensional fluid dynamics, until I saw the equations themselves in Section 2.

I would recommend removing the word "toy" from the manuscript, and describing the ABC model in a way that makes it clear that it involves two-dimensional fluid dynamics.