

***Interactive comment on* “Efficient ensemble data assimilation for coupled models with the Parallel Data Assimilation Framework: Example of AWI-CM” by Lars Nerger et al.**

Anonymous Referee #2

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The manuscript describes the application of the Parallel Data Assimilation Framework (PDAF) for coupled data assimilation, with a strong focus on strongly-coupled data assimilation (DA). An example implementation with a coupled atmosphere-ocean model is described in detail and the differences to a previous similar application of PDAF as well as to a similar application of the Data Assimilation Research Testbed are explained and discussed.

While the presented MPI-based implementation for strongly-coupled data assimilation with PDAF is a logical extension of PDAF's approach for single-component models, it merits publication as a novel and highly relevant approach in the coupled case. This

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is well demonstrated by the comparison to and discussion of the implementations in Kurtz et al. 2016 and Karspeck et al. 2018.

However, the presented example of data assimilation for the coupled atmosphere-ocean model AWI-CM seems to fall short of demonstrating strongly-coupled data assimilation. Lines 322 to 330 describe a weakly-coupled assimilation system with coupled forecasts but observations of and assimilation in the ocean component only. The text explicitly states that "the assimilation update is only performed in the ocean compartment" which is confusing after sections 2.2 and 3.3 describe how the model states of ocean and atmosphere components are joined into a single state vector and how the model codes are extended to realize this technically. Presumably this experiment could have been realized with less code modifications than mentioned in the text. While even this setup with ocean-only assimilation into a coupled model demonstrates progress over data assimilation into a single-component model, the current presentation is unfortunate.

I suggest that either the use of the presented example is well justified in the text and its relation to the previous sections and strongly-coupled DA is explained or that the example is extended to a strongly-coupled DA experiment. As it appears that large parts of the discussion and conclusion would still apply to a truly strongly-coupled data assimilation experiment, I would encourage the authors to aim for this way forward.

Other minor points/typos:

line 46: transfers instead of tranDAsfers

line 71: introduce EnDA as abbreviation here

line 267: indicated instead of indicted

line 293: called instead of "are called"

line 355: "DA coupling" instead of "DA coupled"

line 386: FESOM-ECHAM instead of FEMOS-ECHAM

Figure 1 caption: "user-provided" instead of "used-provided"

Figure 6: relative time should not have units of [s]

Interactive comment on Geosci. Model Dev. Discuss., <https://doi.org/10.5194/gmd-2019-167>, 2019.

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