Comment on egusphere-2022-114
Anonymous Referee #1


In this work, some data assimilation methods of the PDAF framework are tested, together with the ESMF framework (for model coupling). Two cases are presented, a theoretical one (lock-exchange) and an application for a real typhoon near Taiwan. The paper is easy to read, the results are quite good and the use of the two frameworks together can be interesting and useful for other works. However, there are some issues in the methodology that in my opinion need to be resolved before the final publication.

Comments below.

General comments:

- The paper aims to demonstrate the use of the PDAF assimilation framework together with the ESMF framework. However, the system is tested with only an oceanographic model, stating that the extension to two models is "trivial". I don't think that's the case. Anyway, a test case, using two coupled models, should be presented. If this takes too much work, you should at least better explain the steps for using a coupled system;
- In both test cases, too few ensemble members are used. Only 8 in the first case and 16 in the second, numbers definitely too low to avoid problems of spurious correlations, even with localization. I recommend consulting the literature about it. However, in my experience, you should never go below 40 members. The fact that the assimilation of SLA does not have a great impact perhaps depends on this and on the fact that the cross-correlations are not very correct;
- It is necessary to better describe the perturbation of the initial state and of the boundary conditions (lateral and/or superficial). In the second test case, it is not clear whether the boundary conditions (for example the wind) have been perturbed. A correct perturbation method greatly affects the results.
Specific comments:

p2r56: See general comment. If the use of a coupling tool (ESMF) is one of the purposes, you cannot say that this is trivial;

p3r73-76: not very clear, rephrase;

p3r80: Provide references for the two methods developed;

p4r96: Do you need to change the SCHISM code? This affects the portability of the method;

Fig. 2: the panel on the bottom-right is not explained in the caption;

Tab.1: the "status" is not related to the development in PDAF I suppose. Clarify;

p8r164: 8 members are few, I recommend at least 40;

p9r166: 'forecast' -> 'background';

Fig. 3: The labels are too small and overall the figure is unclear. I recommend removing it;

p11r183-197: I do not much agree with the interpretation of the results. Even if the MAE is lower with localization, the simulations without localization seem better, since they are able to reproduce the vertical structure. Localization methods are perhaps too limited vertically. However, increasing the number of ensemble members should improve all the DA methods;

p13r232: I suggest at least 40 members and to take care of the perturbations of the initial state and of the boundary conditions (surface in particular);
p16r258: By increasing the number of members the cross-correlation should improve if the perturbations are done correctly;

Fig. 8: the differences are minimal, I would remove this figure, adding a short sentence describing it;

Fig. 10 and 12: Also these figures can be removed. You can just give a couple of numbers in the text.