

## ***Interactive comment on “Developing a common, flexible and efficient framework for weakly coupled ensemble data assimilation based on C-Coupler2.0” by Chao Sun et al.***

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Dear Dr. Nerger,

Thanks a lot for taking time to give further clarifications.

We will try to reduce statements or discussions about PDAF and discuss more about the “new aspects” when revising the manuscript, if reviewers agree.

Here we’d like to reply some of your points.

1. To my impression there are enough differences in the strategy to use a complex coupler compared to the approach of PDAF to by-pass the coupler. This difference is

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also in the situation that PDAF is designed to be compatible with any model coupler (even C-Coupler), while one would need to figure out how to use the C-Coupler based system if a coupled model is already implemented with a coupler like OASIS-MCT.

Response: C-Coupler2 has a functionality namely incremental coupling which enables C-Coupler2 to work cooperatively with other couplers. So, an existing coupled model that uses any other coupler can also use DAFCC enclosed in C-Coupler for data assimilation, without modifying the codes regarding model coupling. Thanks a lot for your reminder. We will introduce this point when revising the manuscript.

2. This experience doesn't coincide with ours. The templates for the communicator setup that we provide with PDAF are readily usable. Thus, there is no particular "users' effort".

Response: We do believe that these templates can work in most cases, while we note that they should be further adapted for special cases (you may have stated this point in your first round of comment), e.g., the distribution of process IDs among ensemble members is irregular.

3. Nonetheless, I'm not aware of any situation where a different decomposition would be useful for an ensemble of equivalent model states where one does not know before the actual computation that any of them would be particularly faster or slower than the others.

Response: We agree that it would be strange if different ensemble members use different parallel decomposition. For example, would it be a real case that DA is performed for an ensemble of WRF on the same big domain, while only one ensemble member has nested domains? Under such a case, the unique ensemble member with nested domains should use more processor cores so as a different parallel decomposition on the big domain for accelerating integration. As we cannot accurately assert the requirements arising from future model developments, we have to make DAFCC as common

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as possible.

4. If you also intend to write “ ... efforts should be made to enable the software compilation system of C-Coupler to compile” your alternative sentence would make sense. Obviously, also the code of C-Coupler and the assimilation code you use need to be compiled. Thus, it might be even more effort in your case since C-Coupler and the assimilation codes are really separate.

Response: We do not require the software compilation system of C-Coupler to compile a DA algorithm because dynamic linking is used in DAFCC. When there are a lot of DA algorithms but only using one, only one DA algorithm can be compiled. When integrating a new DA algorithm, the C-Coupler code and mode code can be unchanged. Compilation is one of our consideration while it may not be a critical point when using a framework. We will modify the manuscript accordingly.

5. In short the modification would be as follows: One modifies the parallel setup so that COMM\_couple consists of a single process each, which switches off communication in COMM\_couple. Then, in the call-back routines (namely in prepoststep\_pdaf.F90) one would add a subroutine to collect the ensemble on the sub-subdomains of the model (thus, on chunks of the state vector) and to distribute the ensemble states again after the analysis update.

Response: Could you please show us the benefit of using PDAF under such a case? Thanks. As the required call-back routines function similarly to the data exchange functionality in DAFCC that is based on C-Coupler, it would be a very challenging work for users to develop such call-back routines. Moreover, further efforts would be required to generate COMM\_filter that combines all processes of the whole ensemble of a component model.

Wish more discussions with you again.

Many thanks again.

Best regards,

Li

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