

Dear Author,

Thank you for this revised version of your manuscript. I think it has considerably improved compared to the first version but there are still many important points that need clarification. In particular, I consider that in many cases, you don't reply to the reviewer's comments in a satisfactory way. Therefore I suggest you analyse and reply to my following comments before the manuscript can be considered for publication. My comments are classified into 4 lists: first the comments related to Reviewer 1 comments, then the one related to Reviewer 2 comments, then my own additional major comments, and finally my additional minor comments.

Reviewer 1 comments:

#2 – Details on lags and restarts

In the revised manuscript, there is a whole new section on adaptive restart capability. Here are some comments on this issue and new section:

- P24, l20-24: I don't understand these lines. You propose to "...to extend the simulation period to guarantee correct simulation of the model states in the concerned simulation period", but then you add a whole new section 4.8 on "Adaptive restart capability" describing how C-Coupler2 supports restart capability even with lags (fig 11 a and 11 c). Also, in the last paragraph of this new section, you conclude that "C-Coupler2 currently does not guarantee exact restart capability under such kind of coupling lag specification". Please clarify what is supported or not by the C-Coupler2 in terms of restart capability with lags.
- I don't understand the first paragraph, p 32, l6-12. I think that in your text you suppose that Comp1 and Comp2 are stopped after 600s and restarted; is it the case? If so, it is not clear, either in your text, or on Fig 11a. Please clarify. If this is the case, then I suppose that when Comp1 and Comp2 are restarted:
 - Comp1 exports exp1_1 at 1200s (that will be received by Comp2 at 1800s) and then imports imp1_1 that is exported as exp2_1 by Comp2 at 1200s.
 - Comp2 exports exp2_1 and then tries to import imp2_1. Comp1 produced the corresponding exp1_1 during the previous run at 600s; therefore it has to be in the restart file. And then the simulation can go on.

So I conclude that the only coupling field that has to be in the restart file is exp1_1 from Comp1 at 600s and I don't understand why you write: "... at the second and third iterations", p 32, l12. Please correct or clarify.

- Regarding case 11c, I understand, as you write (P33, l1), that it is unnecessary for comp1 to export exp1_1 at 1200s, but then I don't understand where imp2_1, needed by Comp2 at 600s, will come from? Please clarify.
- P33, l11: what do you mean with "almost" in "almost at each time step"? Is it or is it not required at each time step?
- P33, last line, P34, l1-3. You write "When a receiver component ... the values of the import field instance will be read from the corresponding NetCDF restart data file"; will this be done automatically or is it that the model has to explicitly call a *CCPL_start_restart_read_IO* ?

- P34, l4-21, fig 11 (a): the example is too difficult to follow without a graph illustrating the different steps. If you want to keep the example, please add an explanatory graph.

#3 - One-sided vs two-sided communication: your updated section 4.5 is fine for me but for the following details:

- P29, L9: What do you mean by “when all existing message passing buffers are unavailable”; please rephrase.

#5 - Comparison with OASIS3-MCT and CESM.

I am sorry to write that this comparison does not seem much clearer to me in the revised manuscript. I would advice to completely remove this comparison and just insist on C-Coupler2 characteristics.

For example, does C-Coupler2 allow coupling between two components that run sequentially on the same MPI tasks? Please specify.

I think you should keep the first part of the sentence “Similar with OASIS3-MCT_3.0, C-Coupler2 also works as a library without a driver layer and is driven by calls from the models”, but please remove “or coupling layers such as CESM” as I think this does not apply to C-Coupler2 and this last part of the sentence is confusing.

Please remove sentences like “Therefore, each component model of CESM can be treated as a component model of C-Coupler2, and coupling between different component models of CESM can still be treated as coupling between different component models.” or “Therefore, CESM can be treated as a unique component model of OASIS3-MCT_3.0, while any coupling between CESM component models can be treated as a coupling between different grids of OASIS3-MCT_3.0.” as I think that these are more confusing than informative.

#6 - Using a file to coordinate MPI tasks between components

I consider that you don’t answer the reviewer’s comments. In particular, you did not add anything regarding the fact that even if file synchronisation may be simpler than synchronizing with MPI, there is still the equivalent of a global barrier in the interaction. Also you did not answer the question on how does the C-Coupler2 ensure that all components have written to the file before any other component gets the information. Please clarify these two points.

#7 - 3D conservative coupling

Again, I consider that you did not answer the reviewer’s comment. Given his/her remarks, I think that what you write is not correct. There is no specific problem extending 2D conservative remapping based on areas to 3D conservative remapping based on volumes. The problem you mention “a component model ... may have its own specific way to diagnose 3-D conservation” is also present in 2D. Please review this section.

#9 – Self nesting on overlapping pes

I am sorry to say that it is still not clear to me if C-Coupler2 supports self nesting between a component model and another instance of the same component model running on the same or overlapping MPI tasks. Please clarify. Sorry if I missed something.

#17 – Deadlocking and non-blocking communication

You write that you made modifications in the text to address the reviewer’s comment on the fact that, even with non-blocking communication, you have at one point to check if the data has been received, but I don’t see any related modifications in the text.

Reviewer 2 comments:

#4 - Figure 1

I agree that Figure 1 is not needed; it does not help understanding the text, which itself is fine.

#7 - Default for options

Could you mention somewhere in the text that the default for each option is described in the User Guide?

#9 – Source fractions

It is still not clear to me what “source fractions” are and how they are involved in the conservative remapping. Can you clarify?

#10 – Coupling procedure

I agree with reviewer that the list, or at least examples, should be repeated at this point. Or please add a reference to the list provided p3, l2.

#11 – CESM driver

For clarity, maybe replace “... such as CESM consist ...” by “... , such as the CESM driver , consist ...”

#12 – OASIS3-MCT

For clarity, please replace “Note that the latest coupler OASIS3-MCT_3.0 ...” by “Note that the latest version of the OASIS coupler, OASIS3-MCT_3.0 ...”

#14 – “guarantee”

I think that replacing “guarantee” by “do our best” is not appropriate. Either you target backward compatibility and you do what is needed for this, either you don’t target backward compatibility. See also my “Additional major comment” on Section 6.

Additional major comments

#Section 4.1.1.7 - Two designs for the coupling procedure generation

What do you mean by “Two designs ... are compared.”

Do you mean that they were compared and that you decided to implement only the second design in C-Coupler2? If so, why do you insist so much (3 paragraphs) on the first design?

Do you mean that the two designs are implemented in C-Coupler2 and that you compare here in this paper the two? (I don't think this is the case).

Please clarify.

p22, lines 6 & 7: please clarify what is effectively done in practice i.e. using the average value or the instantaneous field at its last activation. Is it the user who chooses what to do through the configuration file?

Section 6

I think this section is particularly weak and should be reviewed. This section is not a general “Discussion and conclusion”, it is just a (not very precise) description of some future plans for C-Coupler2.

First I am not sure what “integrating an external coupling algorithms” precisely means. In this context, I think you mean integrating some external calculation/transformation routines? If so using “coupling algorithm” is too vague.

Second, see my remark above (#14 – guarantee) about the sentence “However, we will try our best ...”

Finally, the discussion on 3D conservative remapping needs to be reviewed (see also my remark above “#7 - 3D conservative coupling”).

Additional minor comments

- P1, l28-29: It could be nicer to write “Two coupled models were built using C-Coupler1” instead of “There are two coupled models with C-Coupler1”.
- P3, l5: Replace “in default ...” by “by default”
- P6, l5: Replace “Coupling generator” by “Coupling procedure generation”
- P6, l17-18: Stating “In a coupled model, a component model always executes both data send and receive operations (i.e., two-way coupled)” is wrong. There are one-way coupled models into which one model performs only data send and one model performs only data receive. Maybe modify the sentence like this: “In a two-way coupled model, a component model always executes both data send and receive operations.”
- P12, l22: Replace “... unnecessary register a model ...” by “... unnecessary to register a model ...”
- P24, l15: Replace “... by an receiver ...” by “... by a receiver ...”
- P29, l23-24: Please rewrite sentence “For a regional model without self-nesting capability (i.e., it can only manage a unique grid domain), C-Coupler2 can it help achieve self-nesting capability as follows.” Maybe “C-Coupler2 can also help achieve self-nesting in a regional model that does not originally support this possibility.” would be better?

- P30, l27: Please rewrite “Similarly, it can also benefit from C-Coupler2 to nest a regional model into a different model.”. Maybe “Similarly, C-Coupler2 can be used to nest a regional model into a different model.” would be better?
- P33, l14-15: change “(Users can disable ... the API. Please refer ... details),” for “(users can disable ... the API; please refer ... details),”