Geoscientific
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Interactive
comment

Interactive comment on "Compact Modeling Framework v3.0 for high-resolution global ocean-ice-atmosphere models" *by* Vladimir V. Kalmykov et al.

Anonymous Referee #1

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Title: Compact Modeling Framework v3.0 for high-resolution global ocean-ice-atmosphere models Author(s): Vladimir V. Kalmykov et al. MS No.: gmd-2017-294

General Comments:

This paper provides an overview of the Compact Modeling Framework (CMF2.0 and CMF3.0) implementation. The paper is well organized. Performance plots are shown for several high resolution cases. It would be nice if the performance plots were extended to higher core counts if possible. The paper could use an additional review by a native English speaker as much of the paper includes some grammatical challenges. Specifically, lack of "a" and "the" in the paper could be much improved.

Specific Comments:

page 2, line 53. Please define WOM at first use and review that definitions exist for other acronyms.

page 4, line 33. Please define SOA at first use and review that definitions exist for other acronyms at first use.

Figure 1 implies that the coupler has distinct cores. Please make sure this is also clearly stated in the text. The picture in Figure 1 suggests there is a 1:1 connection between model tasks and coupler tasks, but this is highly unlikely in practice. It might be clearer if each component had different numbers of tasks in Figure 1. The figure also implies the decomposition on the coupler is the same as the decomposition in the models. But then this does not guarantee "locality of data and communications during the interpolation process or I/O actions" as stated on page 4, line 50. Either the coupler has "near" 1:1 communication with physical models and then interpolation requires a rearrange communication OR there is M:N communication between physical models and the coupler and then minimal communication as part of interpolation. The only way both communication to coupler and interpolation communication can be minimized is if the model decompositions are all chosen very carefully. Again, in practice, this will not be the case. Some rethinking about how this is stated and shown would be helpful.

page 5, line 60. Please provide additional details on how this is implemented.

Figures 2-4 and Figure 6. It would be nice if there were some additional results at higher core counts. I recognize the authors feel this is not needed because the performance of the model is adequate as shown. It still would be informative to the community to see how far the strong scaling goes in their implementation.

Figure 4. The log scaling does not show the detailed information of the relative performance of different cases for a fixed core count. The text notes the percentage differences of a few cases, and this is interesting but incomplete. I wonder if it might

be better to show the data differently, maybe in a table, or maybe in a plot where the y-axis was linear with non-dimensionalized scaling units.

Section 3.4 describes some theoretical ideas about cost for 4 different I/O schemes. It closes by indicating the asynchronous scheme was chosen and that it works without providing any further results. I think, at the least, the performance of the implementation should be documented with actual numbers and then compared with the theoretical description. It would be great if that scheme could be compared to the 3 other schemes, although recognize this might not be possible. The description of the 4 schemes could certainly be reduced, especially as no results are presented for them. Result from the actual performance of the implementation should be increased and described in more detail.

Figure 6, could the CMF2.0 results be added to the plot. This is brought up directly on page 11, line 15 and then again on page 11, line 19.

page 11, line 19. "as expected". Please expand on this, why is it expected?

More generally, please expand on the differences in CMF2.0 and CMF3.0. They both have the coupler on separate cores. CMF3.0 has an additional buffer layer, how is this beneficial, what works well, what doesn't work so well? It is slower than CMF2.0 so how does the community feel about the implementation?

page 13, line 61. Please state how many cores the coupler was using. This should be noted in all application results.

Figure 8. It would be nice if this plot were formatted similar to plots 2-4 with time instead of acceleration on the y-axis, for consistency. Even if it's not log-log and even if it's relative time in this case.

Technical Comments:

I will not go thru each grammatical error but strongly encourage additional review by a native English speaker. Let me just propose an update to the Abstract, for instance,

We present a new version of the Compact Modeling Framework (CMF3.0) developed for the software environment of stand-alone and coupled global geophysical fluid models. The CMF3.0 is designed for use on high and ultra-high resolution models on massively-parallel supercomputers. The key features of the previous CMF version (2.0) are mentioned to reflect progress in our research. In the CMF3.0, the MPI approach with a high-level abstract driver, optimized coupler interpolation, and I/O algorithms is replaced with the PGAS paradigm communications scheme, while the central hub architecture evolves to a set of simultaneously working services. Performance tests for both versions are carried out. In addition, a parallel realisation of the EnOI (Ensemble Optimal Interpolation) data assimilation method as a program service of CMF3.0 is presented.

Much of the document could use similar revision. There are issues throughout.

page 7, line 3, "communicational" is not a word and that sentence makes little sense as written.

page 11, line 11, using -> use

page 14, line 2. Starting the sentence with SYPD is not ideal. Just say "The model throughput" and provide units on the 0.75 value.

page 15, line 27, remove "with" in "handle with huge"

page 15, line 34, change "to further" to "for further"

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