Key: Blue Text=Reviewer. Black Text=Author Response. Purple Text=Alterations to the manuscript.

Reviewer #3: David Bailey, NCAR

This manuscript summarizes the CMIP7 data request focussing on the ocean and sea ice fields. This manuscript is very well written and thoroughly details the opportunities and needs for new variables to be added for CMIP7. I do like the way this has broken things down into different opportunities for ocean, sea ice, paleoclimate, polar amplification, extremes, and so on. However, I do have some significant concerns here.

Thank you for your efforts in reviewing and improving this paper.

1. This is not a traditional scientific paper. Which might be fine for this particular audience. I understand there is a need to have this documented somewhere. However, this really just reads like a workshop report. It is just summarizing outcomes of several discussions. In fact, Appendix A - Opportunity Processing is a table of the outcomes from all of the meetings. I really feel like this table adds nothing to the manuscript even though it is simply an appendix.

We agree that this is very formulaic and not scintillating, but it was decided by the CMIP leadership that this documentation would be valuable. We have confirmed with them that this remains true.

2. I get the feeling overall in this summary that the CMIP6 data request was perfect and we just need to add more output. I would argue that this paper could have provided a critical retrospective of the CMIP6 data request. How many people actually used the variables? What are the lessons learned here. For example, we had extensive discussion about the difficulty of sea ice albedo (sialb) and how to standardize this calculation. Really, the only accurate way to do this is to compute the ratio of outgoing shortwave over the incoming shortwave. This is a true broadband albedo and this should be done daily. I'm sure there are numerous other variables both from the ocean and sea ice perspective that could be tweaked or even removed from the data request. A little bit of this is discussed in the key reflections section, but I don't feel this is enough.

The download and upload statistics from CMIP6 were used to guide the discussion and writing here–primarily to eliminate variables that were not often uploaded and to help in prioritization which is quite different from the CMIP6 set. This data request is for the ocean and sea ice specialists, as opposed to the Rapid Evaluation Framework and Baseline Climate data requests. Those parallel efforts are somewhat reproduced here, and imply an additional higher priority than the variables included by our team that address more specialized concerns.

As to the albedo request, the issue provoked long discussions indeed on how to calculate it. In the end, we proposed to request it as a variable and also provide direction on how it should be calculated (see

https://github.com/cmip6dr/CMIP6_DataRequest_VariableDefinitions/issues/185). In the end, the CMIP office made the decision that albedo should not be requested and instead the radiative fluxes should be requested, from which albedo can be calculated, exactly for the same reasons outlined by the reviewer. This decision was also made for consistency with calculations of the albedo of other surfaces, not just sea ice. :

3. Also I am not as clear how these opportunities map to the set of experiments that are being done for CMIP7. There is mention of the Fast Track experiments, but are we supposed to include all of the for DECK, Scenario, PAMIP, ... We are being challenged at big modeling centers to reduce our carbon footprint and only do essential experiments. This sort of a data request is going to be hard to manage. We have to be very smart and efficient with our data output from the model. Creating petabytes of data is just not feasible.

In the airtables, the specific experiments relevant to specific opportunities are spelled out. It is not intended that all opportunities and their related variable groups would be calculated for all AFT experiments. We recognize the large data volume of the request, but it is shy of PB (our estimates have now been provided explicitly).

4. We are being asked to rank the scientific significance, quality, and reproducibility. These are really not applicable to this manuscript. I can see aspects here that are significant for potential science down the road.

We thank you for your effort and thoughtful comments. These are not the standard papers for peer review, and it takes some ingenuity on the part of everyone involved to reinterpret this format for this purpose.

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