

Interactive comment on “Biogeochemical protocols and diagnostics for the CMIP6 Ocean Model Intercomparison Project (OMIP)” by James C. Orr et al.

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Dear OMIP BGC authors,

The CMIP Panel is undertaking a review of the CMIP6 GMD special issue papers to ensure a level of consistency in answering the key questions that were outlined in our request to submit a paper to all co-chairs of CMIP6-Endorsed MIPs. These questions are outline in the overview paper (Eyring et al, GMD, 2016) and the relevant section is summarised below:

‘Each of the 21 CMIP6-Endorsed MIPs is described in a separate invited contribution to this Special Issue. These contributions will detail the goal of the MIP and the major sci-

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entific gaps the MIP is addressing, and will specify what is new compared to CMIP5 and previous CMIP phases. The contributions will include a description of the experimental design and scientific justification of each of the experiments for Tier 1 (and possibly beyond), and will link the experiments and analysis to the DECK and CMIP6 historical simulations. They will additionally include an analysis plan to fully justify the resources used to produce the various requested variables, and if the analysis plan is to compare model results to observations, the contribution will highlight possible model diagnostics and performance metrics specifying whether the comparison entails any particular requirement for the simulations or outputs (e.g. the use of observational simulators). In addition, possible observations and reanalysis products for model evaluation are discussed and the MIPs are encouraged to help facilitate their use by contributing them to the obs4MIPs/ana4MIPs archives at the ESGF (see Section 3.3). In some MIPs additional forcings beyond those used in the DECK and CMIP6 historical simulations are required, and these are described in the respective contribution as well.'

We very much welcome the OMIP BGC contribution and the hugely valuable detailing of the desired formulations for gas exchange and carbonate chemistry, diagnostic tracers and their initialisation that you currently cover in section 2. This is nicely consistent with the leadership that the other OMIP paper (Griffies et al) is also providing on the physical ocean diagnostics and together these will provide an important protocol for CMIP6.

However we would like to suggest that for consistency with the other papers in the GMD special issue, you consider moving much of section 2 to an appendix rather than in the main body of the paper. A similar suggestion was made on the Griffies et al paper for documentation of diagnostics. Some parts of section 2 such as detailing the tier 1 experiments, their length and initialisation should remain in the main paper and perhaps this section can be re-organised around these including the justification of these runs. I think much of this is already in the paper but could be better structured.

Additionally, we would like to see some more detail on some of the issues raised above,

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notably;

a. More discussion on the science goals of the OMIP BGC in CMIP6 and what science gaps it is attempting to fill to be outlined in the introduction. You mention that OMIP BGC is focussed on the CMIP6 question on 'understanding systematic biases' but give no detail on what OMIP BGC is hoping to achieve that is new.

b. All MIPs have been asked to demonstrate connectivity to the DECK experiments and the CMIP6 historical simulations as one of the 10 endorsement criteria (see Table 1 in Eyring et al., 2016). Please document this for OMIP BGC.

c. You have not provided an analysis plan for the science community engaged in OMIP BGC. How are you going to use the experiments and diagnostics? Are you committing to analyse all the data that you are requesting (or can you point to other MIPs that will do so)?

d. You describe observations of e.g. CFC-11, CFC-12, SF6 etc in the introduction that might be used for evaluation of the models. Are/Could any new observations be made easily available to the modelling community (e.g. through Obs4MIPs?)

We hope you agree that some level of consistency across the MIP papers in this special issue is valuable and that the above suggestions can be accommodated in your paper.

Other comments:

- For the diagnostic section (3 and tables 4-14), what is the link to the CMIP6 data request? Perhaps you need to clarify where is the definitive documentation of what is actually being output from the models (e.g. via a link to the actual data request) and to reference the GMD paper by Martin Jukes?

With many thanks for your ongoing efforts in the CMIP6 process.

The CMIP Panel

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