

Interactive comment on “The Decadal Climate Prediction Project” by George J. Boer et al.

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Comments from CMIP Panel

The CMIP Panel is undertaking a review of the CMIP6 GMD special issue papers to ensure a level of consistency among the invited contributions, also 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 scientific 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

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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 important contribution from DCPD to the CMIP6 special issue. We think the experiment design is well chosen and reflects the long and intense community discussions that DCPD has initiated during the last years, but we have several comments on the manuscript that we are hoping you can address in a revised version:

Please ensure that the title of your paper includes both the acronym of the MIP, and CMIP6, so that it is clear this is a CMIP6-Endorsed MIP (e.g. *'The Decadal Climate Prediction Project (DCPD) contribution to CMIP6'*).

Please ensure consistency of the experiment names with the CMIP6 overview paper (see Eyring et al., 2016).

p1, l5ff The state-of-the art on decadal predictions that has been achieved with CMIP5 simulations and a proper definition or motivation for decadal predictions seems missing from the introduction and the rest of the paper. Related to this then it is difficult to see how this new effort for CMIP6 builds on achievements from CMIP5 and what is different or better. For example, are Component A Tier 1 experiments a simple rep-

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etition of CMIP5 hindcasts or are they different in terms of e.g. new observations for initialization, new initialization techniques, improved models, or initialized additionally with non-ocean components (e.g. sea-ice, land, stratosphere)? The sentence p4, l16 *'The lessons learned from the CMIP5 decadal prediction experiments have been incorporated into the design of the DCPD'* is a good start, but the lessons should actually be summarized in the paper.

The CMIP6-Endorsed MIP contributions to the GMD special issue have been asked to describe the experimental design of each of the experiments in detail, so that the groups can find all the necessary information how to run the experiments in each paper, with technical instructions that could be given in an appendix. To achieve this, we feel that additional information is required that could be provided in the appendices. For example. (1) There is no mentioning or recommendation regarding full-field initialization versus anomaly initialization; (2) we assume the forcings in Component A and B should be exactly as in the CMIP6 historical simulations or a specific ScenarioMIP experiment. However, this is not mentioned. Please expand. Even if in some cases the authors decide not to provide a specific recommendation for good scientific reasons, then this is fine but should be explained and justified.

The scientific analysis plan is rather general and we are hoping it can be extended. All the manuscript currently says is summarized in a single sentence without references: *'The analysis of available observations for initializing forecasts, the improvement of the models used in the production of the forecasts, post processing of forecasts including bias adjustment, calibration and multi-model combination, together with the production and application of probabilistic decadal forecasts, are all involved in the research and development efforts contributing to the DCPD'* There are a lot of open questions in the analysis of decadal simulations (e.g., bias corrections, different metrics used to assess skill) which could benefit from some guidance from DCPD. Even if DCPD is not able to recommend something specific, a scientific summary with references to some of the key papers should be given.

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Figure 3: Please expand the caption and text so that it is clear what the figure shows.

For each proposed experiment to be included in CMIP6, the paper should specify the science question and/or gap being addressed with this experiment and should outline possible synergies with other CMIP6-Endorsed MIPs. (1) There is no mention of the other CMIP6-Endorsed MIPs in the paper, but there are some obvious relationships for example with ScenarioMIP for the forecast component (Component B), to DAMIP (for the additional ensemble members of the CMIP6 historical simulation), to GMMIP that also defines pacemaker experiments etc. Please expand this discussion in the main paper. (2) The scientific motivation for the experiments in the main paper is summarized only very briefly in a few bullet points collectively for each of the three components. We suggest that this list is expanded so that the scientific motivation is provided in the main part of the manuscript. For example, there are good reasons why a larger ensemble size is also required for the CMIP6 historical simulations in order to properly assess hindcast skill. Or, while those involved in the discussions know why an experiment like C3.1 is suggested, the scientific motivation is not provided in the manuscript, leaving the unfamiliar reader with speculation why such an experiment might possibly be useful. Please expand.

p19, l20ff: Demonstrated connectivity to the DECK and the CMIP6 historical simulations is an endorsement criterion for the MIPs (see No 2 in Table 1 of Eyring et al., 2016). We suggest to move this discussion from the Appendix to the main text. Please convincingly state how the models that do not run DECK/Historical are otherwise sufficiently characterized and how drifts, unforced variability and climate sensitivity that matter for predictions on decadal time-scales are diagnosed or why it is believed this does not matter.

Component A is a basis for forecasting on annual to decadal timescales as is said in the abstract. Therefore it seems important that Component A is performed by all models that enter Component B of DCP. We suggest to rewrite the last sentence of the abstract to reflect this: *'Groups are invited to participate in as many or as few of the*

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Components of the DCP, each of which are separately prioritized, as are of interest to them.' This should then be stated again in the main manuscript.

p.4,19: *'although both climate simulations and decadal hindcasts'*: decadal hindcasts are also climate simulations. Please be more specific.

p.10,1.8 ff: The last sentences of the data availability section gives the impression that separate forcings are developed for DCP. However, hindcasts and forecasts use exactly the same forcings than the CMIP6 historical simulations and ScenarioMIP, respectively. Please rewrite this part accordingly, for example *'Datasets of natural and anthropogenic forcing information are required for the DCP simulations, which are based on the exact same forcings that are defined for the CMIP6 historical simulations and ScenarioMIP. They are described in separate contributions to this special issue and will be made available through the ESGF with version control and DOIs assigned.'*

p.26, 113: The pacemaker experiments in Component C refer to the design of Kosala and Xie (2013). Please specify the experiment to ensure common treatment among the models (e.g. in terms of handling of sea-ice and what exactly is prescribed (wind stress / SSTs)). We would like to encourage you to liaise with GMMIP on the pacemaker experiments, since GMMIP is defining similar experiments and the methods used should be the same or explanations for differences should be given.

Table A1. The entry says *'Prescribed CMIP6 historical values of atmospheric composition and/or emissions and other conditions including volcanic aerosols. Future forcing as the SSP2-4.5 scenario.'* We believe this entry should say: *'Forcings in the hindcasts exactly as in the CMIP6 historical simulations and for forecasts as in the SSP2-4.5 scenario of ScenarioMIP'*. Please give a reference for SSP2-4.5 and define the acronym. Why this scenario and not another one? Please motivate in the main text.

Table A1, experiment A2.2: why are the ensemble members from the CMIP6 historical simulations requested from 1850 onwards? For the particular analysis of DCP,

wouldn't it be sufficient to ask for ensembles starting in 1960? Please motivate.

Reference:

Eyring, V., Bony, S., Meehl, G. A., Senior, C. A., Stevens, B., Stouffer, R. J., and Taylor, K. E.: Overview of the Coupled Model Intercomparison Project Phase 6 (CMIP6) experimental design and organization, *Geosci. Model Dev.*, 9, 1937-1958, doi:10.5194/gmd-9-1937-2016, 2016.

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

The CMIP Panel

Interactive comment on *Geosci. Model Dev. Discuss.*, doi:10.5194/gmd-2016-78, 2016.

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