

The Decadal Climate Prediction Project Responses to Comments SC2

We appreciate the time and effort that the CMIP6 Panel has put in to review the description of the DCPD experiment. It is always helpful to receive comments that indicate how the paper is read and perceived by other than the authors who are close to the material. The other reviewers were basically satisfied with the organization and the “style”, if we may call it that, of the paper where we have attempted to be reasonably terse and to concentrate on the specification of the coordinated experiments that form the DCPD contribution to CMIP6.

We have purposefully avoided writing a review of decadal prediction results and have instead referred to a few basic and recent publications which also provide lists of pertinent references. We provide some additional references but do not attempt the many references which would be needed to cover the many and very broad aspects of the DCPD. We have assumed that participants in DCPD/CMIP6 will understand the basic scientific context and so have been comparatively terse in this regard also. Our attempt is to write the paper as a reference for potential participants who will undertake some or all of the experiments proposed. We do our best to respond to the CMIP6 Panel comments below.

1. Please ensure that the title of your paper.... contribution to CMIP6’).

We have adopted this very title. We have also, in compliance with the wishes of the Panel, avoided a version number.

2. p1, 15ff The state-of-the art on decadal predictions that has been achieved with CMIP5.....Please expand.

We respond to what we consider are the several aspects of the comments:

- i. what does CMIP6 bring beyond CMIP5
- ii. what level of information is needed to specify the experiments (e.g full field or anomaly initialization) etc.?
- iii. forcing should be specified more clearly
- iv. guidance on the analysis of results
- v. Figure 3
- vi. further description of science question/gaps, motivation (e.g. ensemble size)
- vii. connections with other MIPs

Responses:

2iii. Please see the responses to 6 and 8 below concerning forcing.

2v. Figure 3. We do not understand what is missing in the caption of Figure 3 which is a more or less standard in decadal prediction result. We have added the identifiers of the models involved to the caption and modified the text to be more explicit.

2i,ii,iv,vi. We have considerably rewritten and expanded the section beginning p5,15 in an attempt to respond to these comments but without attempting a review of the very broad range of material

involved. We fairly often refer to the recent IPCC report as a heavily referenced compendium of recent published material and we also add some other references. The hope is that this expanded material provides at least some of the information that is felt to be missing. In particular we have added subsections “Multi-system approach”, “Analysis of results”, “Deck and CMIP6 historical simulations” and “Participation”.

The expanded sections provide some further discussion of the “science questions/gaps” which we hope are helpful. As noted earlier, our intent is to provide some terse background while concentrating on the specification of the coordinated experiments that form the DCPD contribution to CMIP6. We do not approach the GMD paper as scientific motivation for an unfamiliar reader but do add some text concerning the desirability of larger ensembles for instance. We have kept the motivation brief in the body of the paper and added details in the appendices for the more motivated reader.

As also noted in the expanded text, we make no recommendations as to the details of initialization for instance. We have adopted the view that the DCPD prescribes a specific experimental design but not the details of the implementation. This, of course, is entirely in the tradition of past CMIP approaches to both simulation and prediction. We do not recommend model resolutions; physical parameterizations, specific methods of initialization etc. etc. since the evidence for the best approach is not available and will, in part, be revealed by the output of the DCPD. The presumption is that the participants will naturally adopt what they regard as the best approaches based on their understanding of their forecasting systems and that this is suitable input to a “multi-system” approach.

2.vii. A brief section noting DCPD connections with ScenarioMIP, DAMIP, VolMIP, DynVar and SolarMIP has been added although details of the connections are not stressed. Recent interactions with GMMIP have resulted in common specification of some experiments which formerly differed from those of the DCPD.

3. p19, l20 Demonstrated connectivitydoes not matter.
See response above and the new subsection “Deck and CMIP6 historical simulations”

4. Component A ...
Component A. It is correct that Component A results will (as noted in the expanded text) support the results of Component B. However, we do not insist that only models that have completed Component A can submit results to Component B. Component B may be willing to consider results that are based on other hindcast data sets, especially in the interim, while Component A results are being generated.

5. p4, l9 ...
We don't agree that decadal hindcasts are also climate simulations. Common usage (e.g. Chapter 11, IPCC 2013) note that while simulations represent possible evolutions of the system under external forcing and independent of initial conditions, predictions attempt to trace out the actual evolution of the system based on the initial state plus the external forcing.

6. p10,l8...”forcing”
Yes we agree that this is important and have adopted this text in Section 12 Data Availability.

7. p26 l13...

As seen at l20 the imposed tropical SSTs for the pacemaker experiments are made available on the PCMDI website. There are no references to winds or wind stress, which are not part of the experiment and the treatment where sea ice exists is specified.

8. Table A1. We now reference ScenarioMIP and motivate the choice of SSP2-4.5 as characterized there. Historical simulations, as such, cannot start from 1960 since they depend on past forcing so the entire period is involved. The retention of data from 1850 contributes to the CMIP6 historical multi-model ensemble.