

Interactive comment on “The PMIP4 contribution to CMIP6 – Part 2: Two Interglacials, Scientific Objective and Experimental Design for Holocene and Last Interglacial Simulations” by Bette L. Otto-Bliesner et al.

J. Brigham-Grette (Referee)

juliebg@geo.umass.edu

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The paper is written as community vision for the next phase of coupled model experiments (CMIP) within the simulations guided by PMIP4. The long-standing project has successfully guided the community to test model sensitivity and process in understanding the role of forcing and feedbacks in the climate system. This project is a contribution to the WCRP Grand Science Challenges (stated at the end of the paper) with a focus on Earth system response to a variety of forcings, model system biases and how to assess future climate change given uncertainties in scenarios. The point of this paper

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is to outline the planned experimental design criteria for assessing mid-Holocene (6 ka) and Last Interglacial (LIG, about 127ka) climate. The paper outlines requirements for everything from GHGs and orbital configurations to paleogeography and ice sheets, vegetation, aerosols. Requirements are also outlined for a set of Tier 2 experiments prescribing vegetation, ice sheets, meltwater sensitivity etc. A major focus of CMIP6 is on the realism of the mid-Holocene and LIG127 simulations compared to paleoclimate data (line 605).

My major complaint is that the modeling design does not really get at sea ice. Its mentioned a few times. It would seem absolutely necessary that different sea ice configurations are included the same way that different (or prescribed) ice sheet geographies are included. For 6k (with nearly ice free summers from 9 to 6ka? (Funder et al) and for 127k (possible ice free summers at peak interglacial?; no sea ice south of Bering Strait, several papers) sea ice variability or 2-3 different modeled geographies might be considered.

The paper is well written and easy to follow however I had to read parts of the Eyring et al paper 2016 in this journal to find some of the terminology. I am not a modeler, yet I am among those in the community who would like to read about modeling project plans, but might not immediately understand what the “CMIP DECK” is. The paper does an impressive job listing summaries and paleodata compilations that might be used for input however it is not exhaustive.

There are a number of experiments described and the CMIP6 program includes 33 modeling groups (says website). So one would hope there are enough models and groups chasing each experiment for the models to be compared. Eyring et al 2016 says “To ensure community engagement, an important criterion was that enough modeling groups (at least eight) were willing to perform all of the MIP’s highest priority (Tier 1) experiments and providing all the requested diagnostics needed to answer at least one of its leading science questions.

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This paper should move forward to publication with only a few picky edits:

Line 110: I suggest for non-modelers that you add a footnote about what an “entry card” is? I understand this refers to a specific list of requirements. Line 129 : define ISMIP6 – Ice Sheet Model Intercomparison 6 contribution to CMIP.

Line 153: typo, Mollusc shells, not mullusc shells. Line 164: write out the meaning of DECK – Diagnostic, Evaluation and Characterization of Klima. One should not have to read the Eyring et al. 2016 paper to get all of the acronyms. Line 429: move the Lozhkin and Anderson reference. So it reads: . . .vegetation and climate in which vegetation cover in the high-latitudes is changed from tundra to boreal forest (experiment a) (Lozhkin and Anderson, 1995) and the Sahara desert is replaced by evergreen shrub to 25°N and savanna/. . .

Line 445: Add year to the Hoelzmann et al reference.

Line 465 and section 3.4: Should/Could H11 be added to figure 1? Line 490: The location of the freshwater flux is extremely important and there might be reasons for the freshwater to hug the coast rather than be flooded over the entire Labrador sea. So this might also be part of the experimental design?

Line 1158: Fig. 1 caption. Add Veres et al, 2013 to the sentence containing AICC2012. Or perhaps better yet, cite the editors of the AICC2012 volume.

Lines 1175 and 1180: Add color bars to figure 3 and 4 because the print on the lines in the figure are very tiny.

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