

## ***Interactive comment on “The PMIP4 contribution to CMIP6 – Part 4: Scientific objectives and experimental design of the PMIP4-CMIP6 Last Glacial Maximum experiments and PMIP4 sensitivity experiments” by Masa Kageyama et al.***

### **Anonymous Referee #1**

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#### General comments

This paper describes the LGM and related experiments for the next phase of the PMIP, which are expected to aid the coming IPCC AR6 publication, and makes conscious effort toward the consistent comparisons with a series of the CMIP6 experiments. The manuscript is well written overall, and new aims to bring ESM components into the scope and to disentangle the multiple forcing-response relations are clear. Unfortunately, description of some figures is unsatisfactorily. I recommend to accept this manuscript after such minor revisions.

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#### Major specific comments

1. I think that the description of Fig. 2 in the text is insufficient. The authors can at least address why the suggested reconstructions are different and what are the main differences before asking the community to use them. How about showing the differences between the three maps? The authors do not have to write in details as they are in the original references, but a summary would be useful.
2. I think that the description of Fig. 5 in the text is insufficient. Could you provide what is the main message that the readers should take from Figs. 5c-5e?
3. I think that the description of Fig. 6 is insufficient. The authors can address at least briefly why they are different and what are the main differences. I also do not understand the meaning of labels (PI, PI&LGM, LGM) in Figs. 6a and 6b.
4. Given many choices in forcing, would it be difficult to compare model results even though the use of different forcing may cover the range of forcing uncertainty. I think it is useful to discuss the philosophy of why the authors choose the strategy of free choice in forcing, rather than defining one set of ‘standard’ forcing for all models to use before conducting optional experiments.

#### Minor specific comments

1. It would be easier for readers, including non-modellers and modellers who have never done the LGM experiment, to overview the LGM experimental design before going into the details if two tables are provided which separately summarise the forcing and the sensitivity experiments (e.g. LGM\_PI\_ghg, LGM\_PI\_ice, etc.)
2. Based on the PMIP3 experience, it would be very useful to define the ‘equilibrium’ or to define some indices which show the closeness to the true equilibrium. Some descriptions were already given (e.g., SST trend, but not entire ocean trend), but is it possible to make all indices a bit more objective (e.g., the trend of variable X for the last 100 years of the spinup)? I do not think it is necessary that all models are very

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close to the equilibrium, but the information on how far from the equilibrium is useful to safely interpret the result.

3. The authors mention climate sensitivity and close collaboration with the RFMIP. They also suggest a LGM AGCM simulation. Would it be useful to request each model to provide effective radiative forcing as in the RFMIP (if AGCM simulation is to be done already as suggested by the manuscript)?

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