EGU2020-11153
https://doi.org/10.5194/egusphere-egu2020-11153
EGU General Assembly 2020

The PMIP4-CMIP6 Last Glacial Maximum experiments: preliminary results and comparison with the PMIP3-CMIP5 simulations

Masa Kageyama[1] and the PMIP4 LGM group[*]
[1]Laboratoire des Sciences du Climat et de l'Environnement, IPSL, Gif-sur-Yvette Cedex, France (masa.kageyama@lsce.ipsl.fr)
[*]A full list of authors appears at the end of the abstract

The Last Glacial Maximum (LGM, ~21,000 years ago) has been a major focus for evaluating how well state-of-the-art climate models simulate climate changes as large as those expected in the future using paleoclimate reconstructions. A new generation of climate models have been used to generate LGM simulations as part of the Palaeoclimate Modelling Intercomparison Project (PMIP) contributionto CMIP6. Here we provide a preliminary analysis and evaluation of the results of these LGM experiments and compare them with the previous generation of simulations (PMIP3-CMIP5). We show that the PMIP4-CMIP6 are globally less cold and less dry than the PMIP3-CMIP5 simulations, most probably because of the use of a more realistic specification of the northern hemisphere ice sheets in the latest simulations although changes in model configuration may also contribute to this. There are important differences in both atmospheric and ocean circulation between the two sets of experiments, with the northern and southern jet streams being more poleward and the changes in the Atlantic Meridional Overturning Circulation being less pronounced in the PMIP4-CMIP6 simulations than in the PMIP3-CMIP5 simulations. Changes in simulated precipitation patterns are influenced by both temperature and circulation changes. Differences in simulated climate between individual models remain large so, although there are differences in the average behaviour across the two ensembles, the new simulation results are not fundamentally different from the PMIP3-CMIP5 results. Evaluation of large-scale climate features, such as land-sea contrast and polar amplification, confirms that the models capture these well and within the uncertainty of the palaeoclimate reconstructions. Nevertheless, regional climate changes are less well simulated: the models underestimate extratropical cooling, particularly in winter, and precipitation changes. The spatial patterns of increased precipitation associated with changes in the jet streams are also poorly captured. However, changes in the tropics are more realistic, particularly the changes in tropical temperatures over the oceans. Although these results are preliminary in nature, because of the limited number of LGM simulations currently available, they nevertheless point to the utility of using paleoclimate simulations to understand the mechanisms of climate change and evaluate model performance.

PMIP4 LGM group: Sandy P. Harrison2, Marie-L. Kapsch3, Marcus Löfverström4, Juan M. Lora5, Uwe Mikolajewicz3, Sam Sherriff-Tadano6, Tristan Vadsaria6, Ayako Abe-Ouchi6, Nathaelle Bouttes1, Deepak Chandan7, Allegra N. LeGrande8, Fanny Lhardy1, Gerrit Lohmann9, Polina A.

Morozova10, Rumi Ohgaito11, W. Richard Peltier7, Aurélien Quiquet1, Didier M. Roche1,12, Xiaoxu Shi9, Andreas Schmittner13, Jessica E. Tierney4, Evgeny Volodin14