



## **Are the PMIP climate models consistent with the MARGO data synthesis for the Last Glacial Maximum?**

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The use of information from paleoclimates as a means of assessing the performance of global climate models has long been considered an important motivation of paleoclimate research, but this tenet has only recently become widely accepted in the mainstream climate modelling community. Several standard paleoclimate simulation experiments are for the first time included in the forthcoming CMIP5 model intercomparison project which should motivate and permit a more detailed exploration of this issue in the next IPCC report.

Recently the MARGO project (MARGO Project Members, 2009) produced a synthesis of several different proxy data types representing sea surface temperature anomalies at the Last Glacial Maximum on a five degree grid, including an error estimate at each grid point. Such a dataset should be suitable for direct comparison with climate models and yet, due to the lack of a sound theoretical basis with which to evaluate the multi-model ensemble, this information has not yet been directly exploited.

Here we use the framework of ensemble reliability, commonly used in weather prediction, and recently highlighted by Annan and Hargreaves (2010), to assess and compare the existing paleoclimate multi-model ensembles, PMIP and PMIP2, as well as one single model ensemble based on the MIROC3.2 model. It is shown that the uncertainty estimate included in MARGO is of critical importance to the resulting assessment of the models, and we recommend that concerted effort to further refine this uncertainty is made in future.

### References:

J.D. Annan and J.C. Hargreaves, Reliability of the CMIP3 ensemble, 2010, *Geophys. Res. Lett.*, 37, L02703, doi:10.1029/2009GL041994.

MARGO Project Members, Constraints on the magnitude and patterns of ocean cooling at the Last Glacial Maximum, 2009, *Nature Geoscience*, 2, 127-132.