



Exchanges

- Scientific Contributions -

The second phase of the Paleoclimate Modeling Intercomparison Project (PMIP2)*

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The Paleoclimate Intercomparison Project (PMIP) is a long-standing initiative endorsed by the World Climate Research Programme (WCRP; JSC/CLIVAR Working Group on Coupled Modelling (WGCM)) and the International Geosphere - Biosphere Programme (IGBP; Past Global Changes (PAGES)). The major goals of PMIP are to determine ability of models to reproduce climate states that are different from those of today and to increase our understanding of climate change. The PMIP effort developed out of a NATO Advanced Research Workshop, convened in 1991, which led to a cooperative and coordinated effort to compare model simulations with each other and with paleoclimatic data. The mid-Holocene and the Last Glacial Maximum were the major targets during the first phase of PMIP both for modelling and data synthesis. Simulating the mid-Holocene represents a sensitivity experiment to increased seasonal contrast of incoming solar radiation at the top of the atmosphere in the northern hemisphere, which leads to enhanced summer monsoons in the tropics. On the other hand, simulating the Last Glacial Maximum, allows an assessment of model representation of extreme cold conditions as well as feedbacks arising from a reduced CO₂ concentration and 2 to 3 km ice sheet elevation over North America and northern Europe. Only atmospheric models were considered in the first phase. PMIP results formed a crucial part of the evaluation of climate models in the Third Assessment Report of the Intergovernmental Panel on Climatic Changes (IPCC, 2001)

Complementary experiments, examining the role of the ocean and of the land surface in past climate changes were also carried out by several PMIP participating groups. These experiments demonstrated that the ocean and vegetation feedbacks were both needed to simulate regional patterns and magnitude of past climate changes

correctly (Braconnot et al., 2003). The evaluation of fully-coupled ocean-atmosphere and ocean-atmosphere-vegetation models will be the major focus of the second phase of the PMIP project (Harrison et al., 2002). Coupled simulations also allow us to consider new questions such as the role of the thermohaline circulation in climate change, or the changes in interannual to multidecadal variability and the influence of ocean and vegetation feedbacks in modulating these changes. Evaluation of the ability of coupled models to simulate such behaviour is needed to increase our confidence in future climate projections. In addition new periods of interest have emerged. Some of the PMIP participants are interested in the Early Holocene, when the insolation forcing was even larger than during the mid-Holocene, and in glacial inception studies to better constrain the major feedbacks that are needed to amplify the insolation forcing and bring the system from a warm interglacial state to a cold glacial state.

This second phase of PMIP2 is just starting. It was initiated at an international PMIP workshop in Cambridge last year (Harrison et al., 2002). In this new phase of the project, we will study the role of climate feedbacks arising in the different climate subsystems (atmosphere, ocean, land surface, sea ice and land ice) and evaluate the capability of state of the art climate models to reproduce climate states that are radically different from those of today. PMIP2 is led by Sylvie Joussaume, Laboratoire des Sciences du Climat et de l'Environnement, France, email: sylvie.joussaume@cnr-dir.fr, and will have five modelling foci:

- the mid-Holocene climate (contact: Pascale Braconnot, Laboratoire des Sciences du Climat et de l'Environnement, France, email: pasb@lsce.saclay.cea.fr)
- the last glacial maximum climate (contact: Chris Hewitt, Met Office Hadley Centre, UK; email: Hewitt@metoffice.com)
- the Early Holocene climate (contact: Paul Valdes, University of Bristol, UK; email: p.j.valdes@bristol.ac.uk)
- the last glacial inception (contact: Gilles Ramstein, Laboratoire des Sciences du Climat et de l'Environnement, France, email: ramstin@lsce.saclay.cea.fr)
- a sensitivity experiment to water hosing in the north

Atlantic (contact: Ronald J. Stouffer, NOAA Geophysical Fluid Dynamics Laboratory, USA; email: ronald.stouffer@noaa.gov). This experiment is a common experiment between PMIP and WGCM's Coupled Model Intercomparison Project (CMIP).

Analyses will be based on model-model and model-data comparisons. Evaluation of model experiments depends on the existence of spatially explicit data sets that can be compared with output from the model simulations. PMIP2 will continue to stimulate continuous development and improvement of paleo-environmental data sets (contact: Sandy Harrison, School of Geographical Science, Bristol, UK, email: sandy.harrison@bris.ac.uk).

Results from both coupled ocean-atmosphere models and ocean-atmosphere-vegetation models will be considered in this second phase. The experimental protocols for the first two periods have been widely discussed during the last year and agreed upon during the special evening session on PMIP at the INQUA meeting last July (Reno, 23 - 27 July). For these experiments model outputs will be stored in a common database at LSCE. All the information can be found on the pmip2 web site <http://www-lsce.cea.fr/pmip2> (contact: jypeter@lsce.saclay.cea.fr). This site will be updated regularly as new information is available.

The work for the early Holocene and last glacial inception will start in the form of working groups. Several modelling groups will run these experiments and our goal within PMIP is to encourage discussion and comparison of these simulations. The water hosing experiment has already started by a sub group of people involved in the CMIP project.

The PMIP2 coordination committee formed with the co-authors of this announcement can be easily reached with the following email address: pmip2-com@lsce.saclay.cea.fr. We invite all the modelling groups interested to know more about the ability of their coupled model to represent a climate different from the present day one to participate to this new phase of PMIP. Let us know if you intent to contribute to this new phase and to which experiments.

References:

- Braconnot, P., S. Harrison, J. Joussaume, C. Hewitt, A. Kitoh, J. Kutzbach, Z. Liu, B.L. Otto-Bliesner, J. Syktus, and S.L. Weber, 2003: Evaluation of coupled ocean-atmosphere simulations of the mid-Holocene. Kluwer, in press.
- Harrison, S., P. Braconnot, C. Hewitt, and R.J. Stouffer, 2002: Fourth international workshop of The Palaeoclimate Modelling Intercomparison Project (PMIP): launching PMIP Phase II. EOS.
- IPCC, 2001: Climate Change 2001, The Scientific Basis. Cambridge University Press, Cambridge, 882 pp.