

# Design for the Last Deglaciation experiment

You will find on this page information about the experiment design for the PMIP4 [Last Deglaciation](#) experiments.

Please make sure to read the [Associated publications](#) before setting up your experiments or using the output data, and read any *how-to* sections associated with specific boundary conditions.



Get in touch with the following people if you have questions:

|                                        |                                     |
|----------------------------------------|-------------------------------------|
| <a href="#">Jean-Yves Peterschmitt</a> | Technical questions or missing data |
| <a href="#">Ruza Ivanovic</a>          | working group leader                |
| <a href="#">Lauren Gregoire</a>        | working group co-leader             |
| <a href="#">Masa Kageyama</a>          | working group steering              |
| <a href="#">Didier Roche</a>           | working group steering              |
| <a href="#">Paul Valdes</a>            | working group steering              |
| <a href="#">Andrea Burke</a>           | working group steering              |

## Associated publications

### Last deglaciation experiment design, version 1:

Ivanovic, R. F.; Gregoire, L. J.; Kageyama, M.; Roche, D. M.; Valdes, P. J.; Burke, A.; Drummond, R.; Peltier, W. R. and Tarasov, L.: Transient climate simulations of the deglaciation 21–9 thousand years before present, version 1; PMIP4 Core experiment design and boundary conditions, Geosci. Model Dev. Discuss., 8, 9045–9102, doi:[10.5194/gmdd-8-9045-2015](https://doi.org/10.5194/gmdd-8-9045-2015), 2015.

## Version 1 Specifications

For general advice on boundary condition implementation in palaeoclimate models, see [Kageyama et al. \(2016\)](#).

### Last Glacial Maximum spinup (21 ka)

This spinup simulation is compatible with the PMIP4-CMIP6 LGM experiment, which can also be used as the initialisation state for the fully transient run from 21 ka onwards, provided the ICE-6G\_C or GLAC-1D ice sheet reconstructions and associated boundary conditions (orography, coastlines and bathymetry) were used.

|            | PMIP4 specifications |
|------------|----------------------|
| PMIP4 name | <b>LDv1-LGMspin</b>  |

|                                      | <b>PMIP4 specifications</b>                                                                                                                                                  |
|--------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Astronomical parameters              | <b>eccentricity</b> = 0.018994<br><b>obliquity</b> = 22.949°<br><b>perihelion-180°</b> = 114.42°<br><b>Date of vernal equinox</b> : Noon, 21st March                         |
| Solar constant                       | 1361.0 ± 0.51365 W m <sup>-2</sup>                                                                                                                                           |
| Trace gases                          | <b>CO<sub>2</sub></b> = 190 ppm<br><b>CH<sub>4</sub></b> = 375 ppb<br><b>N<sub>2</sub>O</b> = 200 ppb<br><b>CFC</b> = 0<br><b>O<sub>3</sub></b> = Preindustrial (e.g. 10 DU) |
| Ice sheets, orography and coastlines | 21 ka data from either<br>- ICE-6G_C reconstruction <a href="#">[Access to data]</a><br>- GLAC-1D reconstruction <a href="#">[Access to data]</a>                            |
| Bathymetry                           | Keep consistent with the coastlines, using either:<br>- Data associated with the ice sheet<br>- Preindustrial bathymetry                                                     |
| Global ocean salinity                | + 1 psu, relative to preindustrial                                                                                                                                           |
| All others                           | As per the PMIP4-CMIP6 LGM experiment                                                                                                                                        |

## Transient orbit and trace gases spinup (26-21 ka)

This option for spinning-up the last deglaciation simulation uses transient orbital parameters and trace gases from 26-21 ka.

|                         | <b>PMIP4 specifications</b>                                                                                                                                                                                                                                                                                                                                                       |
|-------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| PMIP4 name              | <b>LDv1-transpin</b>                                                                                                                                                                                                                                                                                                                                                              |
| Astronomical parameters | All orbital parameters should be transient as per <a href="#">Berger (1978)</a> 26-21 ka <a href="#">[Access to data]</a>                                                                                                                                                                                                                                                         |
| Trace gases             | All adjusted to the AICC2012 chronology <a href="#">Veres et al. (2013)</a> 26-21 ka:<br><b>CO<sub>2</sub></b> = Transient, as per <a href="#">Bereiter et al. (2015)</a> <a href="#">[Access to data]</a><br><b>CH<sub>4</sub></b> = Transient, as per <a href="#">Loulergue et al. (2008)</a><br><b>N<sub>2</sub>O</b> = Transient, as per <a href="#">Schilt et al. (2010)</a> |
| All others              | As per the LGM (21 ka) spinup type; LDv1-LGMspin                                                                                                                                                                                                                                                                                                                                  |

## Transient deglaciation (21-0 ka)

These are the specifications for the full transient run 21-0 ka.

(Note, the period of focus for version 1 of the experiment is 21-9 ka, but all boundary conditions are provided until 0 ka so that groups can extend the run to present if they wish).

|                                | <b>PMIP4 specifications</b>                                                                                                                                                      |
|--------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| PMIP4 name                     | <b>LDv1</b>                                                                                                                                                                      |
| Initial conditions (pre 21 ka) | Recommended (optional) to use either:<br>- LDv1-LGMspin<br>- LDv1-transpin<br>See above for details. The method must be documented, including information on the state of spinup |
| Astronomical parameters        | Transient, as per <a href="#">Berger (1978)</a> <a href="#">[Access to data]</a>                                                                                                 |
| Solar constant                 | 1361.0 ± 0.51365 W m <sup>-2</sup>                                                                                                                                               |

|                                            | <b>PMIP4 specifications</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|--------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Trace gases                                | Adjusted to the AICC2012 chronology <a href="#">Veres et al. (2013)</a> 21-0 ka:<br><b>CO<sub>2</sub></b> = Transient, as per <a href="#">Bereiter et al. (2015)</a> [ <a href="#">Access to data</a> ]<br><b>CH<sub>4</sub></b> = Transient, as per <a href="#">Louergue et al. (2008)</a><br><b>N<sub>2</sub>O</b> = Transient, as per <a href="#">Schilt et al. (2010)</a><br><b>CFC</b> = 0<br><b>O<sub>3</sub></b> = Preindustrial (e.g. 10 DU)                                                                                                                                                                                                                           |
| Ice sheet                                  | Transient, with a choice of either :<br>- ICE-6G_C reconstruction [ <a href="#">Access to data</a> ]<br>- GLAC-1D reconstruction [ <a href="#">Access to data</a> ]<br>How often to update the ice sheet is optional                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| Orography and coastlines                   | Transient. To be consistent with the choice of ice sheet.<br>Orography is updated on the same timestep as the ice sheet. It is optional how often the land-sea mask is updated, but ensure consistency with the ice sheet reconstruction is maintained                                                                                                                                                                                                                                                                                                                                                                                                                         |
| Bathymetry                                 | Keep consistent with the coastlines, and otherwise use either:<br>- Data associated with the ice sheet; it is optional how often the bathymetry is updated<br>- Preindustrial bathymetry                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| River routing                              | Ensure that rivers reach the coastline<br>It is recommended (optional) to use one of the following:<br>- Preindustrial configuration for the model<br>- Transient routing provided with the ice sheet reconstruction (if available)<br>- Manual/model calculation of river network to match topography                                                                                                                                                                                                                                                                                                                                                                         |
| Freshwater fluxes                          | At participant discretion. Three options are: <i>melt-uniform</i> , <i>melt-routed</i> and <i>no-melt</i> :<br>- <i>Melt-uniform</i> : use a globally uniform ice meltwater flux, e.g. as associated with one of the ice sheet reconstructions [ <a href="#">Access to data</a> ]<br>- <i>Melt-routed</i> : use a routed ice meltwater flux, e.g. as associated with one of the ice sheet reconstructions [ <a href="#">Access to data</a> ]<br>- <i>No-melt</i> : have no ice sheet meltwater in the simulation<br>It is recommended (optional) to run at least one Core simulation with a scenario consistent with the chosen ice sheet reconstruction to conserve salinity. |
| Vegetation & land cover<br>Aerosols (dust) | Prescribed preindustrial cover or dynamic vegetation model<br>Prescribed preindustrial distribution or prognostic aerosols                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |

## Focused simulations

- Empty
- Empty

## References cited

- Bereiter, B., Eggleston, S., Schmitt, J., Nehrbass-Ahles, C., Stocker, T. F., Fischer, H., Kipfstuhl, S. and Chappellaz, J.: Revision of the EPICA Dome C CO<sub>2</sub> record from 800 to 600 kyr before present, *Geophys. Res. Lett.*, 42(2), 2014GL061957, doi:10.1002/2014GL061957, 2015.
- Berger, A.: Long-Term Variations of Daily Insolation and Quaternary Climatic Changes, *J. Atmospheric Sci.*, 35(12), 2362–2367, doi:10.1175/1520-0469(1978)0352.0.CO;2, 1978.
- Kageyama, M., Braconnot, P., Harrison, S. P., Haywood, A. M., Jungclauss, J., Otto-Bliesner, B. L., Peterschmitt, J.-Y., Abe-Ouchi, A., Albani, S., Bartlein, P. J., Brierley, C., Crucifix, M., Dolan, A.,

- Fernandez-Donado, L., Fischer, H., Hopcroft, P. O., Ivanovic, R. F., Lambert, F., Lunt, D. J., Mahowald, N. M., Peltier, W. R., Phipps, S. J., Roche, D. M., Schmidt, G. A., Tarasov, L., Valdes, P. J., Zhang, Q. and Zhou, T.: PMIP4-CMIP6: the contribution of the Paleoclimate Modelling Intercomparison Project to CMIP6, *Geosci. Model Dev. Discuss.*, 1–46, doi:10.5194/gmd-2016-106, 2016.
- Loulergue, L., Schilt, A., Spahni, R., Masson-Delmotte, V., Blunier, T., Lemieux, B., Barnola, J.-M., Raynaud, D., Stocker, T. F. and Chappellaz, J.: Orbital and millennial-scale features of atmospheric CH<sub>4</sub> over the past 800,000 years, *Nature*, 453(7193), 383–386, doi:10.1038/nature06950, 2008.
  - Schilt, A., Baumgartner, M., Schwander, J., Buiron, D., Capron, E., Chappellaz, J., Loulergue, L., Schüpbach, S., Spahni, R., Fischer, H. and Stocker, T. F.: Atmospheric nitrous oxide during the last 140,000 years, *Earth Planet. Sci. Lett.*, 300(1–2), 33–43, doi:10.1016/j.epsl.2010.09.027, 2010.
  - Veres, D., Bazin, L., Landais, A., Toyé Mahamadou Kele, H., Lemieux-Dudon, B., Parrenin, F., Martinerie, P., Blayo, E., Blunier, T., Capron, E., Chappellaz, J., Rasmussen, S. O., Severi, M., Svensson, A., Vinther, B. and Wolff, E. W.: The Antarctic ice core chronology (AICC2012): an optimized multi-parameter and multi-site dating approach for the last 120 thousand years, *Clim Past*, 9(4), 1733–1748, doi:10.5194/cp-9-1733-2013, 2013.

From:

<https://pmip4.lsce.ipsl.fr/> - **PMIP4**

Permanent link:

[https://pmip4.lsce.ipsl.fr/doku.php/exp\\_design:degla?rev=1464953020](https://pmip4.lsce.ipsl.fr/doku.php/exp_design:degla?rev=1464953020)

Last update: **2016/06/03 13:23**

