

Design for the Penultimate Deglaciation experiment

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

This protocol is a product of the *PAGES-PMIP working group on Quaternary Interglacials (QUIGS)*



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:

Laurie Menviel	Experimental design questions
Emilie Capron	Experimental design questions
Ruza Ivanovic	working group leader
Jean-Yves Peterschmitt	Technical questions or missing data

Associated publications

- **Penultimate Deglaciation experiment design, version 1:**

The penultimate deglaciation: protocol for PMIP4 transient numerical simulations between 140 and 127 ka, version 1.0, Menviel et al, GMD, 2019,
https://dx.doi.org/available_soon

Version 1 Specifications

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

Penultimate Glacial Maximum spinup (140 ka)

If possible, this spinup simulation should start from the PMIP4-CMIP6 LGM (21 ka) experiment, as equilibrium would be reached more quickly.

	PMIP4 specifications
PMIP4 name	PDGv1-PGMspin (PDG ⇔ <i>Penultimate DeGlaciation</i> - PGM ⇔ <i>Penultimate Glacial Maximum</i>)

	PMIP4 specifications
Astronomical parameters	eccentricity = 0.033 obliquity = 23.414° perihelion-180° = 73° Date of vernal equinox : Noon, 21st March
Solar constant	1361.0 ± 0.51365 W m ⁻²
Trace gases	CO₂ = 195 ppm CH₄ = 387 ppb N₂O = 201 ppb CFC = 0 O₃ = Preindustrial (e.g. 10 DU)
Ice sheets, orography and coastlines	140 ka data from Combined ice-sheet reconstruction (IcIES-NH, GSM-G and GSM-A): [Access to data]
Bathymetry	Keep consistent with the coastlines, using either: - Data associated with the ice sheet - Preindustrial bathymetry
Global ocean salinity	+ 0.85 psu, relative to preindustrial
All others	See manuscript section 6.1

Transient Penultimate Deglaciation (140-127 ka)

These are the specifications for the full transient run 140-127 ka.

	PMIP4 specifications
PMIP4 name	PDGv1
Initial conditions (140 ka)	Recommended: PDGv1-PGMspin See above for details. The method must be documented, including information on the state of spinup
Astronomical parameters	Transient, as per Berger (1978) [Access to data & README !]
Solar constant	1361.0 ± 0.51365 W m ⁻²
Trace gases	CO₂ = Transient, as per the spline of Koehler et al. (2017) : [Access to data] CH₄ = Transient, as per the spline of Koehler et al. (2017) : [Access to data] N₂O = Linear increase from 201 ppb at 140 ka to 218.74 ppb at 134.5 ka then transient, as per the spline of Koehler et al. (2017) : [Access to data] CFC = 0 O₃ = Preindustrial (e.g. 10 DU)
Ice sheet	Transient: Combined ice-sheet reconstruction (IcIES-NH, GSM-G and GSM-A) [Access to data] How often to update the ice sheet is optional
Orography and coastlines	Transient. To be consistent with the choice of ice sheet. 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: - Data associated with the ice sheet; it is optional how often the bathymetry is updated - Preindustrial bathymetry

The data files have a version string (_vYYmmDD) in their file name, indicating when they have been uploaded to this site (in case we have to update them later and use a more recent version/date).

CH69-K09 (txt)
MD95-2042 (txt)
ODP976 (txt)
ODP980 (txt)
ODP983 (txt)
ODP1063 (txt)
SU90-03 (txt)
SL_LIG_Dutton2017 (txt)
d13Cstack (txt) Stack of U1308, CH69-K09 and ODP1063
IRD-stack (txt)
Figure 9 data (xlsx)

References cited

- Berger, A.: Long-Term Variations of Daily Insolation and Quaternary Climatic Changes, *J. Atmospheric Sci.*, 35(12), 2362–2367, [doi:10.1175/1520-0469\(1978\)035<2362:LTVODI>2.0.CO;2](https://doi.org/10.1175/1520-0469(1978)035<2362:LTVODI>2.0.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](https://doi.org/10.5194/gmd-2016-106), 2016.
- P. Koehler and C. Nehrbass-Ahles and J. Schmitt and T.F. Stocker and H. Fischer: A 156 kyr smoothed history of the atmospheric greenhouse gases CO₂, CH₄, and N₂O and their radiative forcing, *Earth System Science Data*, 9, 363–387, [doi:10.5194/essd-9-363-2017](https://doi.org/10.5194/essd-9-363-2017), 2017.
- 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](https://doi.org/10.5194/cp-9-1733-2013), 2013.

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