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:

Jean-Yves Peterschmitt	Technical questions or missing data
Ruza Ivanovic	working group leader
Lauren Gregoire	working group co-leader
Masa Kageyama	working group steering
Didier Roche	working group steering
Paul Valdes	working group steering
Andrea Burke	working group steering

Associated publications

Transient climate simulations of the deglaciation 21–9 thousand years before present (version 1) – PMIP4 Core experiment design and boundary conditions, Ivanovic, R. F., Gregoire, L. J., Kageyama, M., Roche, D. M., Valdes, P. J., Burke, A., Drummond, R., Peltier, W. R., and Tarasov, L., Geosci. Model Dev., 9, 2563-2587, doi:10.5194/gmd-9-2563-2016, 2016.

Version 1 Specifications

For general advice on boundary condition implementation in palaeoclimate models, see Kageyama et al. (2018).

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	**LDv1-LGMspin**

	PMIP4 specifications
Astronomical parameters	**eccentricity** = 0.018994 **obliquity** = 22.949° **perihelion-180°** = 114.42° **Date of vernal equinox** : Noon, 21st March
Solar constant	1361.0 ± 0.51365 W m^{-2}
Trace gases	**CO_2** = 190 ppm **CH_4** = 375 ppb **N_2O** = 200 ppb **CFC** = 0 **O_3** = Preindustrial (e.g. 10 DU)
Ice sheets, orography and coastlines	21 ka data from either - ICE-6G_C reconstruction: [Access to data] - GLAC-1D reconstruction: [Access to data]
Bathymetry	Keep consistent with the coastlines, using either: - Data associated with the ice sheet - 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.

	PMIP4 specifications
PMIP4 name	**LDv1-transpin**
Astronomical parameters	All orbital parameters should be transient as per Berger (1978) 26-21 ka [Access to data **&** README !]
Trace gases	All adjusted to the AICC2012 chronology Veres et al. (2013) 26-21 ka: **CO_2** = Transient, as per Bereiter et al. (2015): [Access to data (md5sum = `c54a033d8cbf588bc2b95d3b92ff9b1c`)] **CH_4** = Transient, as per Loulergue et al. (2008): [Access to data] **N_2O** = Transient, as per Schilt et al. (2010): [Access to data]
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).

	PMIP4 specifications
PMIP4 name	**LDv1**
Initial conditions (pre 21 ka)	Recommended (optional) to use either: - LDv1-LGMspin - LDv1-transpin See above for details. The method must be documented, including information on the state of spinup

	PMIP4 specifications
Astronomical parameters	Transient, as per Berger (1978) [Access to data **&** README !]
Solar constant	1361.0 ± 0.51365 W m^{-2}
Trace gases	Adjusted to the AICC2012 chronology Veres et al. (2013) 21-0 ka: **CO_2** = Transient, as per Bereiter et al. (2015): [Access to data (md5sum = `c54a033d8cbf588bc2b95d3b92ff9b1c`)] **CH_4** = Transient, as per Loulergue et al. (2008): [Access to data] **N_2O** = Transient, as per Schilt et al. (2010): [Access to data] **CFC** = 0 **O_3** = Preindustrial (e.g. 10 DU)
Ice sheet	Transient, with a choice of either : - ICE-6G_C reconstruction: [Access to data] - GLAC-1D reconstruction: [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
River routing	Ensure that rivers reach the coastline It is recommended (optional) to use one of the following: - Preindustrial configuration for the model - Transient routing provided with the ice sheet reconstruction (if available) - Manual/model calculation of river network to match topography
Freshwater fluxes	At participant discretion. Three options are: *melt-uniform*, *melt-routed* and *no-melt*: - *Melt-uniform* : use a globally uniform ice meltwater flux, e.g. as associated with one of the ice sheet reconstructions [ICE-6G_C] - [GLAC-1D] - *Melt-routed* : use a routed ice meltwater flux, e.g. as associated with one of the ice sheet reconstructions [ICE-6G_C] - [GLAC-1D] - *No-melt* : have no ice sheet meltwater in the simulation 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 Aerosols (dust)	Prescribed preindustrial cover or dynamic vegetation model Prescribed preindustrial distribution or prognostic aerosols

Focused simulations

- Empty
- Empty

References cited

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- 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.