

Project: **1006**

Project title: **Simulations of the Mid-Piacenzian Warm Period (~3.3-3.0 Ma BP) in the framework of the Pliocene Model Intercomparison Project Phase 2 (PlioMIP2)**

Project lead: **Gerrit Lohmann**

Report period: 01.07.2025 – 30.06.2026

During the allocation period 2025/2026 we completed a major chunk of the AWI-CM3 PlioMIP3 simulations targeted for the upcoming model intercomparison (Table 1). These simulations contributed to two published manuscripts. Matos et al. (2025b) presents the AWI-CM3 Late Pliocene setup for PlioMIP3 and results from the core simulations LP and piControl (Fig. 1). Matos et al. (2025a) examines the Atlantic Meridional Overturning Circulation, comparing conventional depth-space diagnostics with the more physically appropriate density-space representation. Both contributions were strategically relevant; consequently, resources from project ab0246 supplemented ba1006. As resources remain tight, we aim to continue PlioMIP3 work exclusively within ba1006.

In the coming year we will contribute to the PlioMIP3 model intercomparison, expected to yield several co-authored publications. The extended and optional PlioMIP3 simulations have been submitted to the PlioMIP3 server; a formal description will follow in Matos et al. (in prep., 2026). In the upcoming allocation period we plan to continue climate modelling in ba1006 as outlined in the request document.

Table 1. AWI-CM3 PlioMIP3 experiments. Run IDs, publications, PlioMIP3 status, and production status. Simulations ≥ 500 model years: 'finished'; not yet started: 'to be done'. Status colour coding: ■ Core; ■ Extension; ■ Optional; ■ Legacy.

Experiment	Run ID	Publications	PlioMIP3 Status	Production status
Pre-Industrial	pictrl-v32_007	Matos et al., 2025a Matos et al., 2025b	Core (PI / E280)	finished
Pre-Industrial with 400 ppmv	pi400_001	Matos et al. (in prep., 2026)	Optional (PI400 / E400)	finished
Late Pliocene	lp_001	Matos et al., 2025b	Core (LP / Eoi400)	finished
Late Pliocene with 280 ppmv	lp-280-001	Matos et al. (in prep., 2026)	Optional (LP280 / Eoi280)	finished
Early Pliocene	ep_002	Matos et al. (in prep., 2026)	Extension (EP)	finished
Late Pliocene high NH orbit	lp-highNH_001	Matos et al. (in prep., 2026)	Optional (LP_highNH_lowSH_orbit)	finished
Late Pliocene low NH orbit	lp-lowNH_001	Matos et al. (in prep., 2026)	Optional (LP_lowNH_highSH_orbit)	finished
Late Pliocene with 490 ppmv	lp490_001	Matos et al. (in prep., 2026)	Optional (LP490)	finished
Pre-Industrial CO ₂ with Late Pliocene orography	eo280_001	Matos et al. (in prep., 2026)	Legacy (PI_lp-orog / Eo280)	finished
Pre-Industrial CO ₂ with Late Pliocene ice sheets	ei280_001	Matos et al. (in prep., 2026)	Legacy (PI_lp-ice / Ei280)	finished
Late Pliocene CO ₂ with Pre-Industrial orography	eo400_001	Matos et al. (in prep., 2026)	Legacy (LP_pi-orog / Ei400)	finished
Late Pliocene CO ₂ with Pre-Industrial ice sheets	ei400_001	Matos et al. (in prep., 2026)	Legacy (LP_pi-ice / Eo400)	finished
Late Pliocene with pre-industrial East Antarctic Ice Sheet	—	Matos et al. (in prep., 2026)	Optional (LP_pi-EAIS)	to be done
Late Pliocene with minimal land-sea mask change	—	Matos et al. (in prep., 2026)	Extension (LP_min_LSM_change)	to be done

Late Pliocene with dynamic vegetation	—	Matos et al. (in prep., 2026)	Optional (LP_dyn-veg)	to be done
Pre-Industrial with dynamic vegetation	—	Matos et al. (in prep., 2026)	Optional (PI_dyn-veg)	to be done
Late Pliocene with 560 ppmv	—	Matos et al. (in prep., 2026)	Optional (LP560 / Eoi560)	to be done
Pre-Industrial with 560 ppmv	—	Matos et al. (in prep., 2026)	Optional (PI560 / E560)	to be done
Late Pliocene with 350 ppmv	—	Matos et al. (in prep., 2026)	Legacy (LP350 / Eoi350)	to be done
Late Pliocene with 450 ppmv	—	Matos et al. (in prep., 2026)	Legacy (LP450 / Eoi450)	to be done

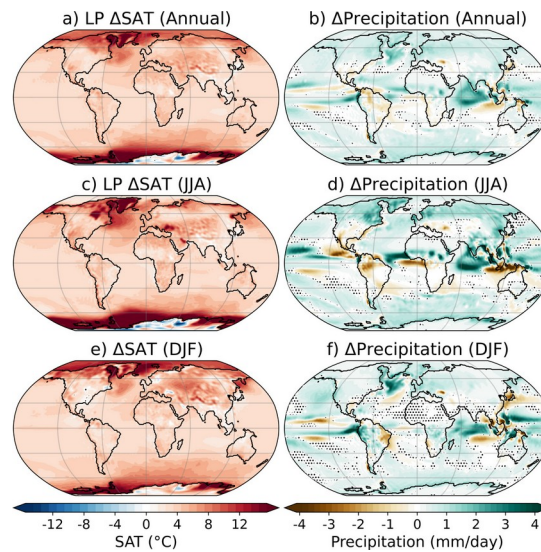


Figure 1: Late Pliocene (LP) climate in comparison to piControl for near surface air temperature (SAT; left) and precipitation (right) with different temporal averaging; annual mean (top), June, July, August (JJA, middle), December, January, February (DJF, bottom). Figure taken from Matos et al. 2025a, it appears there as Fig. 12.

References

- Haywood, A. M., Tindall, J. C., Burton, L. E., Chandler, M. A., Dolan, A. M., Dowsett, H. J., Feng, R., Fletcher, T. L., Foley, K. M., Hill, D. J., Hunter, S. J., Otto-Bliesner, B. L., Lunt, D. J., Robinson, M. M., and Salzmann, U. (2024): Pliocene Model Intercomparison Project Phase 3 (PlioMIP3) – science plan and experimental design, *Global and Planetary Change*, 232, 104316, <https://doi.org/10.1016/j.gloplacha.2023.104316>.
- Oliveira Matos, F. D. A., Stepanek, C., Harig, S., Streffing, J., Zhang, Q., Wang, Z., Power, K., Semmler, T., Sidorenko, D., Scholz, P., Danilov, S., Gravis, P., and Lohmann, G. (2025a): Modeling the Late Pliocene with AWI-CM3 as a contribution to PlioMIP3 core experiments, *Global and Planetary Change*, 257, 105196, <https://doi.org/10.1016/j.gloplacha.2025.105196>.
- Oliveira Matos, F. D. A., Sidorenko, D., Shi, X., Ackermann, L., Pereira, J., Lohmann, G., and Stepanek, C. (2025b): Diagnosing the Atlantic Meridional Overturning Circulation in density space is critical in warmer climates, *Ocean Science*, 21, 2895–2914, <https://doi.org/10.5194/os-21-2895-2025>.
- Oliveira Matos, F. D. A. et al. (in prep., 2026): Pliocene Climate in the extended and optional experiments of the PlioMIP3 simulated with AWI-CM3.