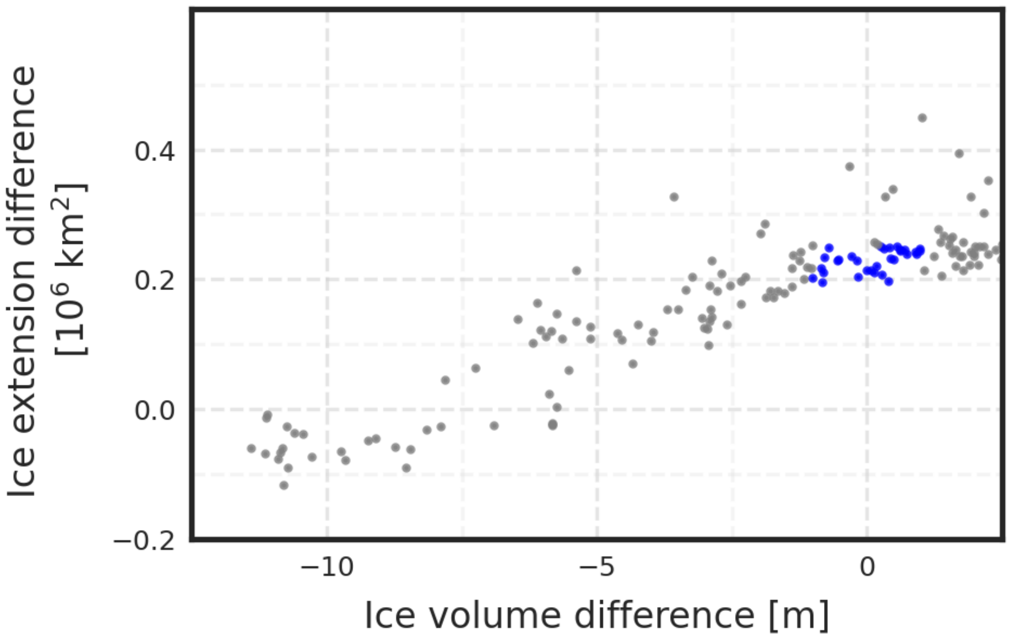

Figure S1. Scatter plot of the Antarctic PD simulations. x-axis represents the ice volume difference between the simulated state and the observations. y-axis represents the ice extension difference between the simulation and the observations. Blue points represent simulations that differ less than 1 mSLE and 2.5 10^6 km^2 with observations (a deviation of 2% from observed values) and are considered for mPWP simulations.

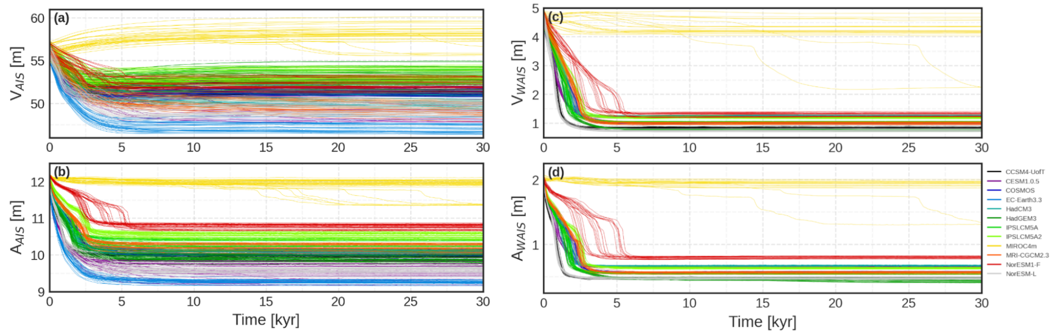

Figure S2. Time evolution of the (a)/(c) AIS/WAIS sea-level content; (b)/(d) AIS/WAIS grounded ice area for the whole ensemble.

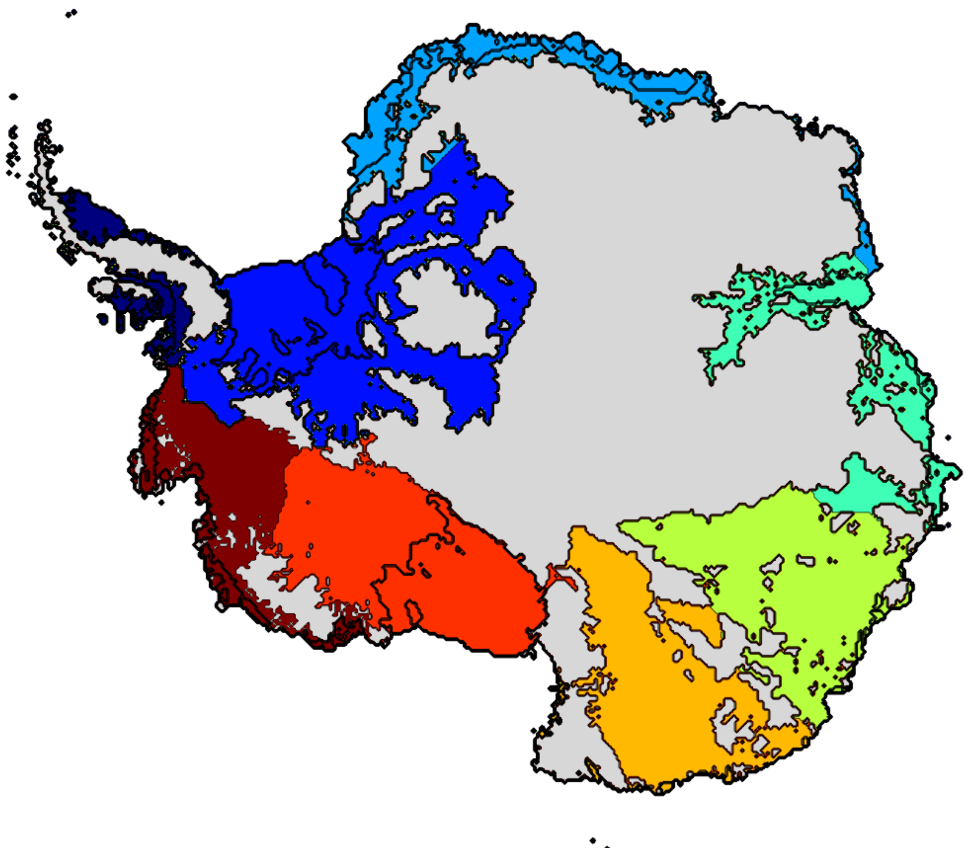

Figure S3. Map of the Bedrock AIS regions. Navy blue: Antarctic Peninsula. Dark-blue: Filchner-Ronne. Light-blue: North-EAIS. Turkish: Amery. Green: Totten. Orange: Wilkes. Red: Ross. Dark-Red: Amundsen. Gray colors represent bedrock regions above sea level.

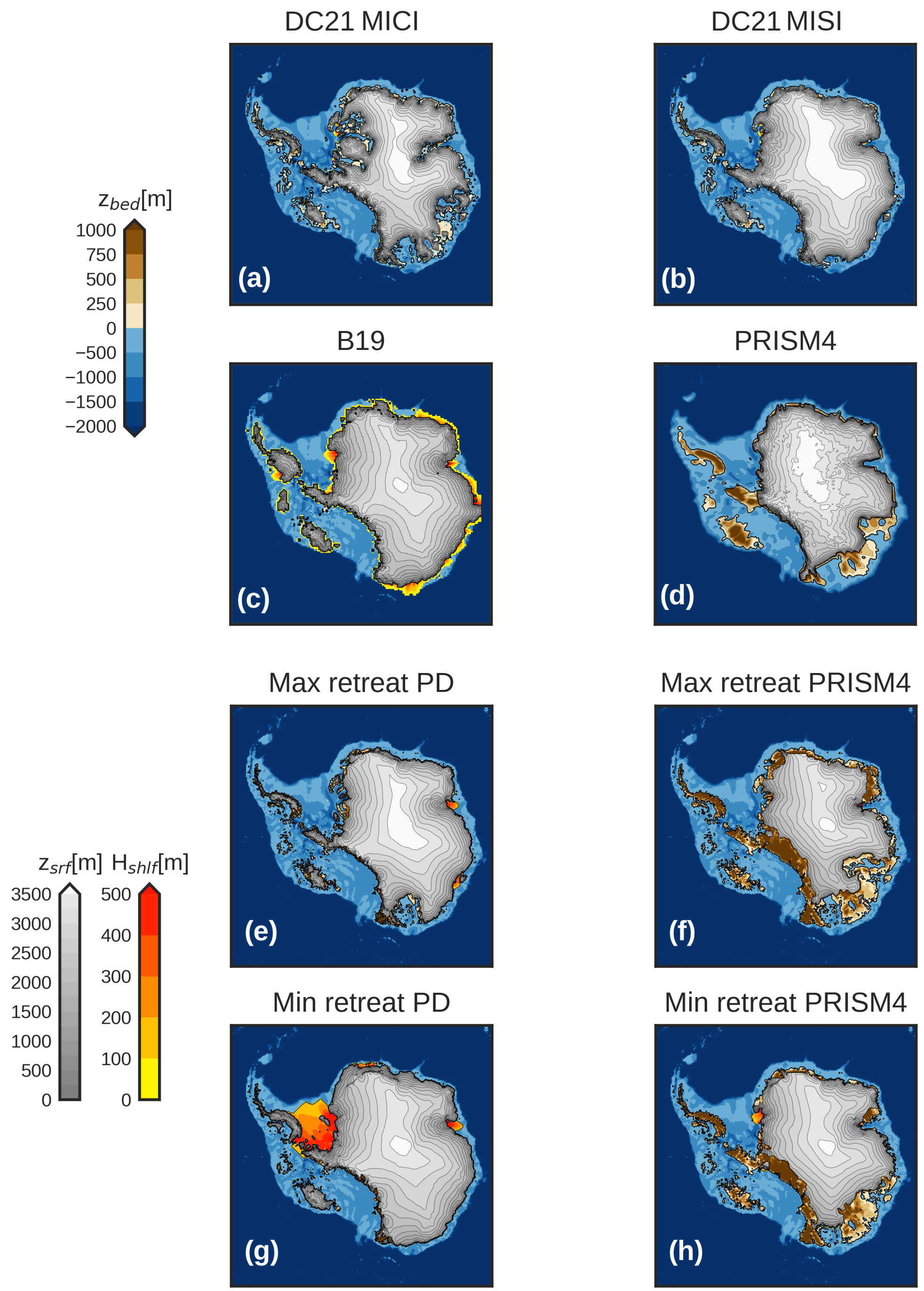

Figure S4. AIS reconstruction/simulations from other studies with surface elevation (gray), floating ice thickness (orange) and bedrock elevation for ice-free points (brown/blue). DeConto et al. (2021) with (a) and without (b) MICI mechanism. (c) Berends et al., (2019) and the (d) PRISM4 boundary conditions for PlioMIP2 (Dowsett et al., 2016). (e)/(f) maximum retreated AIS in our study starting from PD/PRISM4 conditions. (g)/(h) minimum retreated AIS in our study starting from PD/PRISM4 conditions.

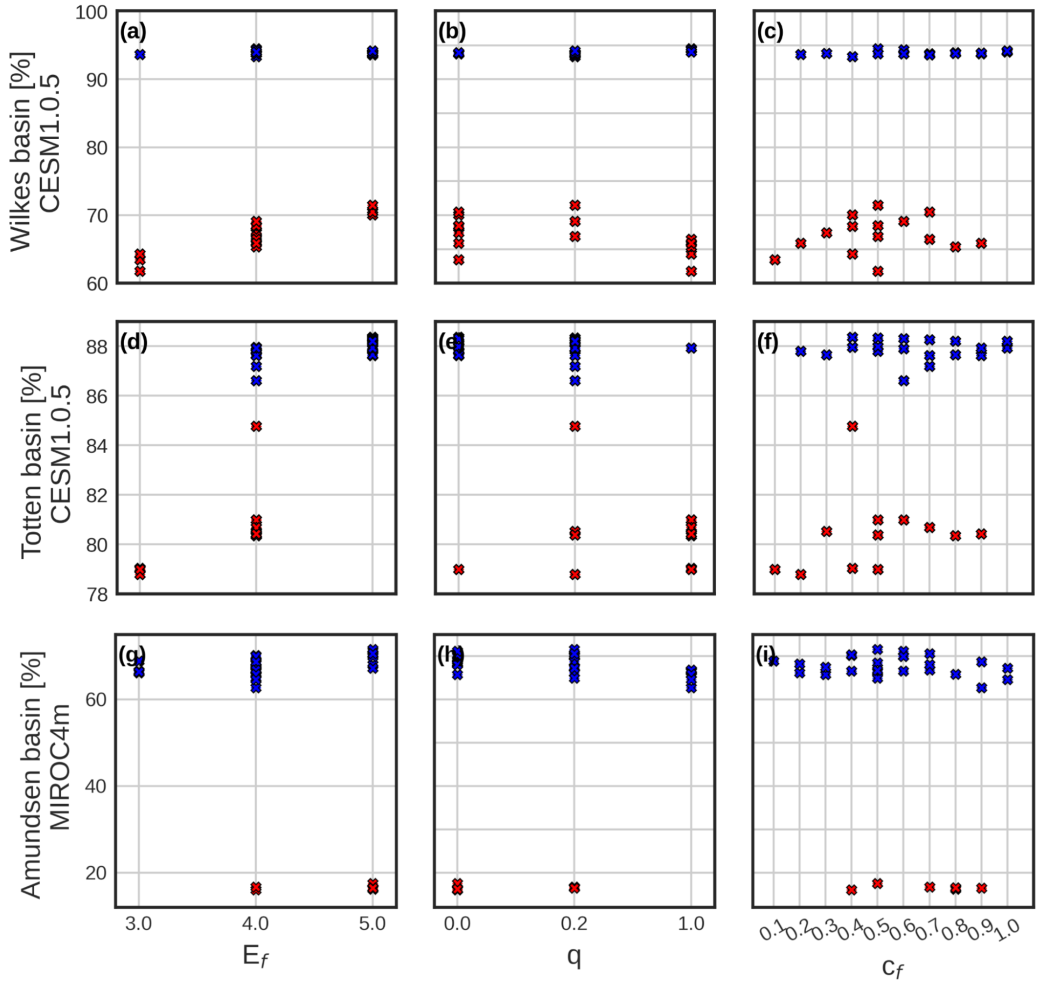

Figure S5. Scatter plot of (a)/(d)/(g) enhancement factor; (b)/(e)/(h) Friction law exponent; (c)/(f)/(i) friction coefficient with respect to the Wilkes, Totten and Amundsen basin ice area. Top/Center and Lower row shows the CESM1.0.5/MIROC4m models. Red/Blue colors represent collapsed/non-collapsed states.

i

AOGCM	CMIP6	Ocean	AIS contribution to sea-level rise (m)	Reference
CCSM4-UofT	No	No	$4.7^{+1.0}_{-0.5}$	Chandan and Peltier (2017)
CESM1.0.5	No	Yes	$5.8^{+3.0}_{-2.1}$	Baatsen et al. (2022)
COSMOS	No	Yes	$4.7^{+0.7}_{-0.4}$	Stepanek et al. (2020)
EC-Earth3.3	Yes	Yes	$8.9^{+0.8}_{-0.7}$	Zhang et al. (2021)
HadCM3	No	Yes	$5.8^{+0.9}_{-0.5}$	Hunter et al. (2019)
HadGEM3	Yes	Yes	$2.7^{+0.9}_{-0.5}$	Williams et al. (2021)
IPSLCM5A	No	No	$3.3^{+0.4}_{-0.5}$	Tan et al. (2020)
IPSLCM5A2	No	No	$2.9^{+0.5}_{-0.3}$	Tan et al. (2020)
MIROC4m	No	Yes	$-1.8^{+1.9}_{-1.0}$	Chan and Abe-Ouchi (2020)
MRI-CGCM2.3	No	No	$7.0^{+0.3}_{-0.4}$	Kamae et al. (2016)
NorESM1-F	No	Yes	$4.0^{+0.5}_{-0.7}$	Li et al. (2020)
NorESM-L	No	Yes	$6.9^{+0.5}_{-0.2}$	Li et al. (2020)

Table S1. Table summarizing the AOGCMs, its contributon to CMIP6, , if ocean files are available and the contrbution in this study to sea-level rise.

References

Baatsen, M. L., von der Heydt, A. S., Kliphuis, M. A., Oldeman, A. M., and Weiffenbach, J. E.: Warm mid-Pliocene conditions without high climate sensitivity: the CCSM4-Utrecht (CESM 1.0. 5) contribution to the PlioMIP2, Climate of the Past, 18, 657–679, https://doi.org/10.5194/cp-18-657-2022, 2022.

Chan, W.-L. and Abe-Ouchi, A.: Pliocene Model Intercomparison Project (PlioMIP2) simulations using the Model for Interdisciplinary Research on Climate (MIROC4m), Climate of the Past, 16, 1523–1545, https://doi.org/10.5194/cp-16-1523-2020, 2020.

Chandan, D. and Peltier, W. R.: Regional and global climate for the mid-Pliocene using the University of Toronto version of CCSM4 and PlioMIP2 boundary conditions, Climate of the Past, 13, 919–942, https://doi.org/10.5194/cp-13-919-2017, 2017.

Hunter, S. J., Haywood, A. M., Dolan, A. M., and Tindall, J. C.: The HadCM3 contribution to PlioMIP phase 2, Climate of the Past, 15, 1691–1713, https://doi.org/10.5194/cp-15-1691-2019, 2019.

Kamae, Y., Yoshida, K., and Ueda, H.: Sensitivity of Pliocene climate simulations in MRI-CGCM2. 3 to respective boundary conditions, Climate of the Past, 12, 1619–1634, https://doi.org/10.5194/cp-12-1619-2016, 2016.

Li, X., Guo, C., Zhang, Z., Otterå, O. H., and Zhang, R.: PlioMIP2 simulations with NorESM-L and NorESM1-F, Climate of the Past, 16, 183–197, https://doi.org/10.5194/cp-16-183-2020, 2020.

Stepanek, C., Samakinwa, E., Knorr, G., and Lohmann, G.: Contribution of the coupled atmosphere–ocean–sea ice–vegetation model COSMOS to the PlioMIP2, Climate of the Past, 16, 2275–2323, https://doi.org/10.5194/cp-16-2275-2020, 2020.

Tan, N., Contoux, C., Ramstein, G., Sun, Y., Dumas, C., Sepulchre, P., and Guo, Z.: Modeling a modern-like p CO 2 warm period (Marine Isotope Stage KM5c) with two versions of an Institut Pierre Simon Laplace atmosphere–ocean coupled general circulation model, Climate of the Past, 16, 1–16, https://doi.org/10.5194/cp-16-1-2020, 2020.

Williams, C. J., Sellar, A. A., Ren, X., Haywood, A. M., Hopcroft, P., Hunter, S. J., Roberts, W. H., Smith, R. S., Stone, E. J., Tindall, J. C., et al.: Simulation of the mid-Pliocene Warm Period using HadGEM3: experimental design and results from model–model and model–data comparison, Climate of the Past, 17, 2139–2163, https://doi.org/10.5194/cp-17-2139-2021, 2021.

Zhang, Q., Berntell, E., Axelsson, J., Chen, J., Han, Z., De Nooijer, W., Lu, Z., Li, Q., Zhang, Q., Wyser, K., et al.: Simulating the mid-Holocene, last interglacial and mid-Pliocene climate with EC-Earth3-LR, Geoscientific Model Development, 14, 1147–1169, https://doi.org/10.5194/gmd-14-1147-2021, 2021.