Supplementary material to Mas e Braga et al. 'Antarctic ice stream thickening under Pliocene warmth'

Modern subglacial topography experiments

Experiment	**Ocean param.**	$\mathbf{T}_{\mathrm{ocean}}$ **(° C)**	**Sea-level (m)**
ocn0p05_sl10p4	F	0.05	10.4
ocn0p05_sl12p7	F	0.05	12.7
ocn0p05_sl25	F	0.05	25
ocn1p6_sl10p4	F	1.6	10.4
ocn1p6_sl12p7	F	1.6	12.7
ocn1p6_sl25	F	1.6	25
ocn2p0_sl10p4	F	2.0	10.4
ocn2p0_sl12p7	F	2.0	12.7
ocn2p0_sl25	F	2.0	25
pico_m1p0_sl10p4	PICO	-1.0	10.4
pico_m1p0_sl12p7	PICO	-1.0	12.7
pico_m1p0_sl25	PICO	-1.0	25
pico_m1p2_sl10p4	PICO	-1.2	10.4
pico_m1p2_sl12p7	PICO	-1.2	12.7
pico_m1p2_sl25	PICO	-1.2	25
pico_m1p4_sl10p4	PICO	-1.4	10.4
pico_m1p4_sl12p7	PICO	-1.4	12.7
pico_m1p4_sl25	PICO	-1.4	25
pico_m1p6_sl10p4	PICO	-1.6	10.4
pico_m1p6_sl12p7	PICO	-1.6	12.7
pico_m1p6_sl25	PICO	-1.6	25

Supplementary Table 1: Summary of buttressing-sensitivity experiments, detailing their ice-shelf basal melt parameterisation (F for Favier et al., 2019, or PICO for Reese et al., 2018), applied ocean temperature, and sea-level rise.

Topographically constrained EAIS ice streams

Glacier (region)	Elevation change	Basin mass change	Precipitation change
Byrd (Ross ice shelf)	Increasing	Insignificant	No
David (Victoria Land)	None	Insignificant	No
Denman (Wilkes Land)	Decreasing	Losing	Increasing
Dibble (Wilkes Land)	Decreasing	Insignificant	Increasing
Mellor (Amery ice shelf)	Increasing	Insignificant	Increasing
Mertz (George V Coast)	Decreasing	Insignificant	Increasing
Ninnis (Wilkes Land)	Decreasing	Insignificant	Increasing
Rayner (Enderby Land)	Increasing	Gaining	Increasing
Robert (Kemp Land)	Increasing	Gaining	Increasing
Shirase (Enderby Land)	Decreasing	Gaining	Increasing
Slessor (Filchner ice shelf)	Increasing	Insignificant	Increasing

Supplementary Table 2: EAIS ice streams under a similar topographical setting than Jutulstraumen, along with observed changes in their surface elevation at the flux gate (Shepherd et al., 2018), in their basin's mass (Velicogna et al., 2020), and projected precipitation over them until 2100 (Tewari et al., 2022).

Pliocene modelling experiments

Experiment	Climate model	T_{ocean}	Rheology	Basal sliding	Bed topography	Initial topography
HadCM3	HadCM3	1.6	Inverted	Inverted	median	BedMachine-Antarctica
COSMOS	COSMOS	1.2	Inverted	Inverted	median	BedMachine-Antarctica
MIROC	MIROC4m	1	Inverted	Inverted	median	BedMachine-Antarctica
IPSL	IPSLCM5A	-0.6	Inverted	Inverted	median	BedMachine-Antarctica
MRI	MRI-CGCM2.3	0	Inverted	Inverted	median	BedMachine-Antarctica
HadCM3_AC	HadCM3	1.6	uniform $A(T = -10°C)$	Inverted	median	BedMachine-Antarctica
HadCM3_CC	HadCM3	1.6	Inverted	uniform $B(u_b = 10\ \mathrm{ma}^{-1})$	median	BedMachine-Antarctica
HadCM3_JV	HadCM3	1.6	Inverted	Inverted	median	BedMachine-Antarctica
HadCM3_P4	HadCM3	1.6	Inverted	Inverted	median	PRISM4
HadCM3_Paxmin	HadCM3	1.6	Inverted	Inverted	minimum	BedMachine-Antarctica
HadCM3_Paxmax	HadCM3	1.6	Inverted	Inverted	maximum	BedMachine-Antarctica

Supplementary Table 3: Summary of Pliocene modelling experiments, their forcing climate model, respective applied ocean temperatures, choice of ice rheology, basal sliding, bed topography, and initial topography. "Inverted" stands for those that use the inversion procedure described in Methods. "median", "minimum" and "maximum" refer to the respective paleotopographic reconstructions (Paxman et al., 2019)

References

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