Table S1. Resulting ice volume variability in the equilibrium cycle of the 40-kyr transient simulation, for the experiments testing the glacial index method compared to the matrix interpolation method to obtain the climate forcing for the ice-sheet model.

	Precipitation via glacial index method	**Precipitation via matrix method**
Temperature via glacial index method	*Case FEEDB* 34.1 m.s.l.e.	*Case FEEDB onlyT* 36.1 m.s.l.e.
Temperature via matrix method	*Case FEEDB onlyP* 19.3 m.s.l.e.	*Case REF* 27.1 m.s.l.e.

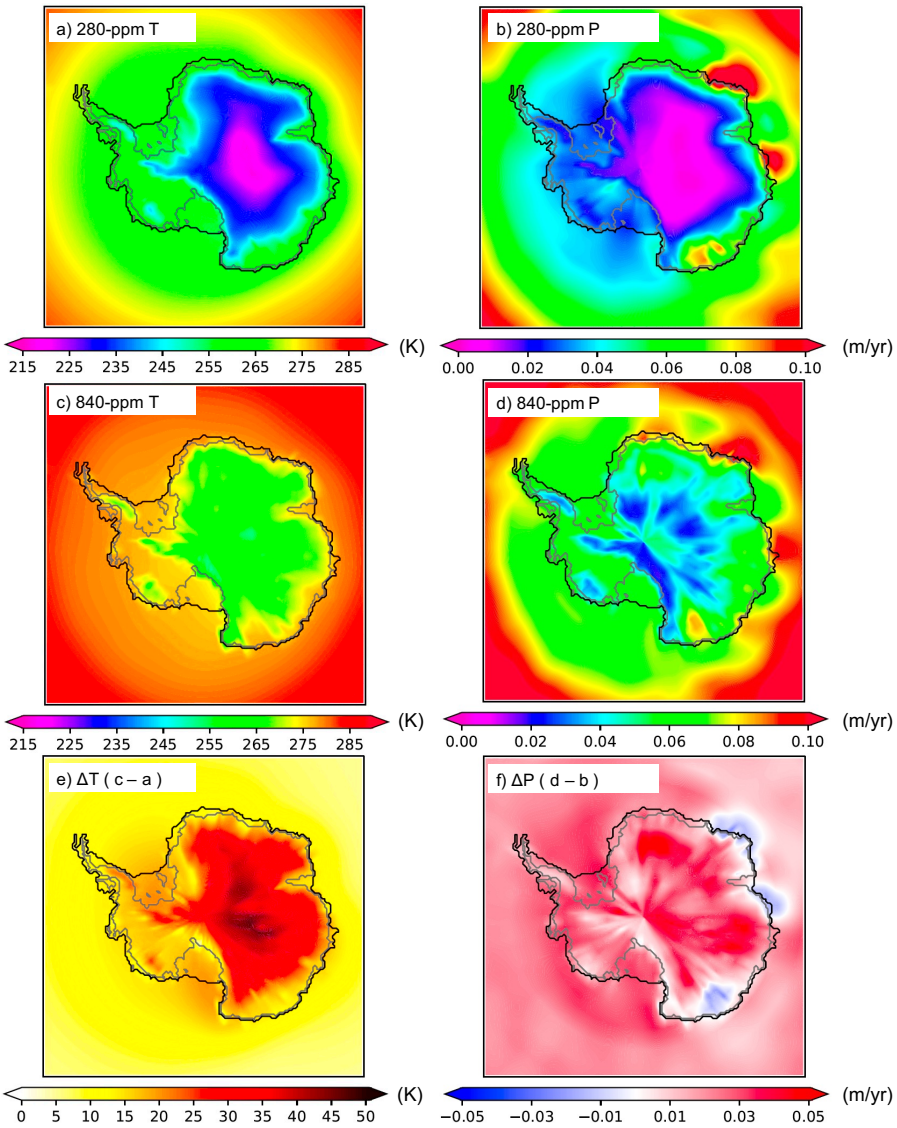

Figure S1. (**a**) Annual average GENESIS 2-m air temperature and (**b**) precipitation, regridded to the 40x40-km ice-sheet-model grid at 280 ppm CO_2 (cold; 1fumebi). (**c**) and (**d**) Same at 840 ppm CO_2 (warm; 3nomebi). (**e**) Difference between the warm and cold temperatures and (**f**) precipitation (warm-cold).

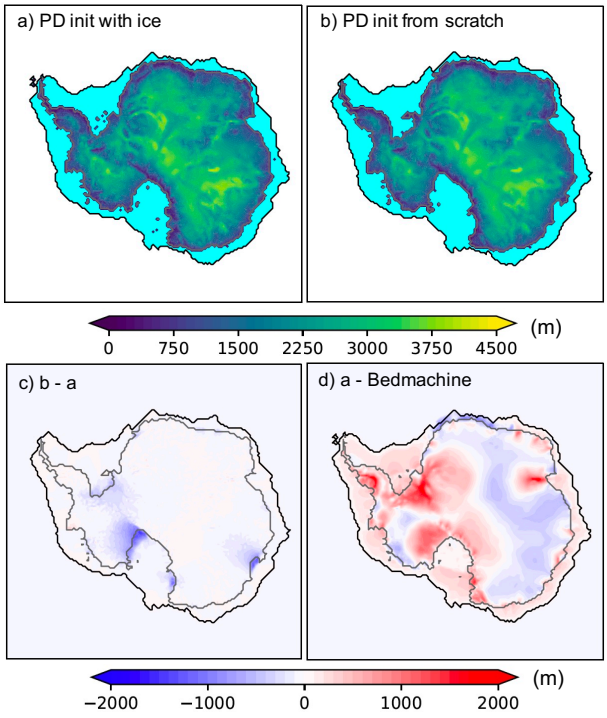

Figure S2. (**a**) Simulated equilibrated ice thickness using present-day (PD) forcing starting from Bedmachine PD ice and topography and (**b**) without ice and an isostatically rebounded topography. Light blue areas indicate ice shelves, the grey line the grounding line, and the black line the continental edge. (**c**) Difference in ice thickness between (**b**) and (**a**) (grounding line and continental edge as in (**b**)), and (**d**) between (**a**) and Bedmachine data regridded to our 40x40-km model grid (grounding line and continental edge as in (**a**)).

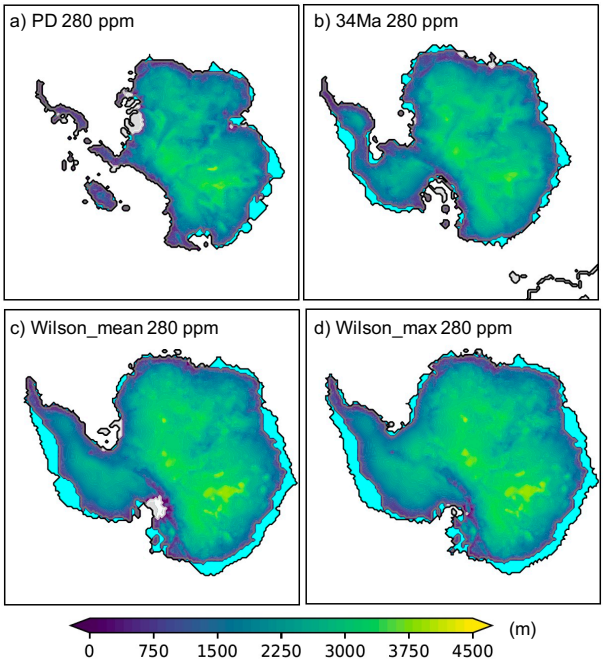

Figure S3. (**a**) Simulated equilibrated ice thickness from experiment TOPO PD, (**b**) TOPO 34Ma, (**c**) TOPO Wilson_mean, and (**d**) TOPO Wilson_max, with 280-ppm CO_2 forcing.

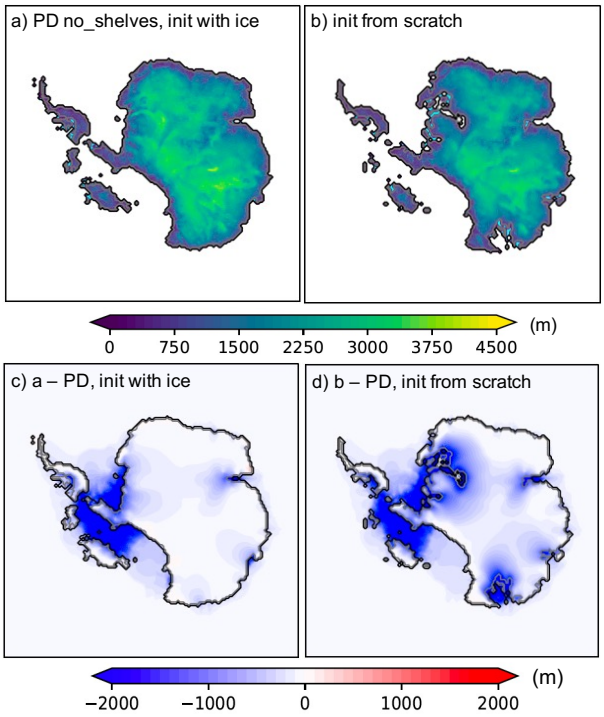

Figure S4. (**a**) Simulated equilibrated ice thickness using present-day (PD) forcing starting from Bedmachine PD ice and topography and (**b**) without ice and an isostatically rebounded topography, applying a constant basal melt rate of 400 m/yr. (**c**) Difference in ice thickness between (**a**) and the reference PD simulation (grounding line and continental edge as in (**a**)), and (**d**) between (**b**) and the reference PD simulation started without ice and an isostatically rebounded topography (grounding line and continental edge as in (**b**).