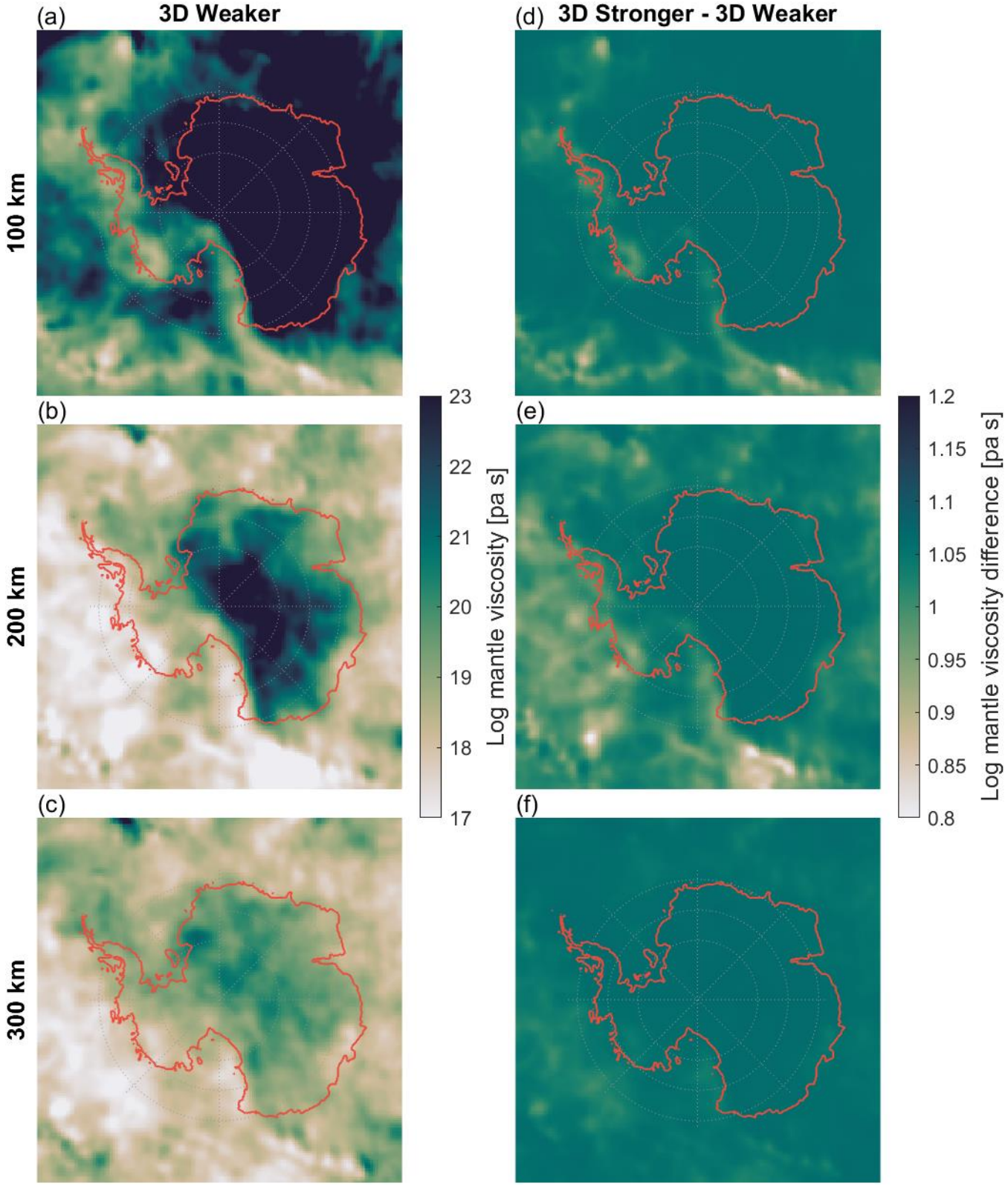
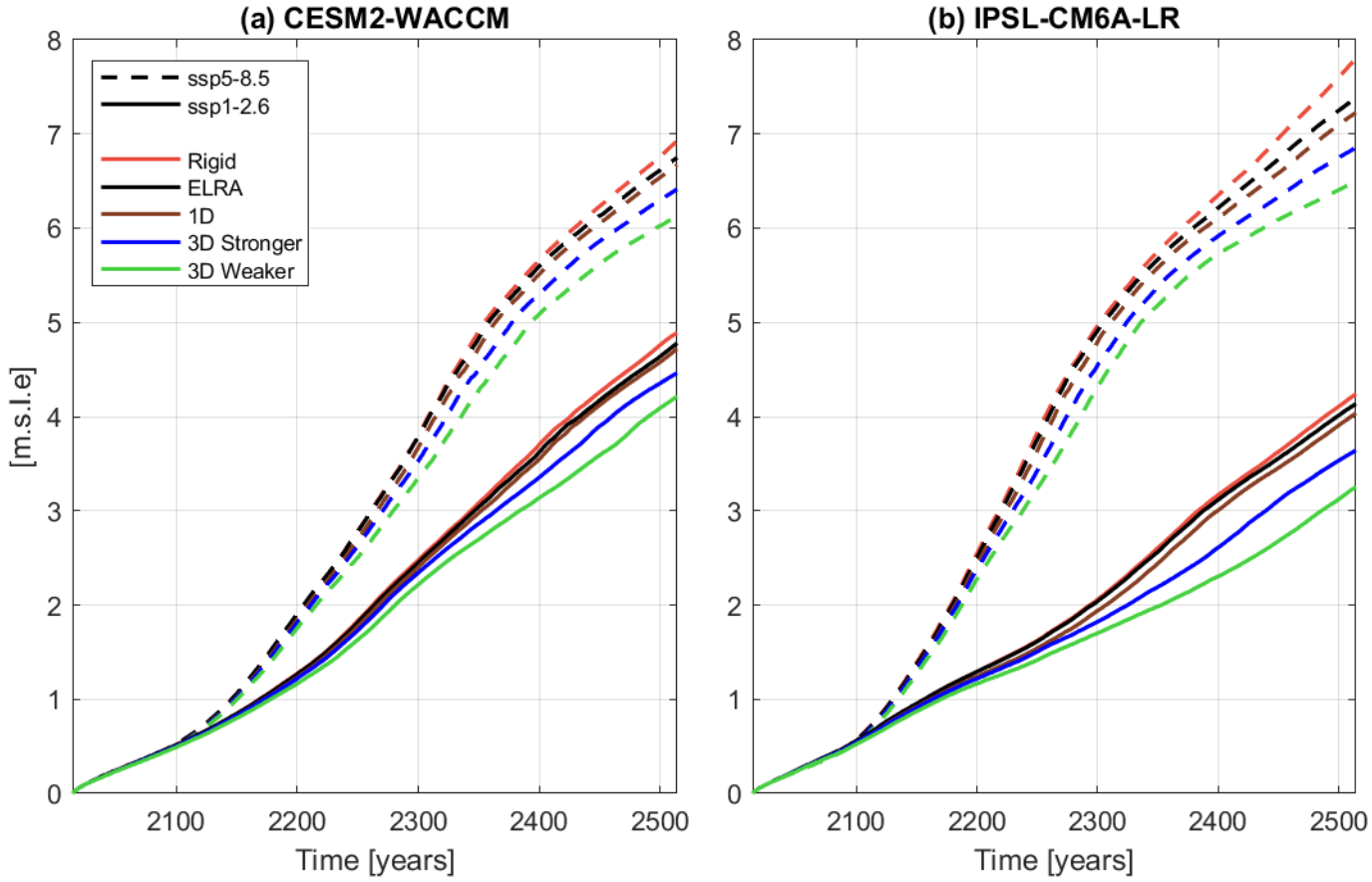
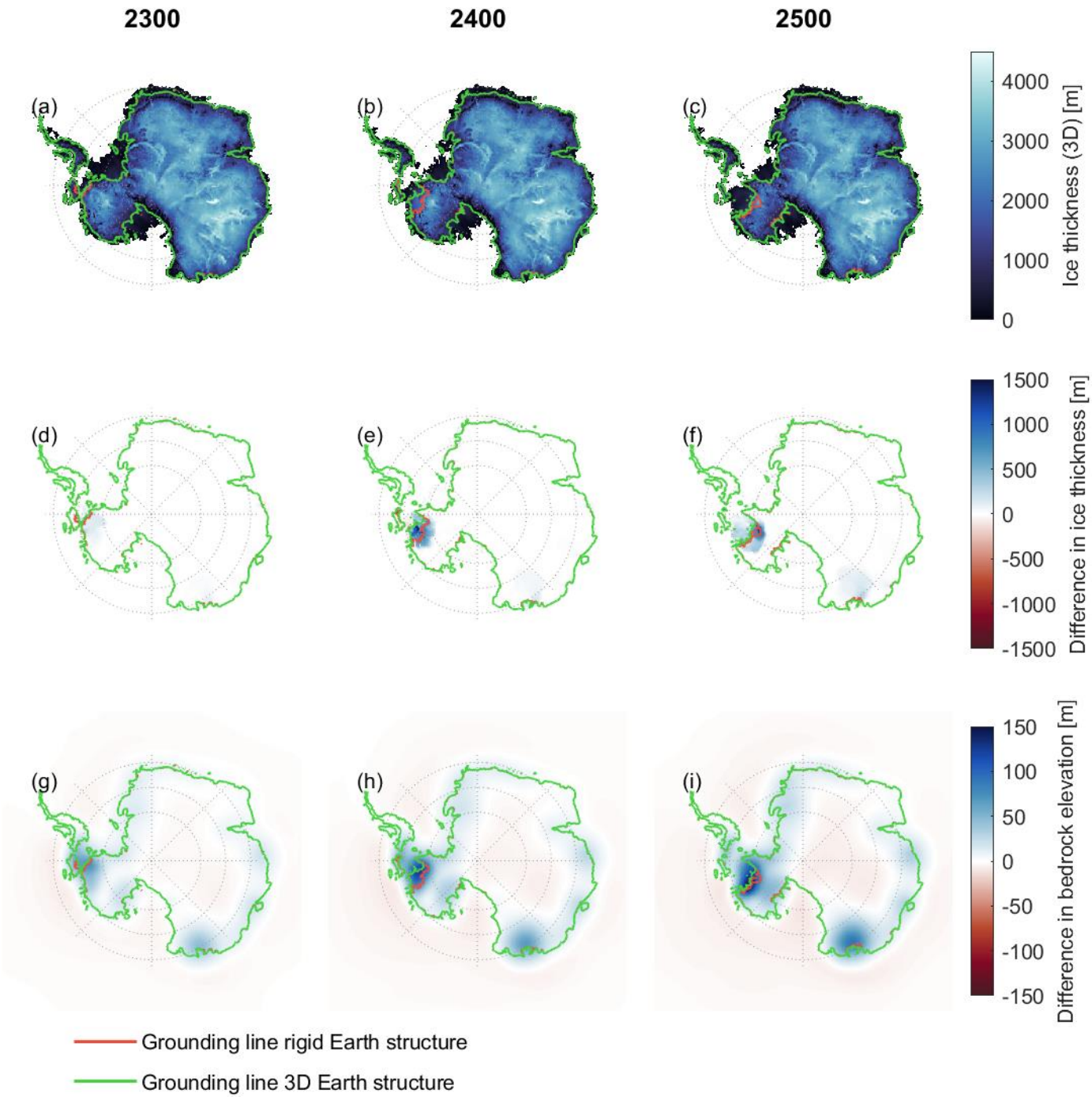
Extended data figures and tables



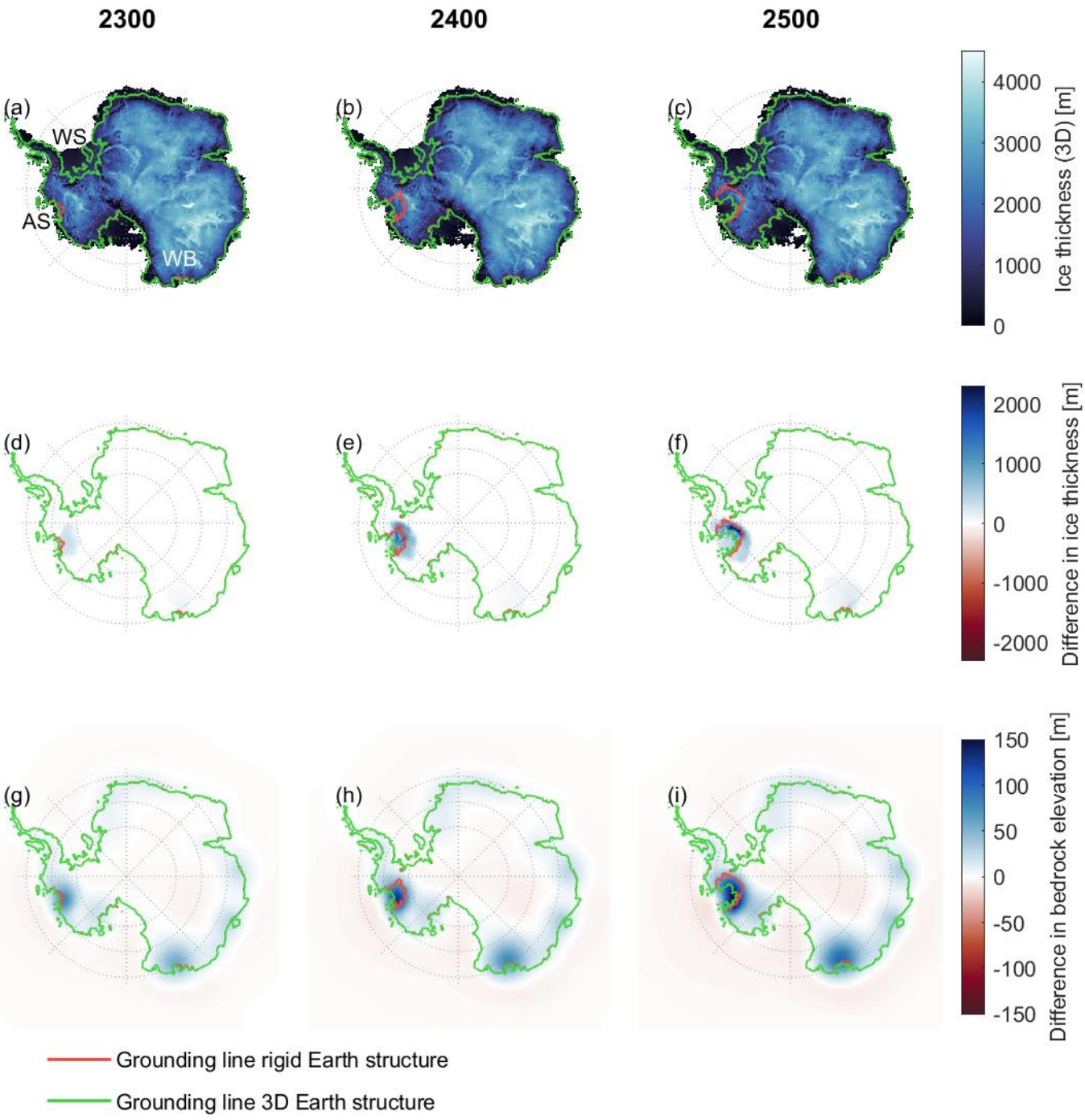
Extended Data Fig. 1: **Viscosity at the depth of 100, 200 and 300 km of the 3D weaker rheology (panels a-c) and the difference in viscosity between the 3D stronger and the 3D weaker rheologies (panels d-f).**



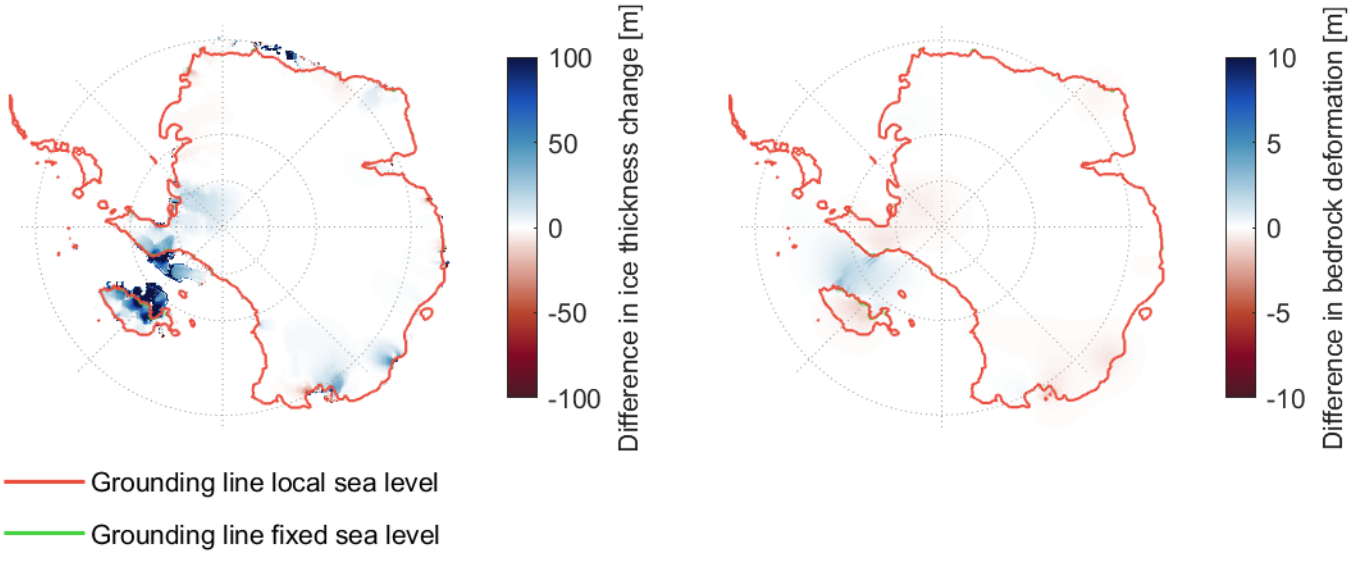
Extended data Fig. 2: Barystatic sea level contribution under two different scenarios, two different global climate models and 5 different Earth structures (Methods).



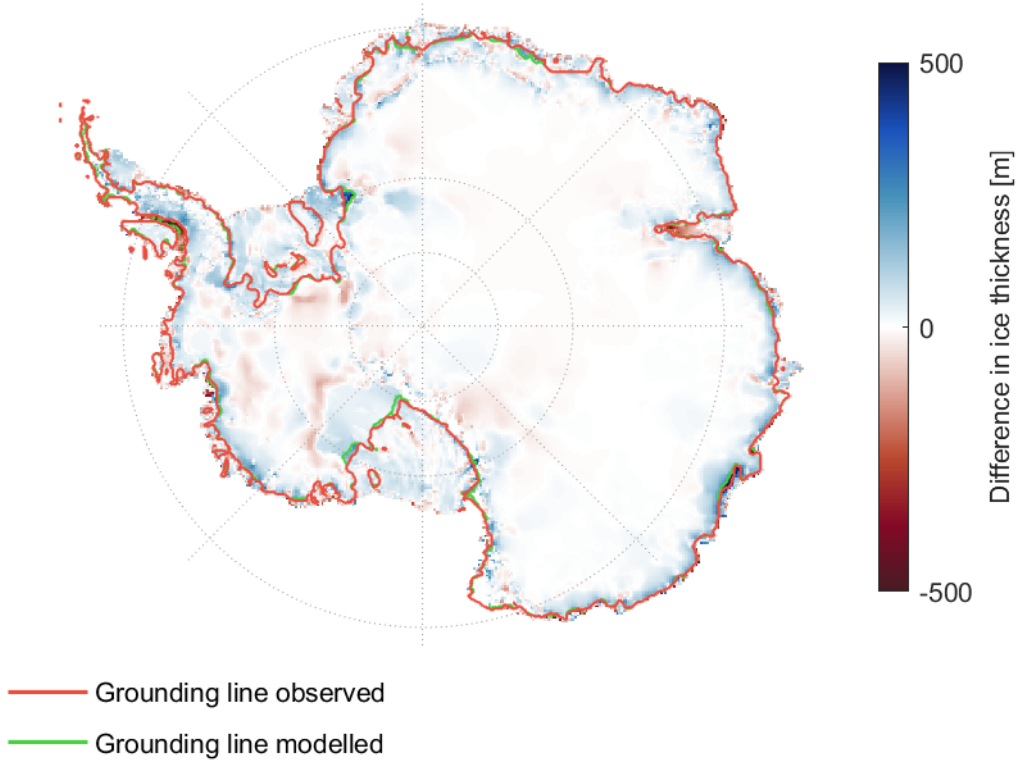
Extended data Fig. 3: The ice thickness of the West Antarctic ice sheet at 2300 , 2400 and 2500 using the 3D Earth structure when applying CESM2-WACCM under the low emission scenario ssp1-2.6 (panel a-c). Panel d-f show the ice thickness difference between using the 3D Earth structure and the rigid Earth structure. Panel g-i show the difference in bedrock elevation between using the 3D Earth structure and the rigid Earth structure. CESM2-WACCM corresponds to the climate model with main warming in the Weddel sea (Methods).



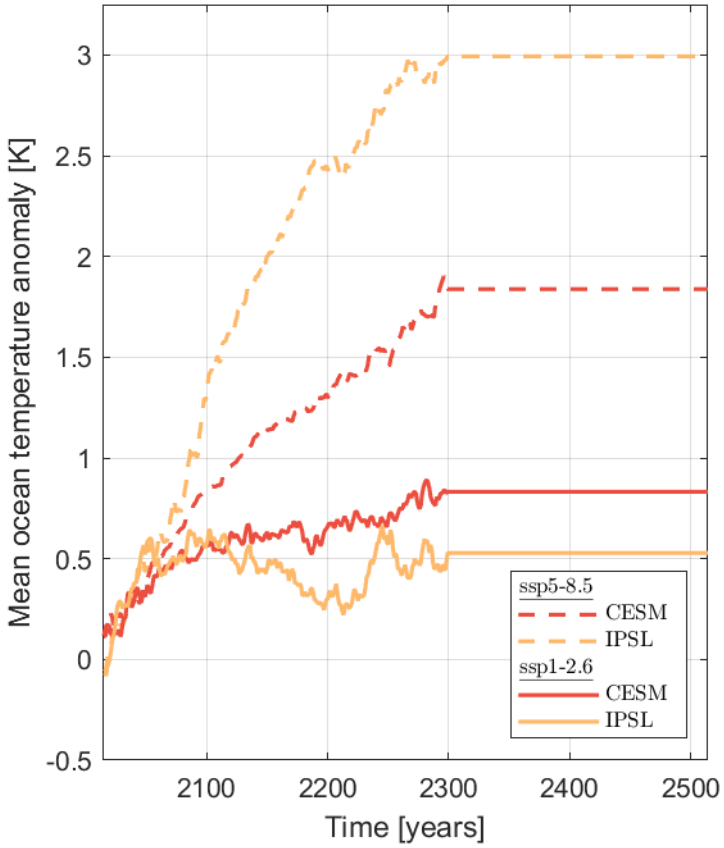
Extended data Fig. 4: The ice thickness of the West Antarctic ice sheet at 2300 , 2400 and 2500 using the 3D Earth structure when applying IPSL-CM6A-LR under the low emission scenario ssp1-2.6 (panel a-c). AS in panel a indicates the Amundsen sea, and WS indicates the Weddel sea, and WB indicates Wilkes basin. Panel d-f show the ice thickness difference between using the 3D Earth structure and the rigid Earth structure. Panel g-i show the difference in bedrock elevation between using the 3D Earth structure and the rigid Earth structure. IPSL-CM6A-LR corresponds to the climate model with main warming in the Amundsen sea (Methods).



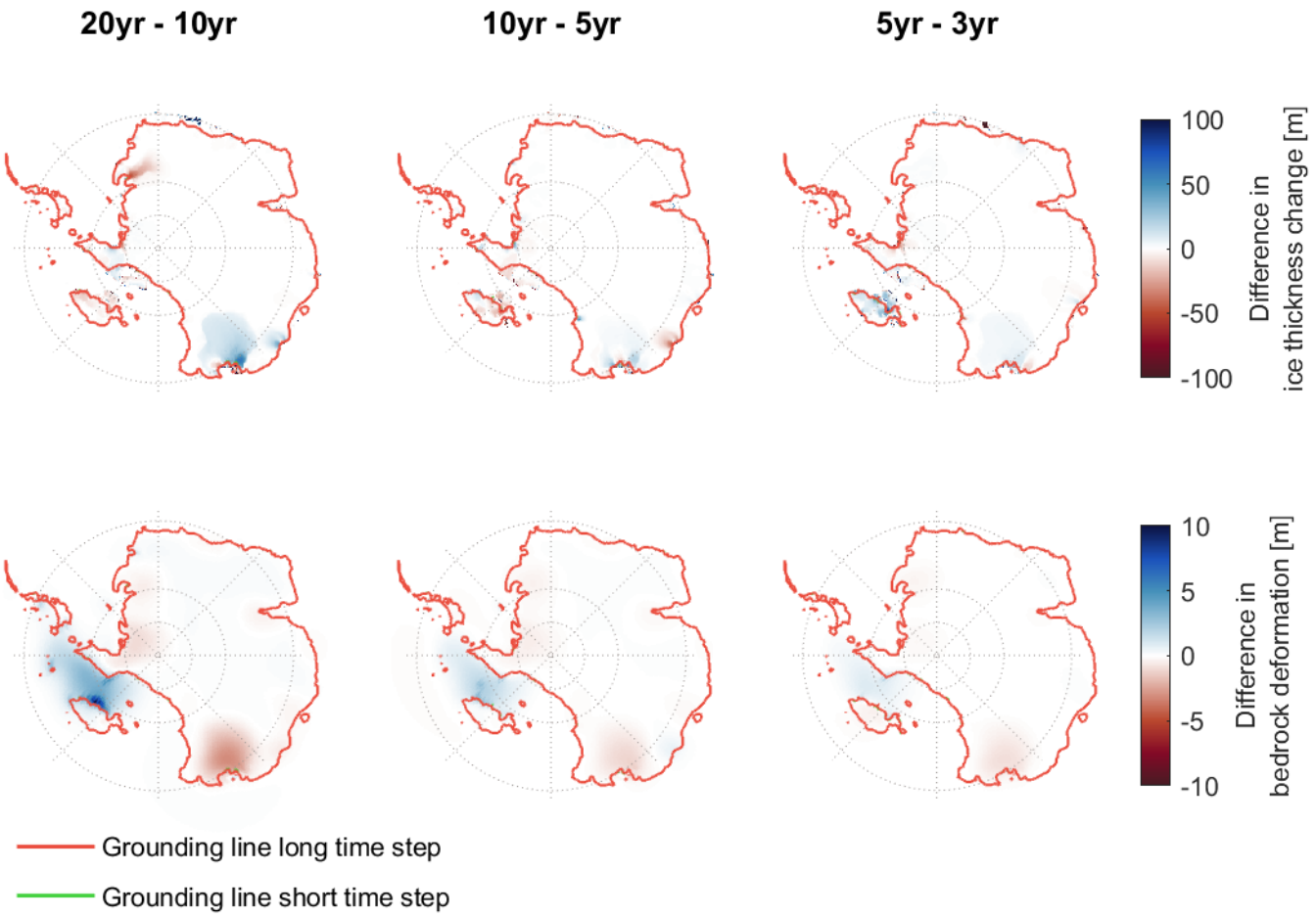
Extended Data Fig. 5: The left panel shows the difference in bedrock deformation when geoid is included vs when geoid is excluded. The right panel shows the difference in ice thickness change.



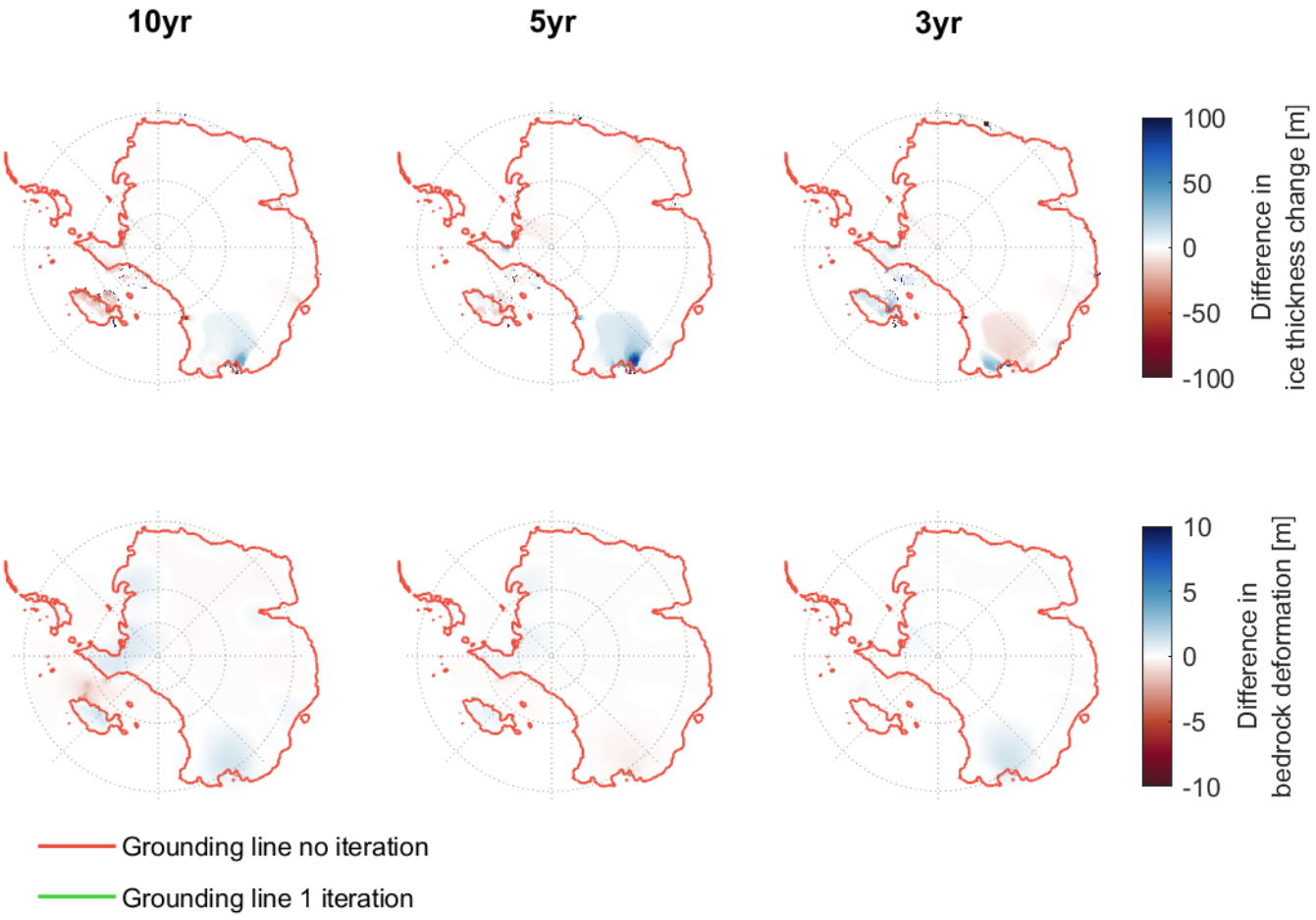
Extended Data Fig. 6: Ice thickness at the end of the inversion minus observed ice thickness (Bedmachine version 3).



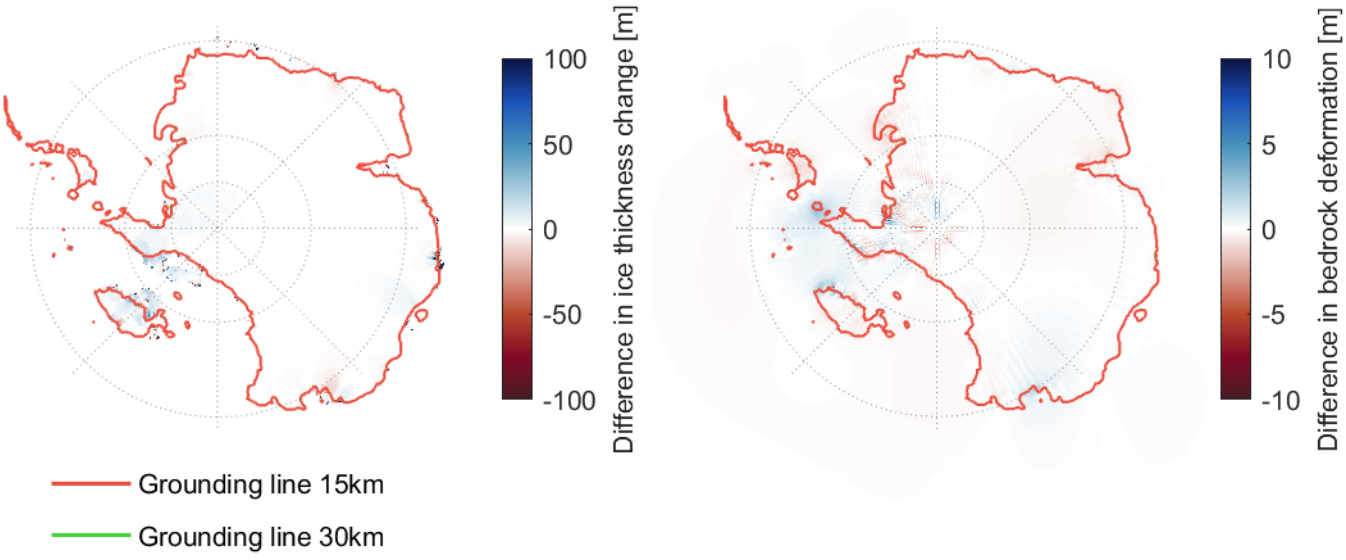
Extended Data Fig. 7: The mean ocean temperature anomaly over the present day ice shelf area between 2014 and 2514. The anomalies are taken from Coulon et al.[9], whom used ocean temperature anomalies from the global climate models CESM2-WACCM (indicated by CESM) and IPSL-CM6A-LR (indicated by IPSL) for two different IPCC scenario's: SSP5-8.5 and SSP1-2.6. The anomalies are averaged over the present day ice shelf area for each time step.



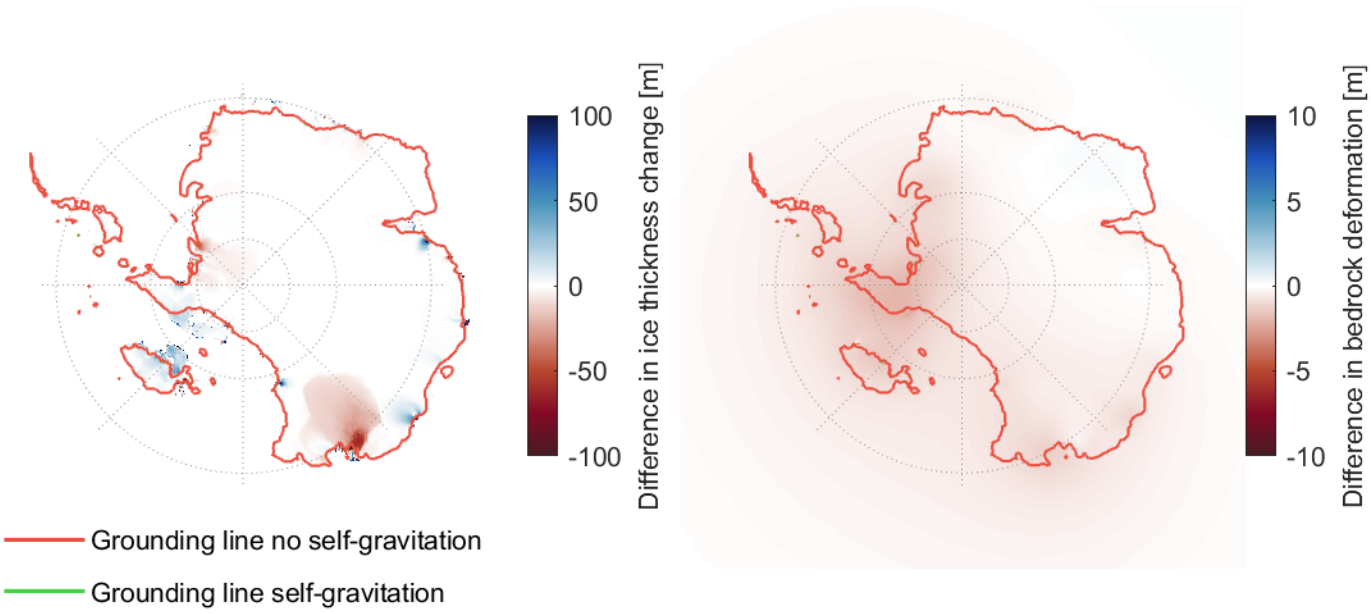
Extended data Fig. 8: Difference in ice thickness (panels a-c) and bedrock deformation (panels d-f) between different coupling time steps. Note that the red line is overlapping the green line.



Extended Data Fig. 9: Difference in ice thickness and bedrock deformation between applying 1 iteration and applying no iterations for each coupling time step. Note that the red line is overlapping the green line.



Extended Data Fig. 10: The left panel shows the difference in ice thickness change between using a 30 km resolution of the GIA model and 15 km resolution. The right panel shows the difference in bedrock deformation. Note that the red line is overlapping the green line.



Extended Data Fig. 11: The left panel shows the difference in ice thickness change when self-gravity is included vs when self-gravity is excluded. The right panel shows the difference in bedrock deformation. Note that the red line is overlapping the green line.

Extended Data Table 1: Maximum reduction in sea level rise of the 3D Earth structures compared to rigid Earth. The climate model IPSL-CM6A-LR is referred to as IPSL and the climate model CESM2-WACCM is referred to as CESM.

Climate model	Emission scenario [SSP]	Reduction of 3D weaker [%]	Reduction of 3D stronger [%]
CESM	**5-8.5**	12	7
CESM	**1-2.6**	16	9
IPSL	**5-8.5**	17	12
IPSL	**1-2.6**	23	14

Extended Data Table 2: Maximum delay in grounding line retreat in years.

	IPSL-CM6A-LR	CESM2-WACCM
3D Weaker	130	70
3D Stronger	80	50

Extended Data Table 3: Maximum reduction in sea level rise of the climate models IPSL-CM6A-LR compared to CESM2-WACCM.

Emission scenario [SSP]	Reduction of rigid Earth [%]	Reduction of 3D weaker [%]	Reduction of 3D stronger [%]
5-8.5	26	22	23
1-2.6	16	31	25

Extended Data Table 4: Maximum reduction in sea level rise of the low emission scenario compared to the high emission scenario. The climate model IPSL-CM6A-LR is referred to as IPSL and the climate model CESM2-WACCM is referred to as CESM.

Climate model	Reduction of rigid Earth [%]	Reduction of 3D weaker [%]	Reduction of 3D stronger [%]
CESM	46	36	35
IPSL	29	59	57

Extended Data Table 5: Contribution of all components to global mean sea level rise, except the component of Antarctica (IPCC AR6 chapter 9).

Contribution	SSP1.2-6		SSP5.8-5	
	2100	**2300**	**2100**	**2300**
Thermal expansion	0.14	0.19	0.3	0.92
Greenland	0.06	0.11	0.13	0.32
Glaciers	0.09	0.12	0.18	0.32
Land-water storage	0.03	0.05	0.03	0.05