Supporting Information for "Antarctic Ice Sheet elevation impacts on water isotope records during the Last Interglacial"

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Introduction This supporting information brings extended analyses to those given in the manuscript.

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Table S1. Model Simulations. Experiment name ("Experiment"), run duration ("Duration" in years), year for the orbital configuation ("Orbit" in kyears BP), and elevation change compared to EDC ("EDC Δz" in meter). All simulations were carried out using HadCM3.

Experiment	Duration (yrs)	Orbit (ka)	EDC Δz (m)
PI	700	0	0
LIG	700	128	0
DC+1km	500	128	+1000
DC+500m	500	128	+500
DC+200m	500	128	+200
DC+100m	500	128	+100
DC-100m	500	128	-100
DC-200m	500	128	-200
DC-500m	500	128	-500

Table S2. Time averaged values over the whole Antarctic. Surface air temperature ("SAT" in ° C), precipitations ("P" in mm/month) and δ^{18}O in the precipitations (in ‰) area-weighted averaged over the last 50 simulated years and the whole Antarctic associated with its standard value.

Experiment	SAT (° C)	P (mm/month)	δ^{18}O (‰)
PI	-36.8 ± 11.8	14.5 ± 15.9	-40.3 ± 12.3
LIG	-35.9 ± 11.8	15.1 ± 16.1	-39.7 ± 12.7
DC+1km	-31.41 ± 7.7	18.1 ± 15.3	-33.8 ± 10.0
DC+500m	-33.5 ± 9.7	16.7 ± 15.8	-36.8 ± 11.5
DC+200m	-34.9 ± 10.9	15.9 ± 15.9	-38.6 ± 12.2
DC+100m	-35.5 ± 11.4	15.4 ± 16.1	-39.1 ± 12.4
DC-100m	-36.4 ± 12.3	14.9 ± 16.3	-40.0 ± 12.8
DC-200m	-36.7 ± 12.6	14.7 ± 16.3	-40.4 ± 12.9
DC-500m	-38.2 ± 13.8	13.9 ± 16.5	-41.6 ± 13.3
DC-1km	-40.3 ± 15.7	12.7 ± 16.8	-42.6 ± 13.3

Table S3. Elevation relationships Area weighted averages and standard deviations of the slopes ("Slope") and correlation coefficients ("r") between the deviations of simulated surface air temperature ("SAT" in ° C /100m), precipitations ("P" in mm/month/100m) and δ^{18}O in the precipitations (in ‰/100m) compared to the Last Interglacial simulations and the elevation at each grid point, for different elevation ranges: above 3000 m a.s.l ("≥3000m"), between 2000 and 3000 m a.s.l ("2000-3000m"), between 1000 and 2000 m a.s.l ("1000-2000m") and below 1000 m a.s.l ("≤1000m"). This table Supplements Figure 2 in the manuscript.

	SAT		P		δ^{18}O	
	Slope	r	Slope	r	Slope	r
¿3000m	-0.92 ± 0.11	-1.0 ± 0.0	-0.22 ± 0.09	-0.96 ± 0.02	-0.53 ± 0.15	-0.83 ± 0.10
2000-3000m	-0.75 ± 0.19	-1.0 ± 0.0	-0.46 ± 0.32	-0.91 ± 0.22	0.70 ± 0.13	-0.94 ± 0.05
1000-2000m	-0.34 ± 0.21	-0.81 ± 0.33	-1.12 ± 1.15	-0.64 ± 0.51	-0.92 ± 0.26	-0.96 ± 0.03
¡1000m	18.65 ± 127.17	0.18 ± 0.75	25.57 ± 249.44	-0.1 ± 0.84	4.66 ± 49.99	-0.6 ± 0.59

Table S4. Changes in the regional sea ice extents Sea ice extent changes (%) when compared to the LIG experiment.The sectors are defined as follows: the Eastern sector (0–180° E), the Weddell sector (60–30° W), the Bellingshausen sector (100–75° W), the Ross sector (180–145° W) and the Pacific sector (180–75° W)

Sector	DC-1km	DC-500m	DC-200m	DC-100m	DC+100m	DC+200m	DC+500m	DC+1k
Bellingshausen	50.0	0.0	0.0	14.3	0.0	0.0	-7.1	0.0
Ross	1.6	1.6	0.0	0.0	-1.6	-1.6	-1.6	-12.5
Pacific	12.8	2.6	0.9	4.3	-1.7	-4.3	-7.7	-16.2
Weddel	-1.2	-3.7	-2.4	3.7	0.0	-2.4	-4.9	-4.9
East	6.9	2.5	0.0	0.0	-1.9	-1.9	-6.9	-10.1
All	7.6	1.1	-0.2	2.3	-1.4	-2.5	-6.0	-10.8

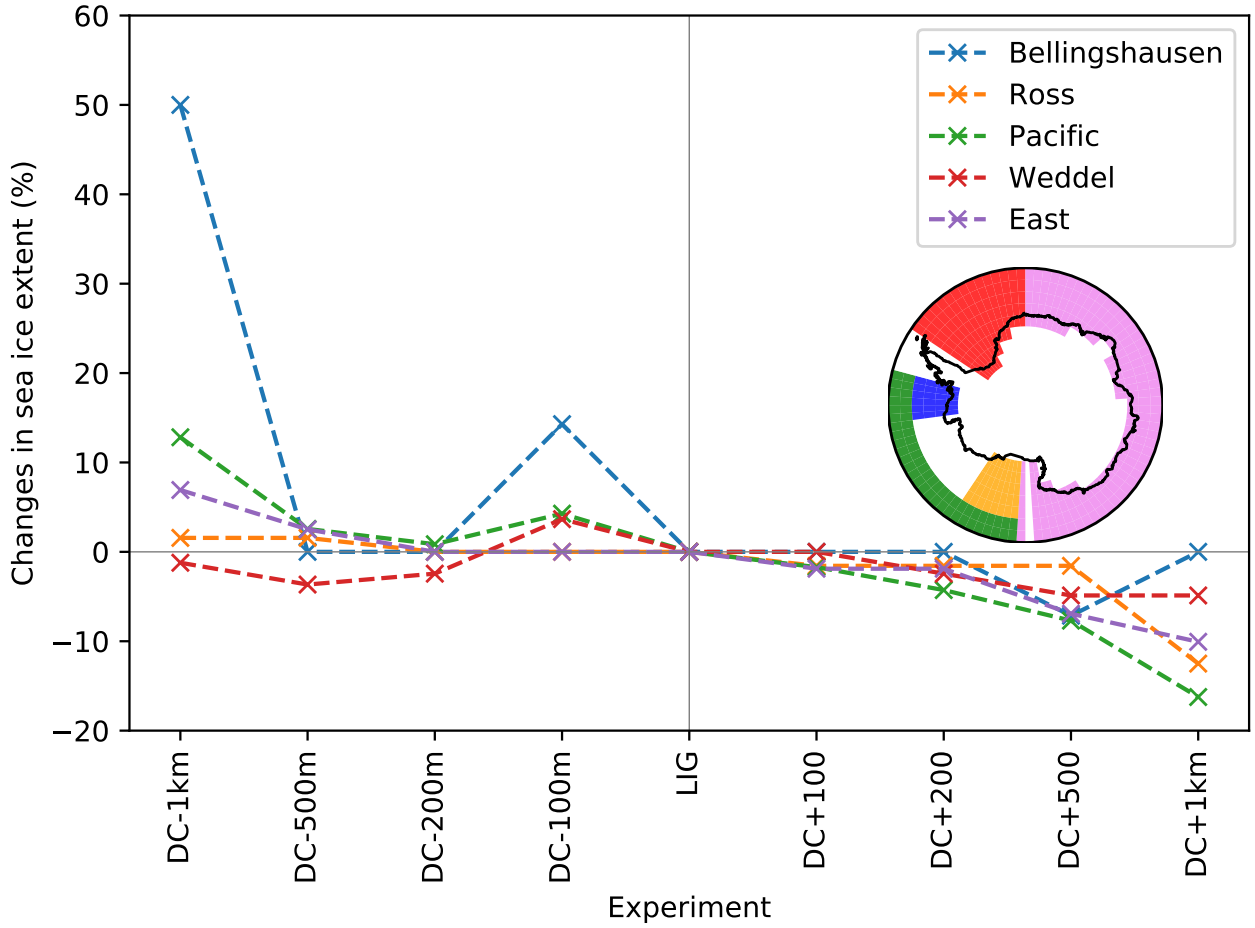

Figure S1. Changes in the regional sea ice extents Changes in sea ice extent (in %) vs changes in elevation (in m) when compared to the BP128 experiment. The sectors are defined as follows: the Eastern sector (0–180° E), the Weddell sector (60–30° W), the Bellingshausen sector (100–75° W), the Ross sector (180–145° W) and the Pacific sector (180–75° W))

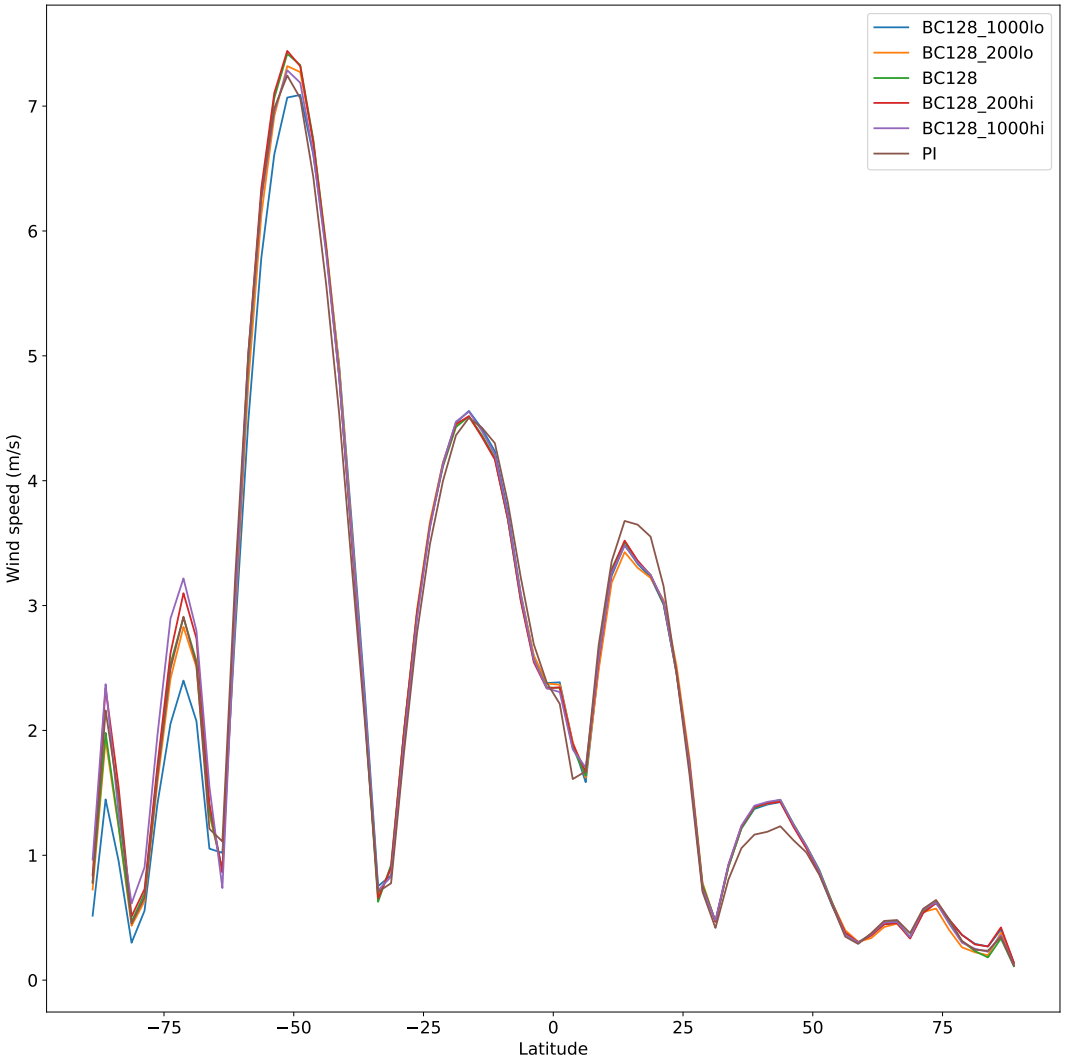

Figure S2. Surface wind speeds Surface wind speed (in m/s) vs latitudes for the Preindustrial ("PI", in brown), Last Interglacial ("BC128", in green), DC-1000 ("BC128_1000lo", in blue), DC-200 ("BC128_200lo", in orange), DC+200 ("BC128_200hi", in red), and DC+1000 ("BC128_1000hi", in purple) simulations.

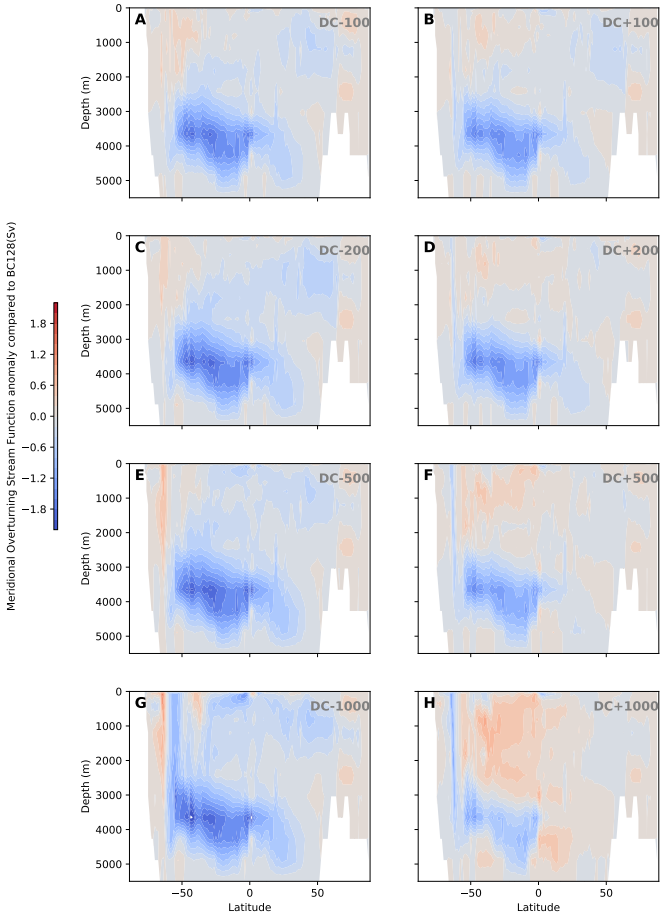

Figure S3. Meridional Overturning Circulation Meriodional Overturning Stream Function anomaly compared to the Last Interglacial (in Sv) along the sea depth (in m) and in function of the latitudes for the DC-100 (pannel A), DC+100 (pannel B), DC-200 (pannel C), DC+200 (pannel D), DC-500 (pannel E), DC+500 (pannel F), DC-1000 (pannel G) and DC+1000 (pannel H) simulations .

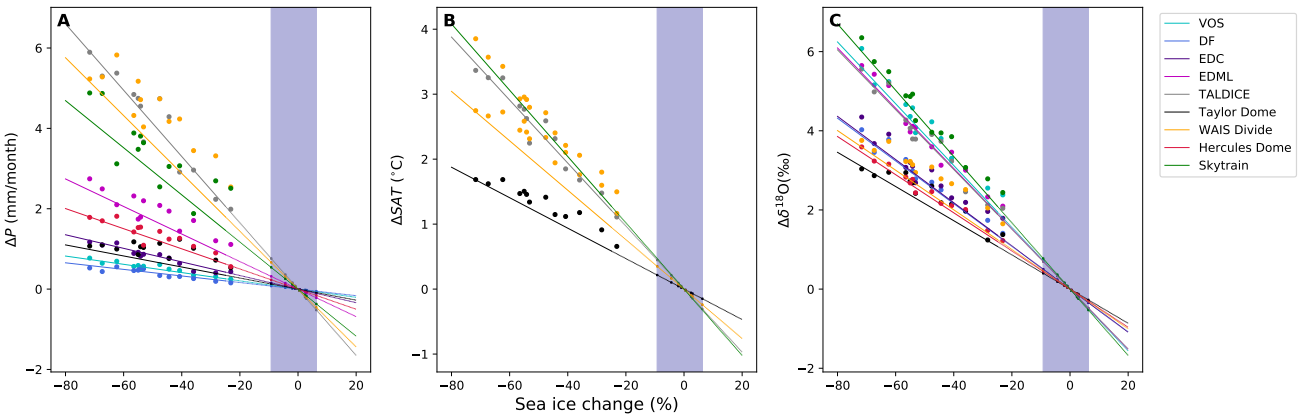

Figure S4. Sea ice corrections Deviations of simulated precipitations ("P" in mm/month, pannel A), surface air temperature ("SAT" in °, pannel B), and δ^{18}O in the precipitations (in ‰, pannel C) compared to the Last Interglacial simulations, against changes in sea ice areas (in %)compared to the Last Inglacial simulations from sea ice reduction sensitivity tests extracted from ? for each ice core location. Dots display outputs form the sea ice reduction sensitivity tests; the lines, the linear regressions for these outputs against the sea ice changes; the blue shadow, the range of our Antarctic Ice Sheet simulations; and little squares the outputs from our Antarctic Ice Sheet simulations.

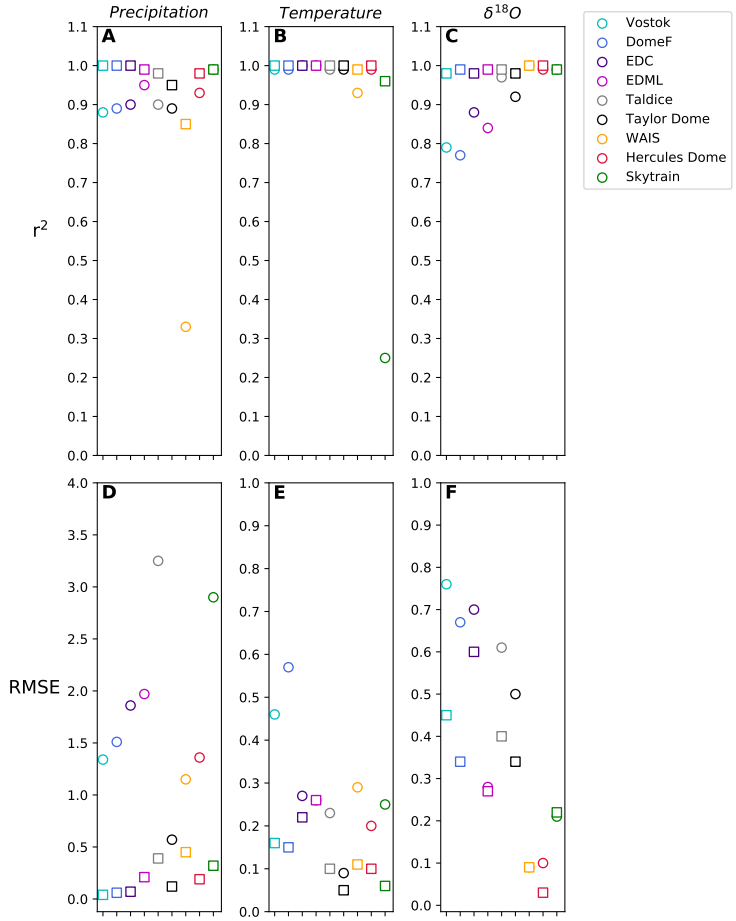

Figure S5. Robustness of ice core elevation linear regressions Correlation coefficient (r^2) (pannels A-C) and RMSE (pannels D-F) of the regressions between the changes in precipitation (pannels A and D), temperature (pannels B and E), $\delta^{18}O$ (pannels C and E) and the changes in elevation for each ice core location. circle markers correspond to linear regressions, while square markers correspond to 2-degrees polynomial regressions.