



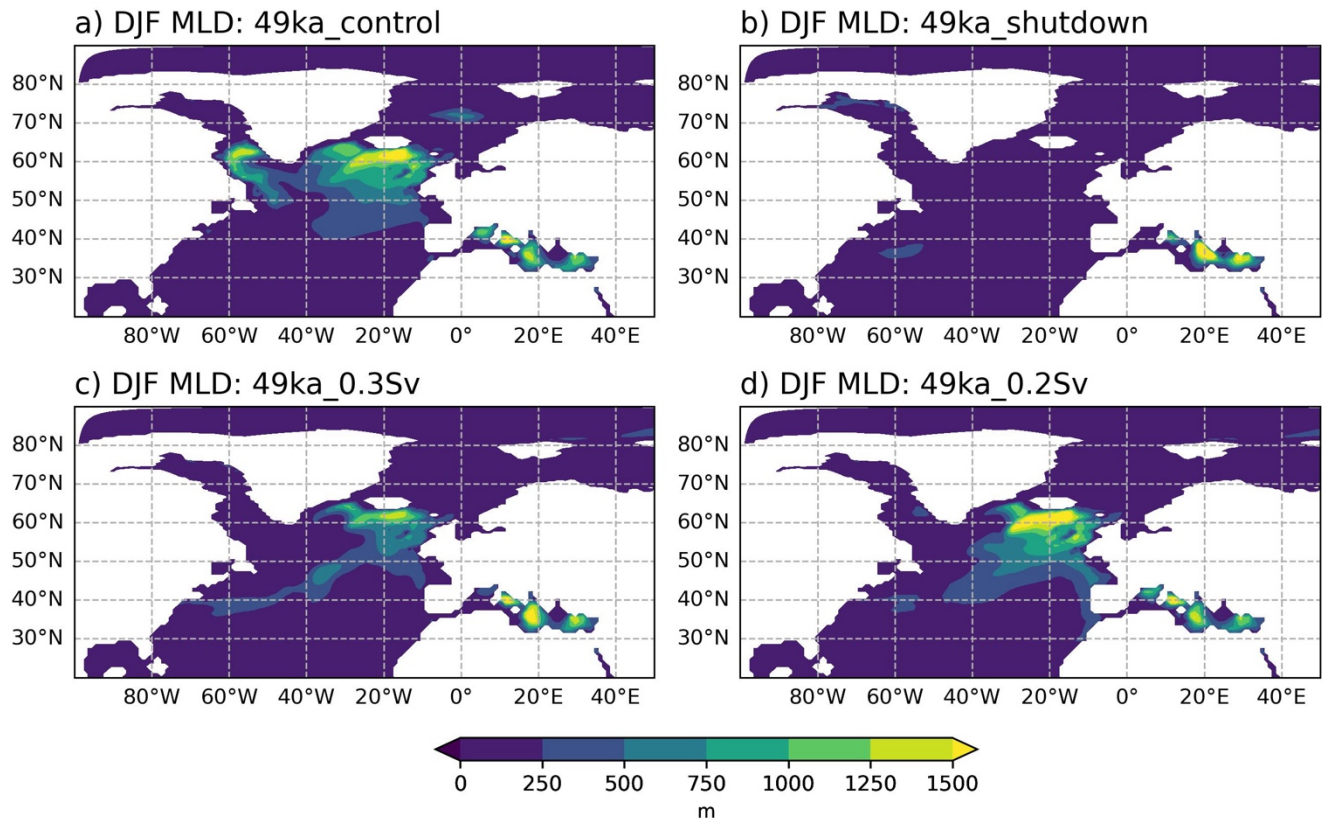
Supplement of

Non-linear climatic response to the weakening of the Atlantic Meridional Overturning Circulation during glacial times

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25 **Figure S1:** Full field mixed layer depth (MLD; in m) in the North Atlantic in DJF season for (a) 49ka_control, Heinrich stadial (b) 49ka_shutdown, and D-O stadial simulations (c) 49ka_0.3Sv, (d) 49ka_0.2Sv.

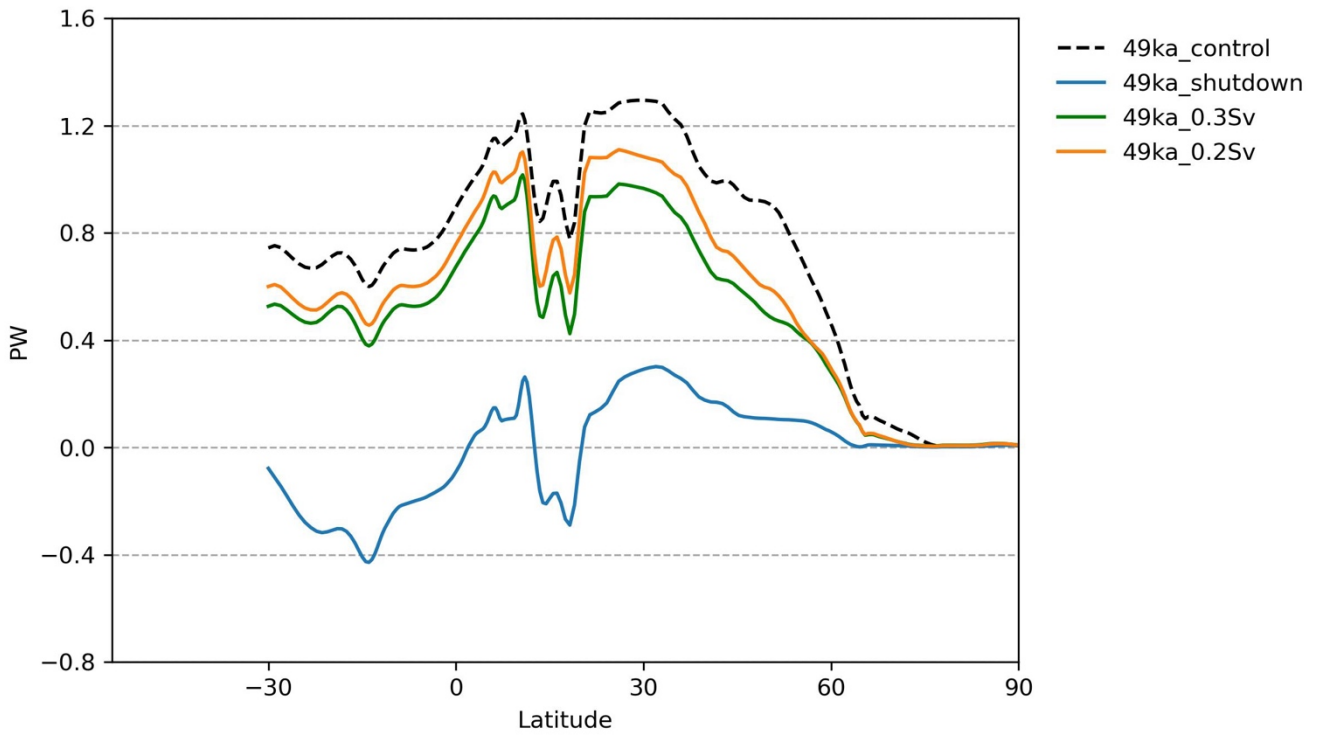
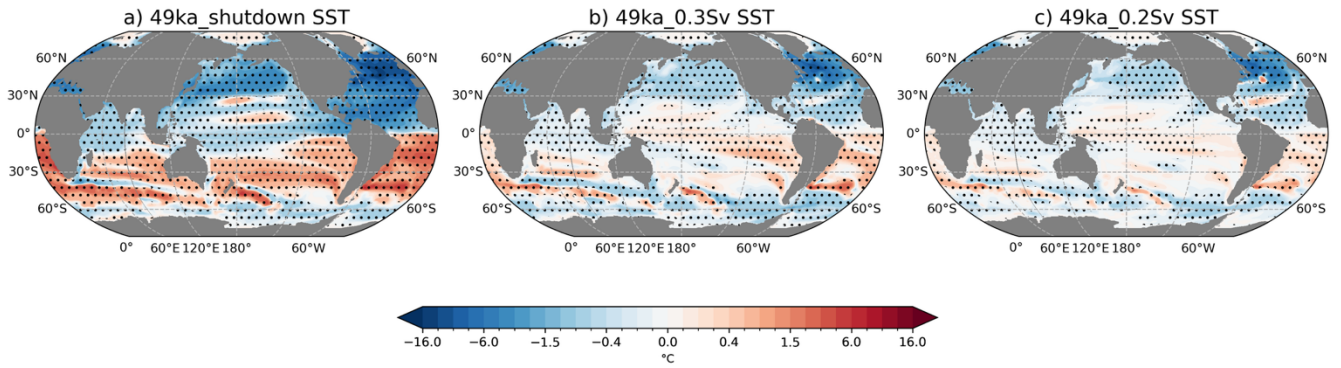


Figure S2: Northward oceanic heat transport (PW) in the Atlantic Ocean in 49ka_control, 49ka_shutdown, 49ka_0.3Sv and 49ka_0.2Sv simulations.

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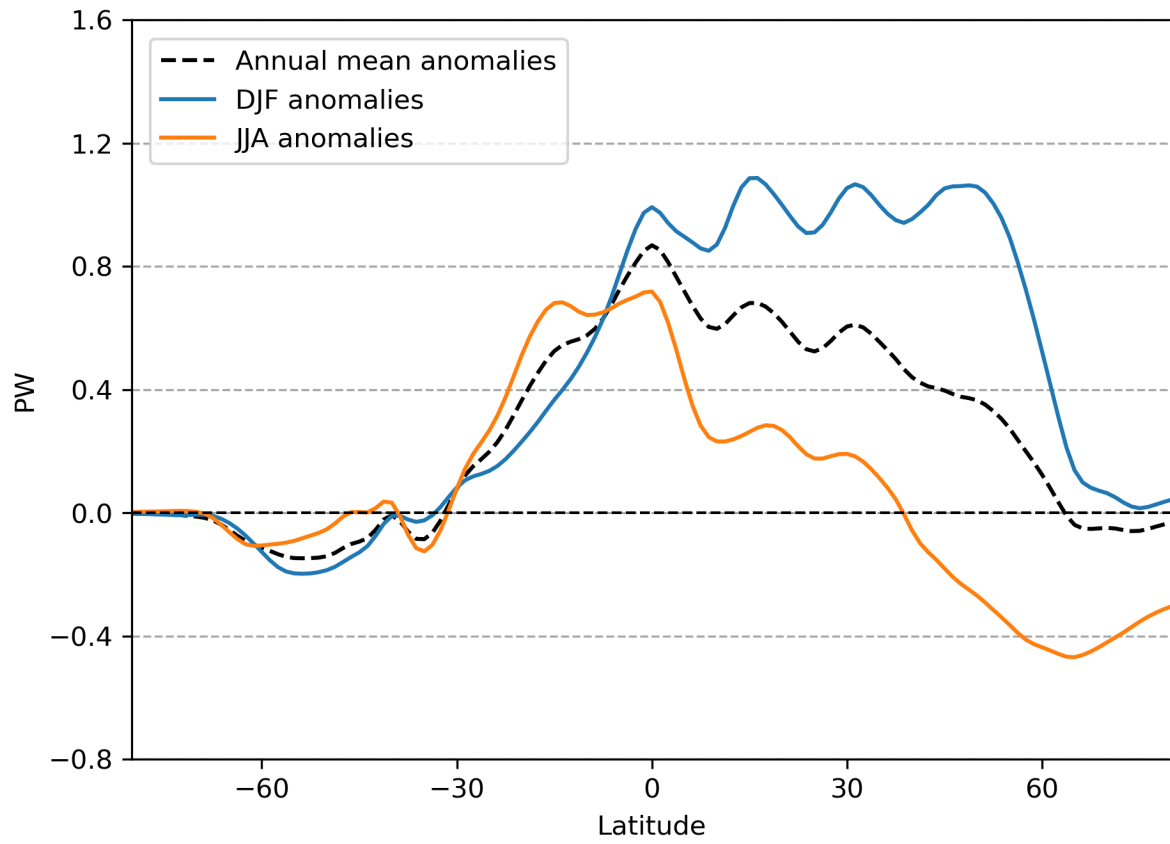


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Figure S3: Annual mean sea surface temperature anomalies (SST; °C) relative to 49ka control in each simulation. Stippling indicates statically significant differences from the control at the 95 % confidence level according to the Student's t-test.

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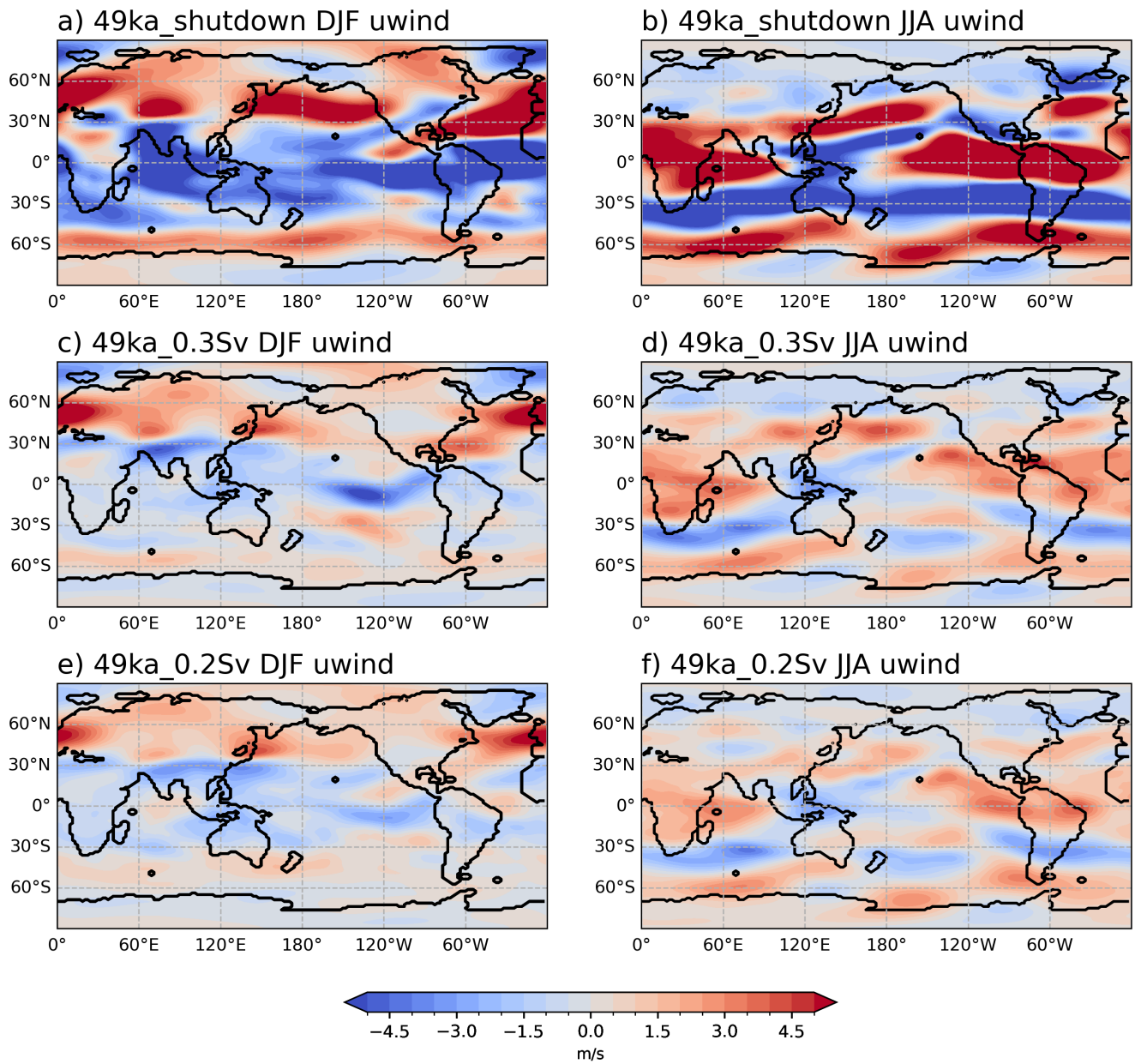
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55 **Figure S4:** 49ka_shutdown - 49ka_control anomalies for annual mean, DJF, and JJA zonally averaged northward atmospheric heat transport (PW).

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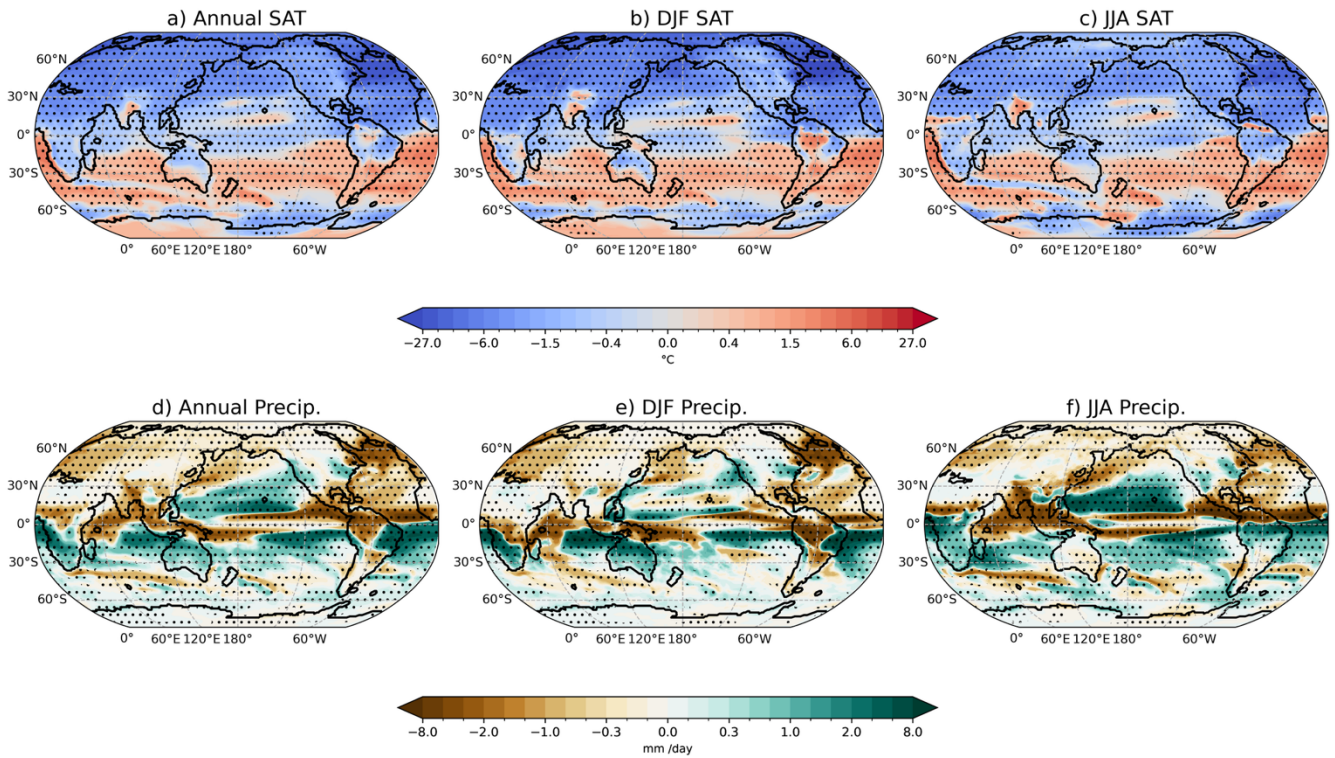
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Figure S5: DJF and JJA 200 hPa zonal wind speed anomalies (m/s) relative to 49ka_control in each simulation.

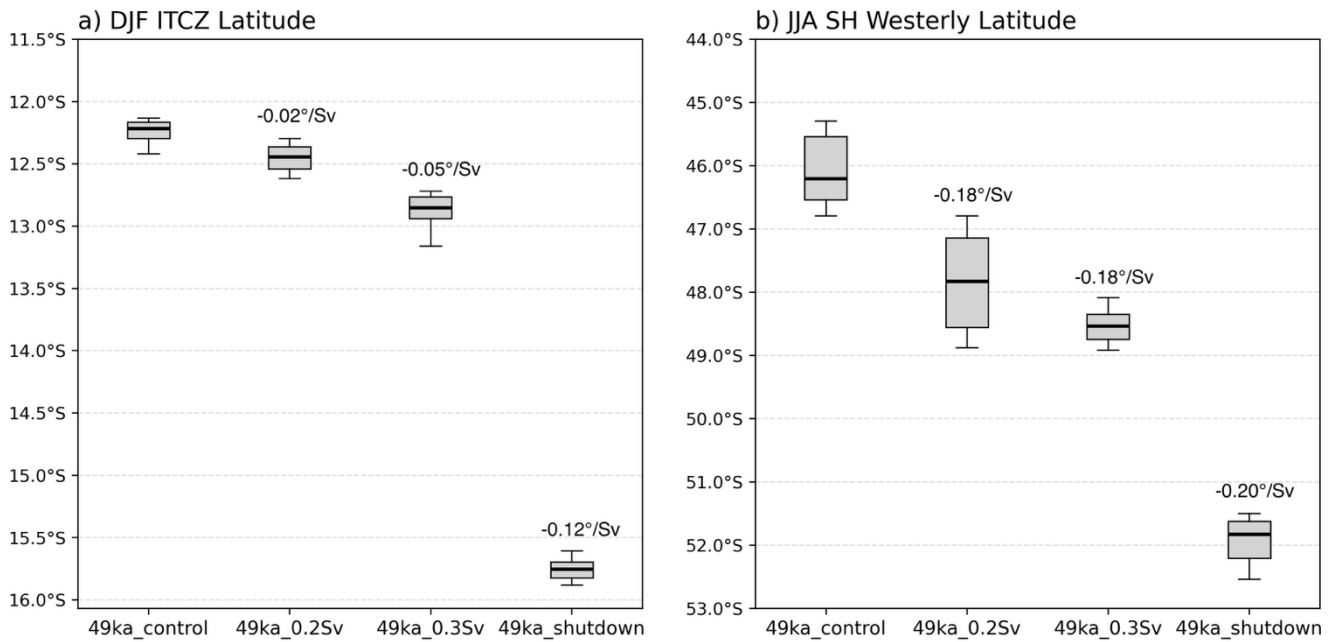
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80 **Figure S6:** 49ka_shutdown annual, DJF and JJA surface air temperature anomalies (SAT; °C), and precipitation anomalies (mm/day) relative to 49ka_control. Stippling indicates statically significant differences from the control at the 95 % level according to the Student's t-test.

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Figure S7: Box plot of 30-year mean across the last 150 years for a) DJF ITCZ latitudes, and b) JJA SH westerly wind latitude in each experiment. Within each box, the thick line inside the box represents the median value (50th percentile) of each group; the top and bottom of the box shows the 25th and 75th percentile, respectively; the whiskers show 10th to 90th percentile. Normalised changes relative to the control in ° per Sv AMOC decrease is shown on top of each AMOC weakening experiment.

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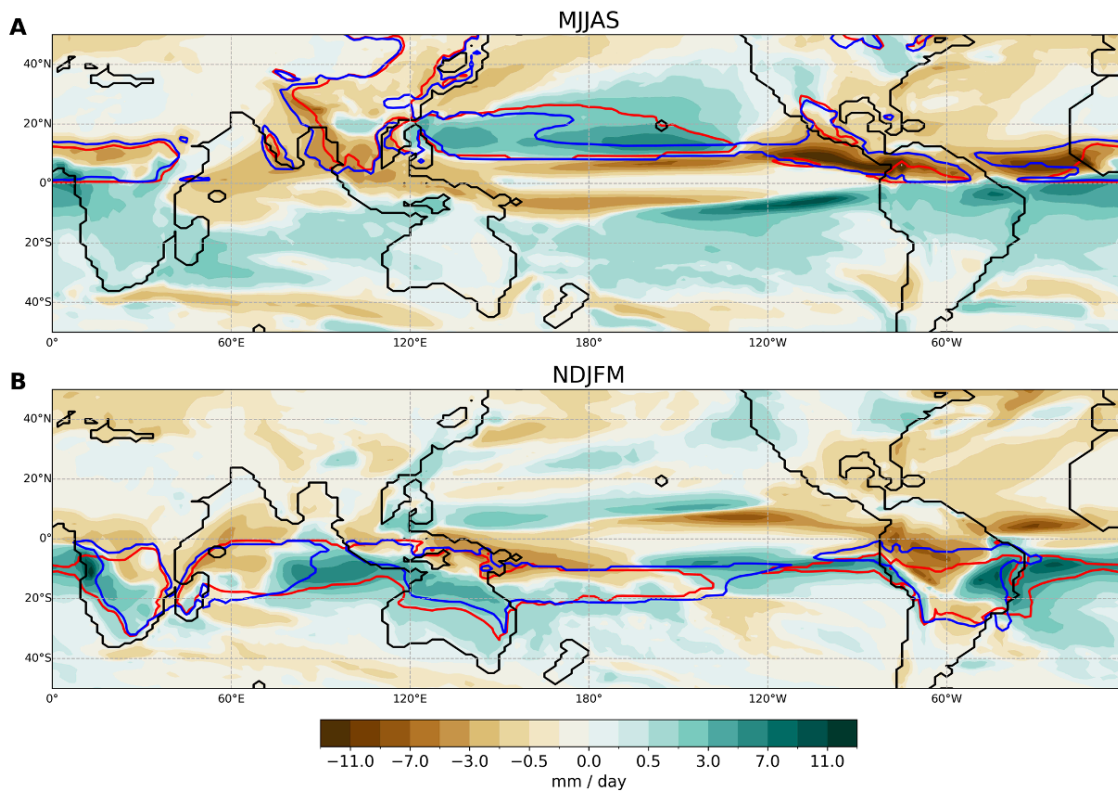


Figure S8: 49ka_shutdown (Heinrich stadial) – 49ka_control precipitation anomaly (mm/day) and monsoon domains in (a) Northern Hemisphere monsoon season: MJJAS, and (b) Southern Hemisphere monsoon season: NDJFM. Contours indicate monsoon domains for Heinrich stadial (in red) and for control (in blue) experiments.

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120 **Table S1.** Area-weighted normalized annual mean surface air temperature (SAT) and precipitation anomalies per 1 Sv AMOC decrease in each experiment relative to 49ka_control. This includes global, NH, SH (0-55° S) temperature changes, and global, NH, and SH (0-90° S) precipitation changes.

Experiment	Global SAT (°C/Sv)	NH SAT (°C/Sv)	SH SAT (0-55° S) (°C/Sv)	Global precip (mm day ⁻¹ /Sv)	NH precip (mm day ⁻¹ /Sv)	SH precip (mm day ⁻¹ /Sv)
49ka_0.2Sv	-0.046	-0.08	-0.0023	-0.0029	-0.0094	0.0036
49ka_0.3Sv	-0.046	-0.08	-0.0026	-0.0027	-0.009	0.0037
49ka_shutdown	-0.061	-0.13	0.015	-0.0036	-0.018	0.011

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Table S2. Wintertime northern (DJF) and southern (JJA) HC mean latitudinal position (°), strength (Sv), and positions (°) of its ascending and descending branches at 500 hPa in each experiments, interpolated to 0.5° latitude resolution using the calculation methods described in Section 2.4.

Experiment	Northern HC in DJF				Southern HC in JJA			
	Mean position (°)	Strength (Sv)	Ascending branch (°)	Descending branch (°)	Mean position (°)	Strength (Sv)	Ascending branch (°)	Descending branch (°)
49ka_control	8.125	476.8	-15.6	28.0	-0.375	-486.6	14.9	-27.2
49ka_0.2Sv	8.125	482.9	-15.7	27.9	-0.875	-473.0	14.7	-27.4
49ka_0.3Sv	8.125	487.1	-15.9	28.0	-0.875	-467.0	14.3	-27.2
49ka_shutdown	-1.875	572.5	-17.1	28.1	-8.375	-328.7	18.4	-28.7

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