



Supplement of

Physical processes of cooling and mega-drought during the 4.2 ka BP event: results from TraCE-21ka simulations

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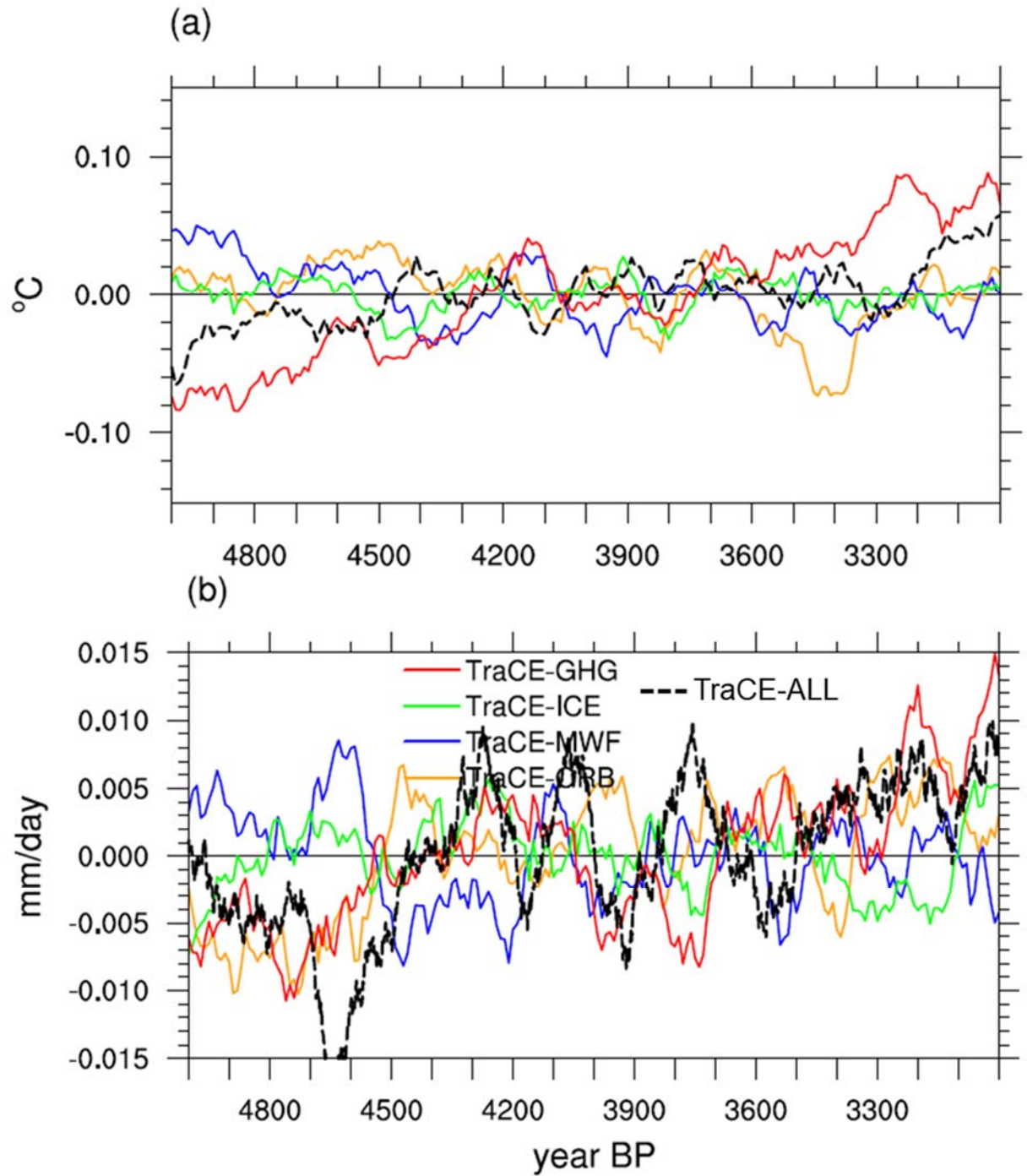


Figure S1 Time series of annual mean Southern Hemisphere (SH) (a) surface temperature anomalies and (b) precipitation anomalies derived from TraCE-ALL run (dashed black lines) and each single forcing runs (solid color lines) from 5 ka BP to 3 ka BP. A 101-year running mean has been applied to the time series.

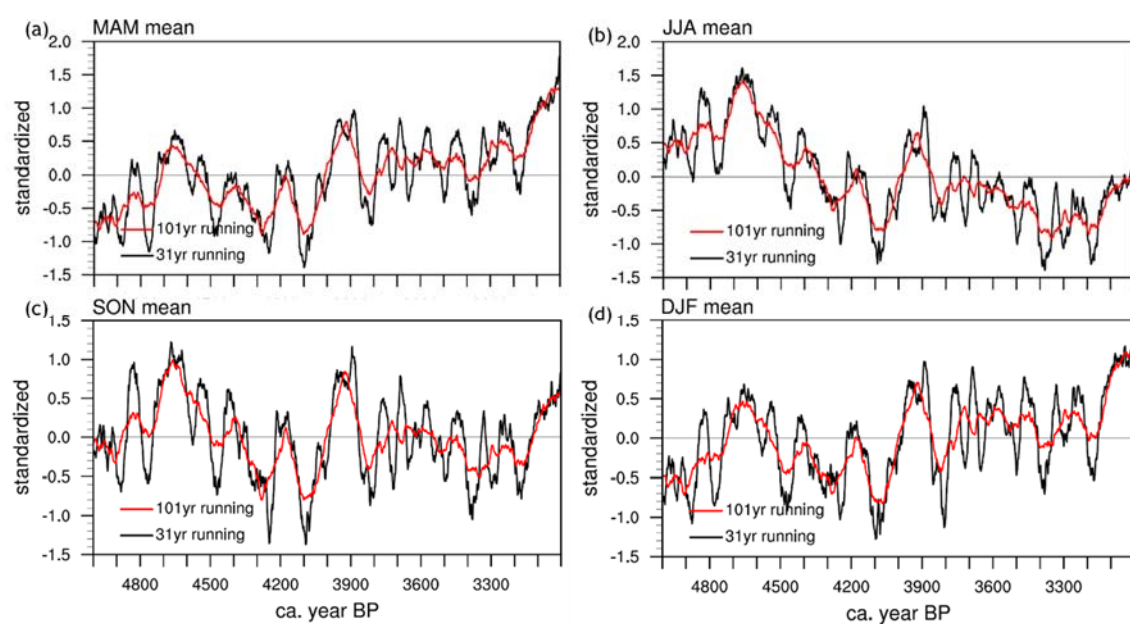


Figure S2 Standardized time series of (a) MAM mean, (b) JJA mean, (c) SON mean and (d) DJF mean NH surface temperature anomalies from 5ka BP to 3ka BP derived from the TraCE-ALL run. A 101-year running mean (red line) and a 31-year running mean (black line) have been applied to the time series.

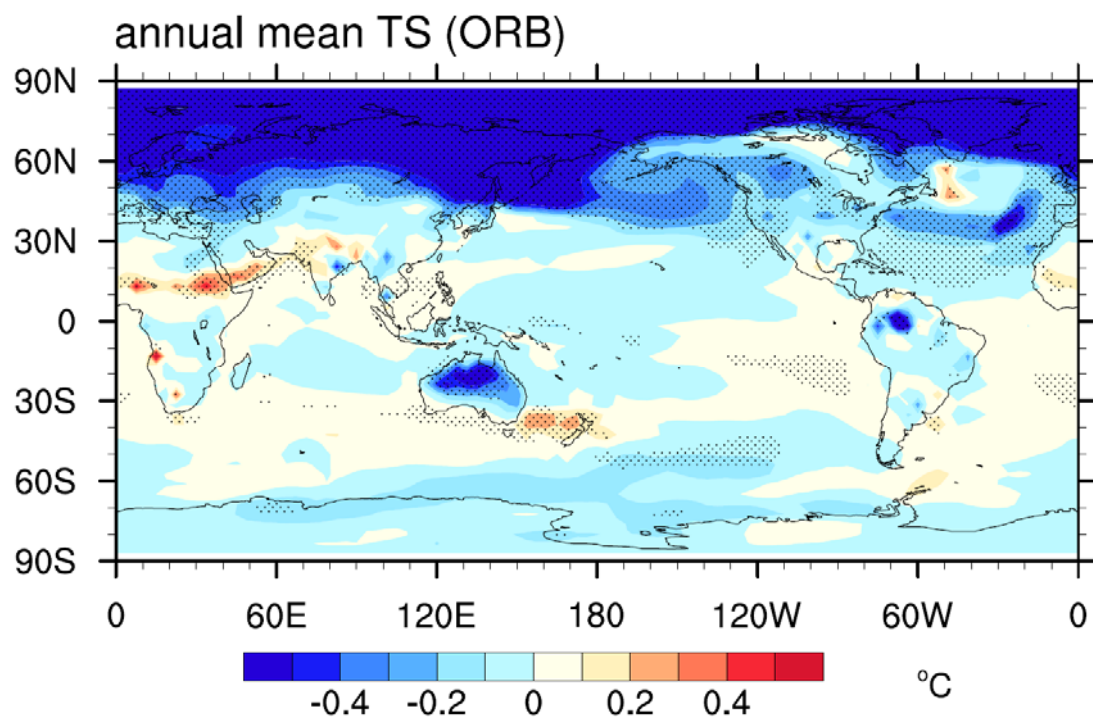


Figure S3 Spatial distribution of the annual mean surface temperature difference between the cold period (4200 BP-3900 BP) and warm period (4800 BP-4500 BP) derived from the TraCE-ORB run. Those regions where significant above 95% confidence level are dotted.

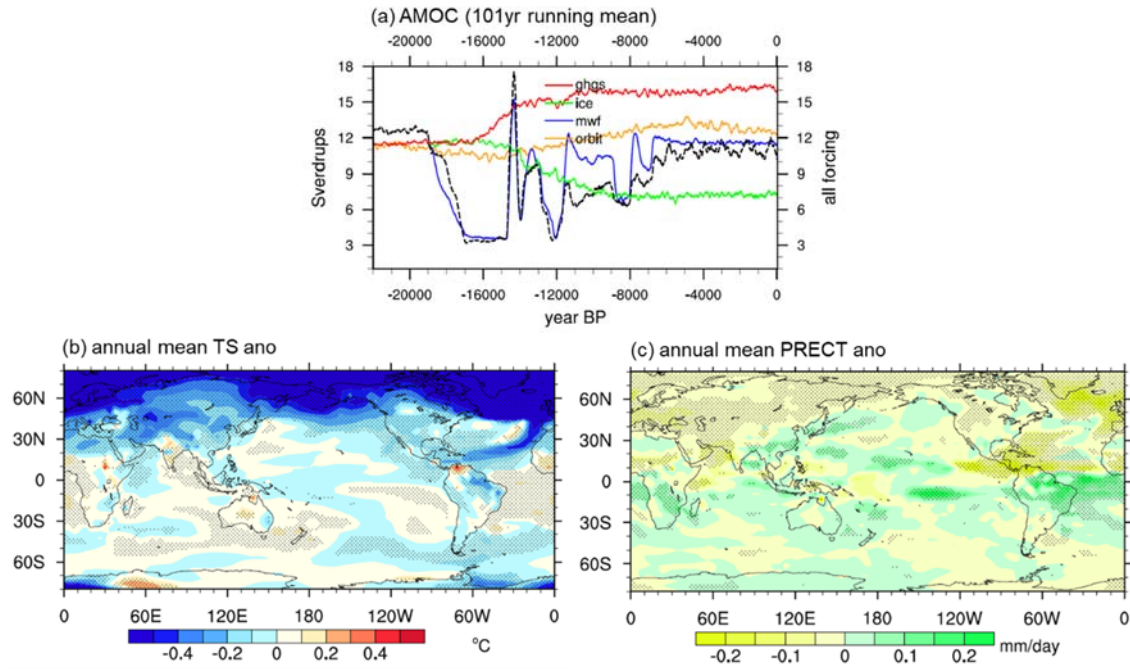


Figure S4 (a) Simulated AMOC over the past 22 ka derived from TraCE-ALL (black line) and each single forcing run (colored lines). Spatial distribution of the annual mean surface temperature difference (b) and precipitation difference (c) between the weak and strong AMOC states derived from TraCE-ALL. Those regions where significant above 95% confidence level are dotted in (b) and (c). The weak and strong AMOC states are selected based on the standardized time series of AMOC during the period of past 6 ka, when the meltwater forcing is absent.

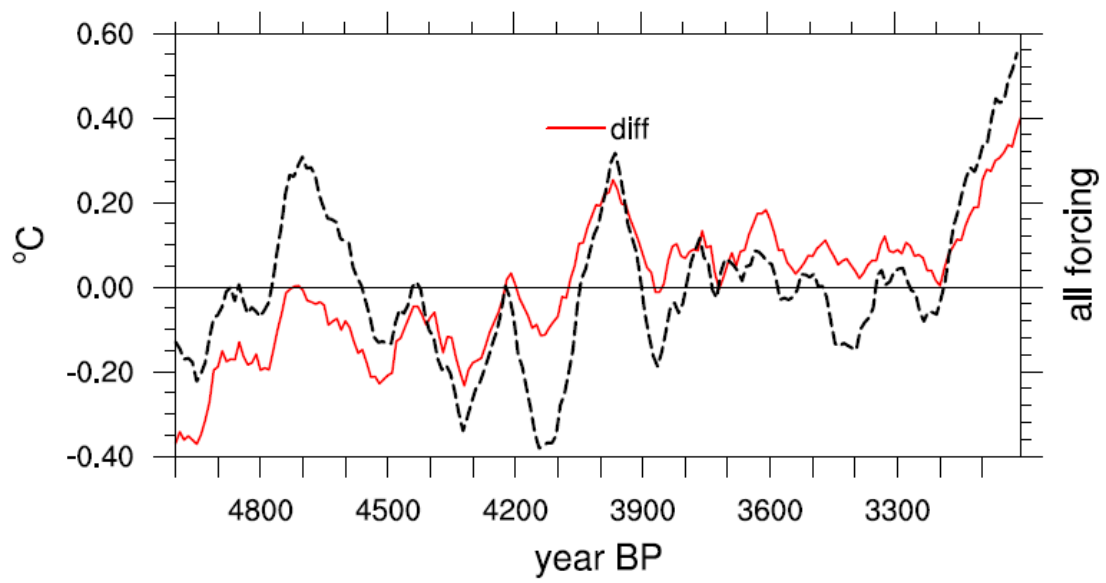


Figure S5 Time series of annual mean NHT anomaly from 5000 BP to 3000 BP. Dashed black line is the result derived from the all forcing run. Red line indicates the difference between the result derived from all forcing run and that derived from the linear sum of the 4 single forcing runs.

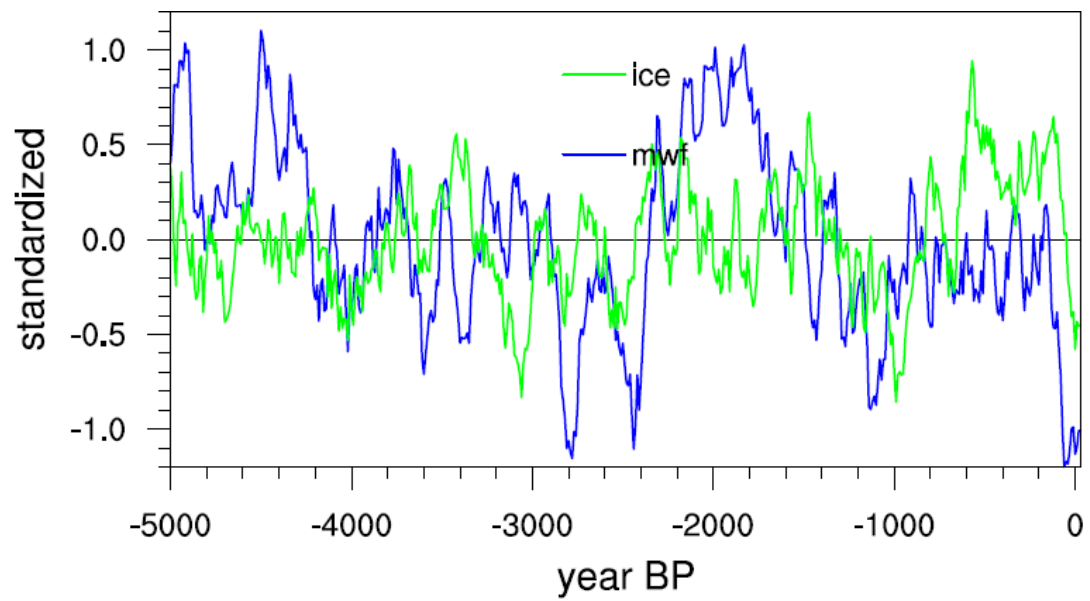


Figure S6 Standardized time series of the annual mean NHT derived from the TraCE-MWF run (blue line) and TraCE-ICE run (green line) from 5000 BP to 1990 CE. A 101-year running mean has been applied to the time series.

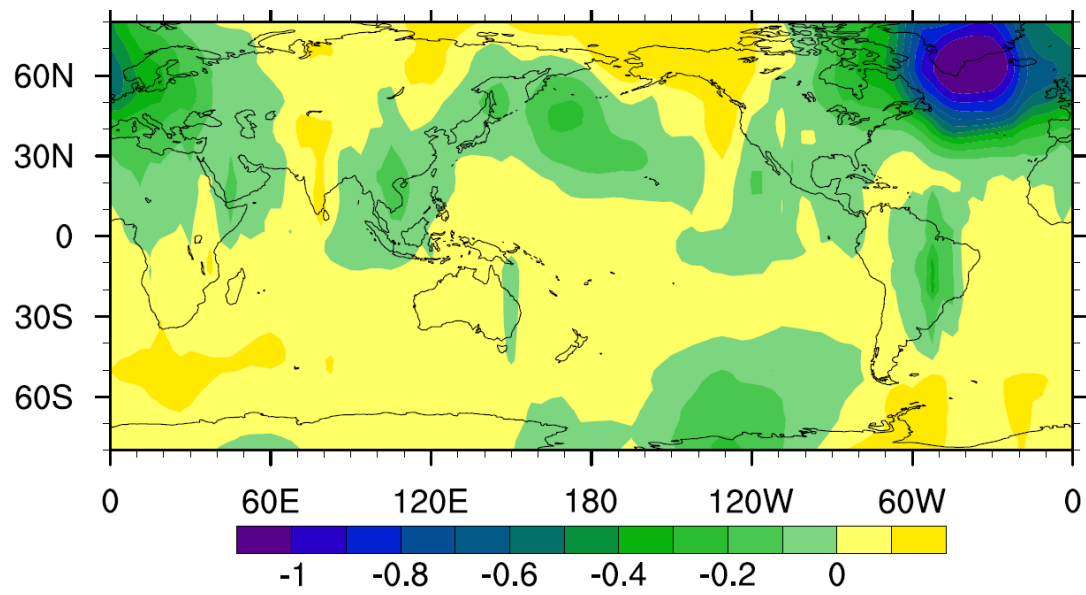


Figure S7 Annual mean TS regressed against the NAO index leading 40-year during 4.4 ka BP - 4.0 ka BP.