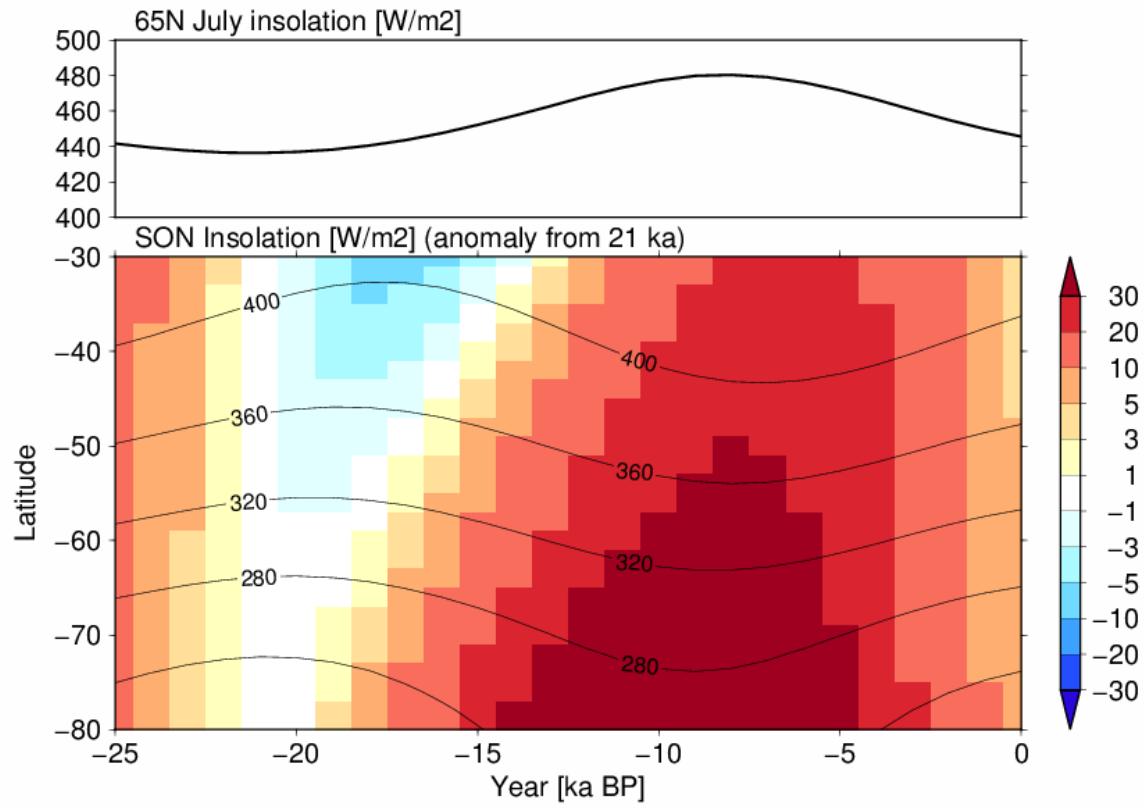
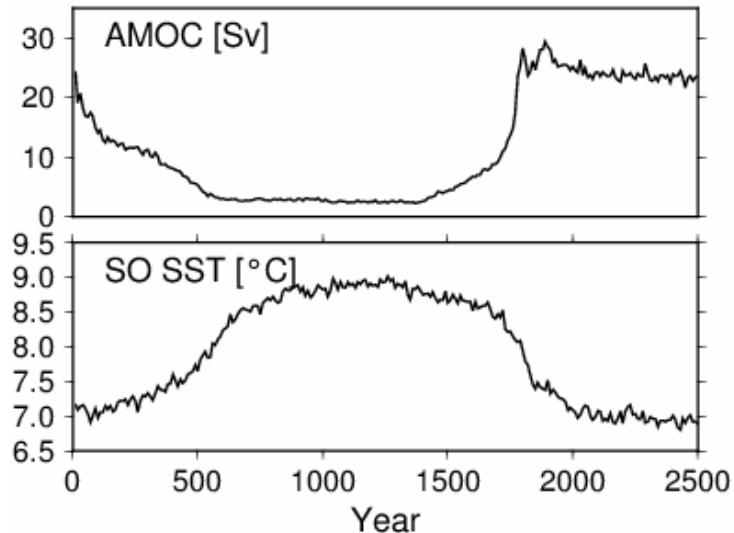
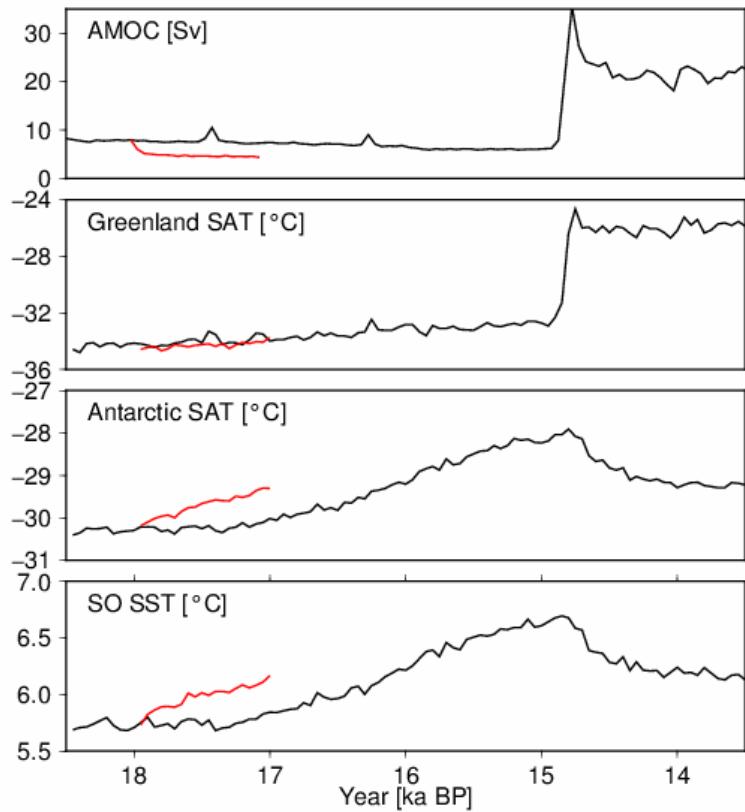
Supplementary Material

Supplementary Figure S1: (top) 65°N July insolation, (bottom) austral spring to summer (September to November) insolation. The contours indicate absolute values of the mean insolation, and colours indicate anomaly from 21 ka.

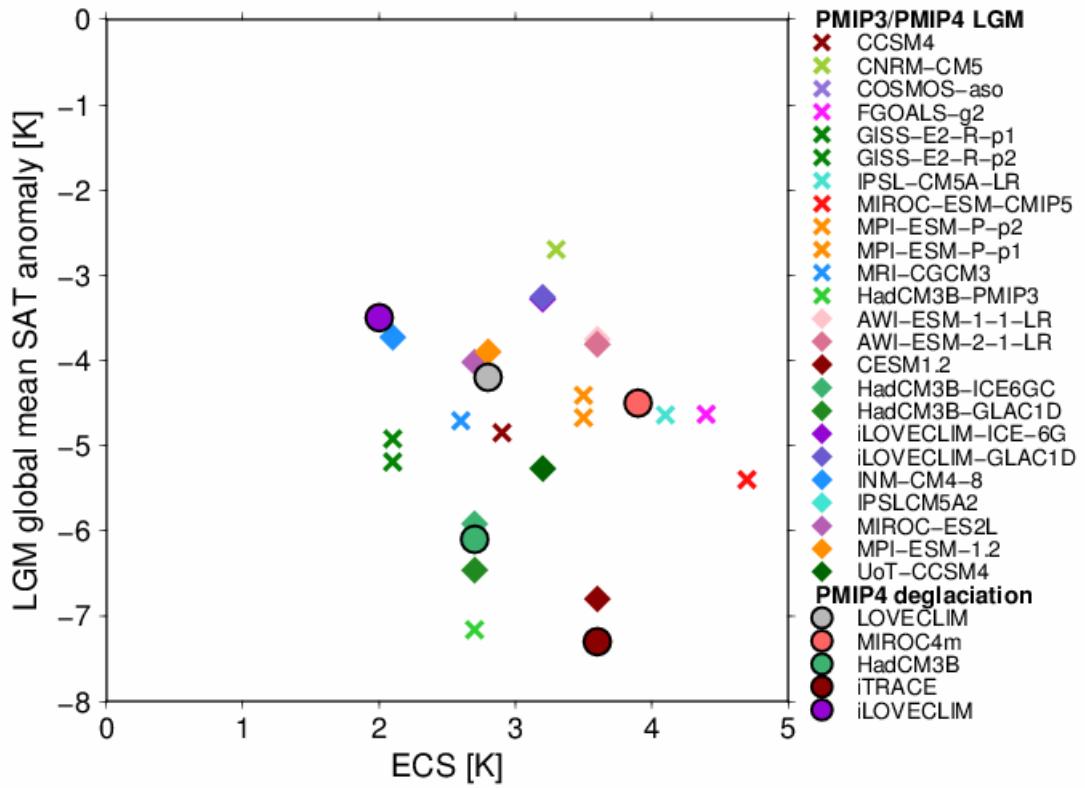
7

Supplementary Figure S2: Results from a North Atlantic meltwater experiment performed with LOVECLIM under 40ka boundary conditions and with an atmospheric CO_2 concentration fixed at 195 ppm (Margari et al., 2020). Freshwater is added into the North Atlantic (50–60°N). The freshwater flux is increased linearly to 0.2 Sv during the first 400 years, decreased linearly to zero during the next 400 years, and remains at zero thereafter.

13

14

15 **Supplementary Figure S3:** Results from a deglaciation experiment with MIROC (red lines), where a

16 uniform freshwater flux of 0.1 Sv is added into the North Atlantic (50–70°N) during 18-17 ka. Black lines

17 represent the standard deglaciation experiment with MIROC.

18

19

20 **Supplementary Figure S4:** Relationship between the equilibrium climate sensitivity (ECS) and global

21 mean surface air temperature (SAT) changes for the LGM. The circles indicate PMIP4 deglaciation (this

22 study), and crosses and diamonds indicate LGM simulations from PMIP3 and PMIP4 (summarised in

23 Kageyama et al., 2021), respectively.