The effect of precipitation seasonality on Eemian ice core isotope records from Greenland

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Supplementary Materials

1 Comparison of ERA-40 and ECHO-G driven RACMO2 simulations

In this study, RAMCO2 simulations driven by ERA-40 and ECHO-G were used. The ERA-40 simulation covers the 1960-1989 period; the ECHO-G simulation resembles the preindustrial climate. Figure 1 shows that the preindustrial simulation has a 2 to 3 K colder T_{2m} temperature over Greenland and a 1 to 2 K colder T_{pp} and T_c than the ERA-40 driven simulation. The preindustrial climate realization is thus colder over Greenland, and has a larger temperature gradient between the surface and the atmosphere (Fig. 1d). However, the changes in dT_{event} and dT_{seas} are relatively small (-1 to 1 K) and less than 0.5 K for most of Greenland. In North Greenland, the decreases effect of precipitation seasonality on T_c (dT_{seas}) and the increased dT_{event} are possibly due to a colder summer climate over the Arctic Ocean, leading to less summer precipitation on this part of the ice sheet.

Another difference between these two simulations is the model resolution of RACMO2. As a result, the rough topography of East Greenland, in particular between 68 and 77 N, is less well resolved in the preindustrial simulation. Local elevation differences can be up to 500 m, causing the dotted patterns in Figures S1 a) to c).

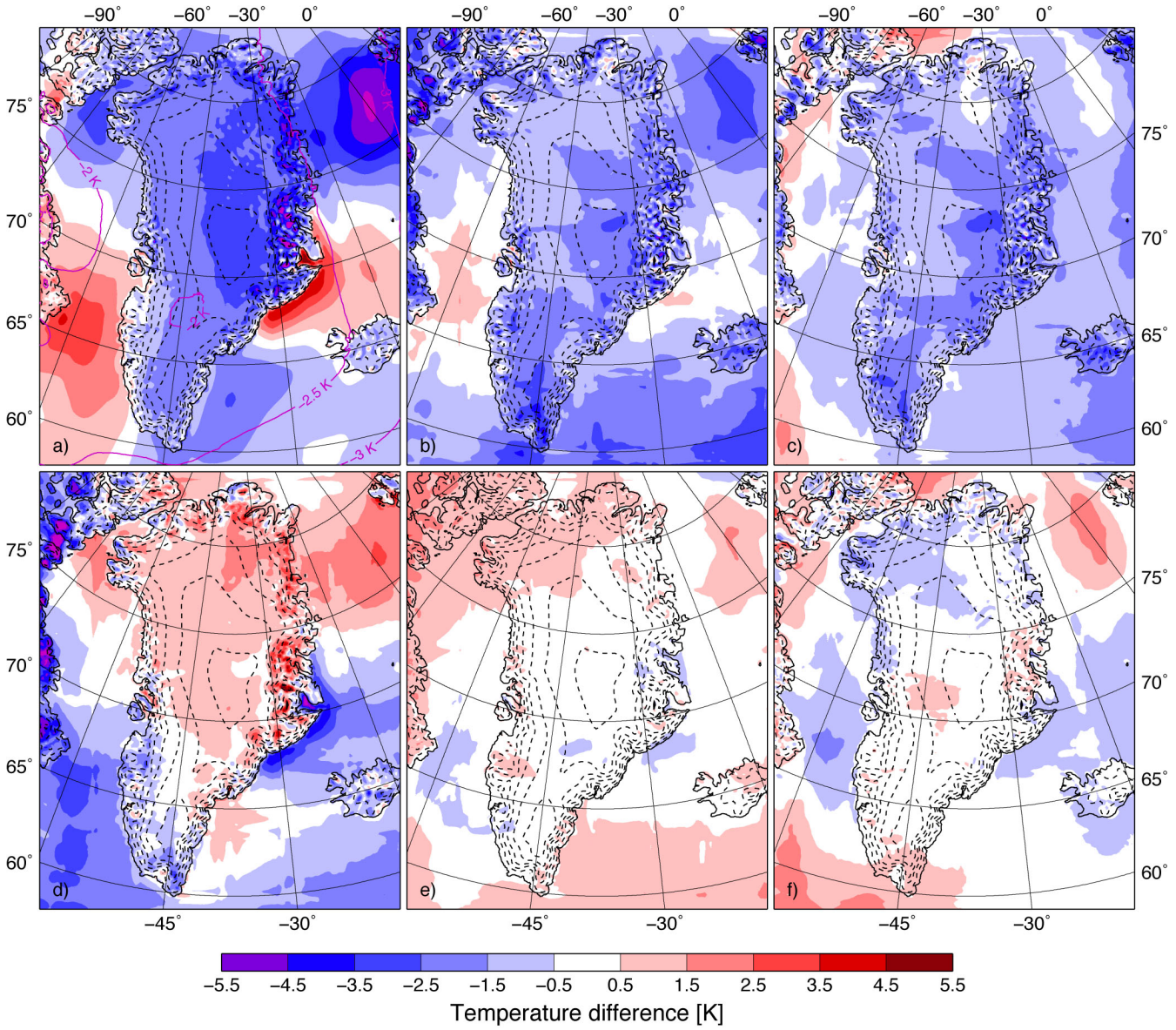

Fig. S1: *Differences between the simulated preindustrial and 1960-1989 climate. Change in* a) T_{2m}, $T_{500\mathrm{hPa}}$ *(purple contours),* b) T_{pp} *and* c) T_c. *Change in the difference between* d) T_{pp} *and* T_{2m}. *Change in* e) dT_{event} *and in* f) dT_{seas}. *Negative values in* a), b) *and* c) *imply that the preindustrial simulation is colder than the 1960-1989 simulation. Negative values in* d), e) *and* f) *indicate that the specific process decreases in the preindustrial simulation than in the 1960-1989 simulation.*

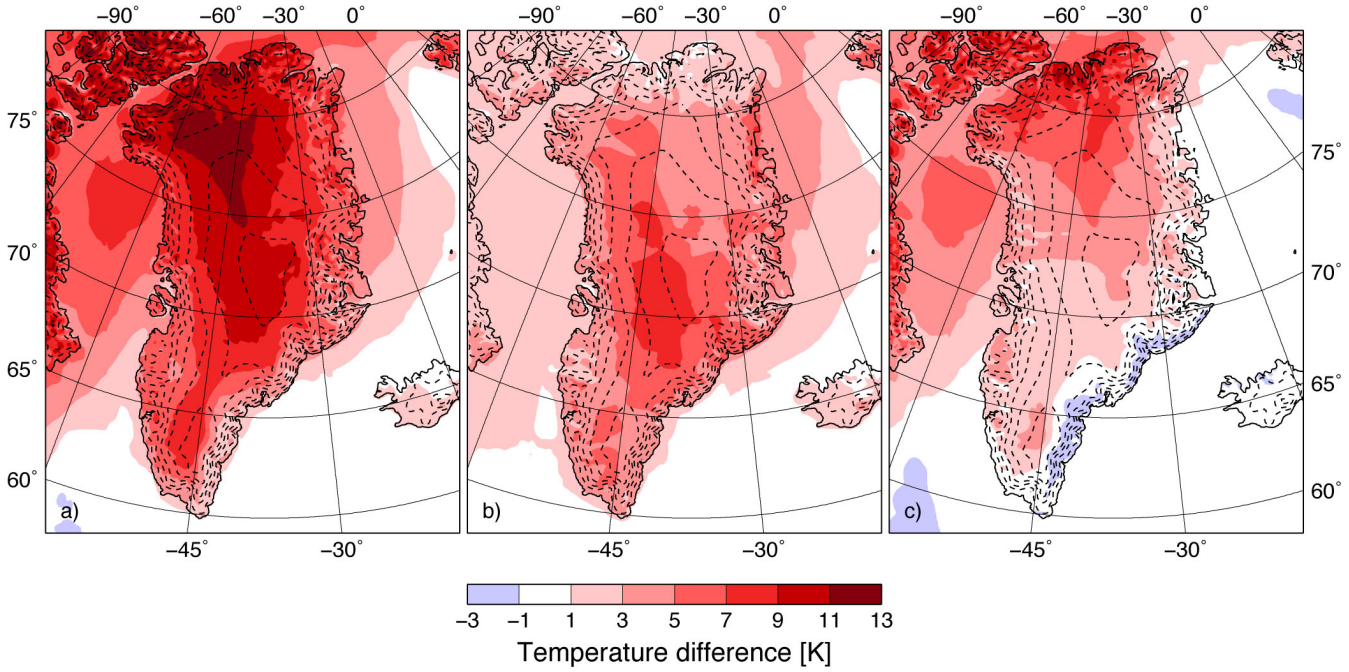

Fig. S2: a) *Difference between* $T_{2m,p}$ *and* T_{2m}. *Contributions of* b) dT_{event} *and* c) dT_{seas} *to the difference between* $T_{2m,p}$ *and* T_{2m}.

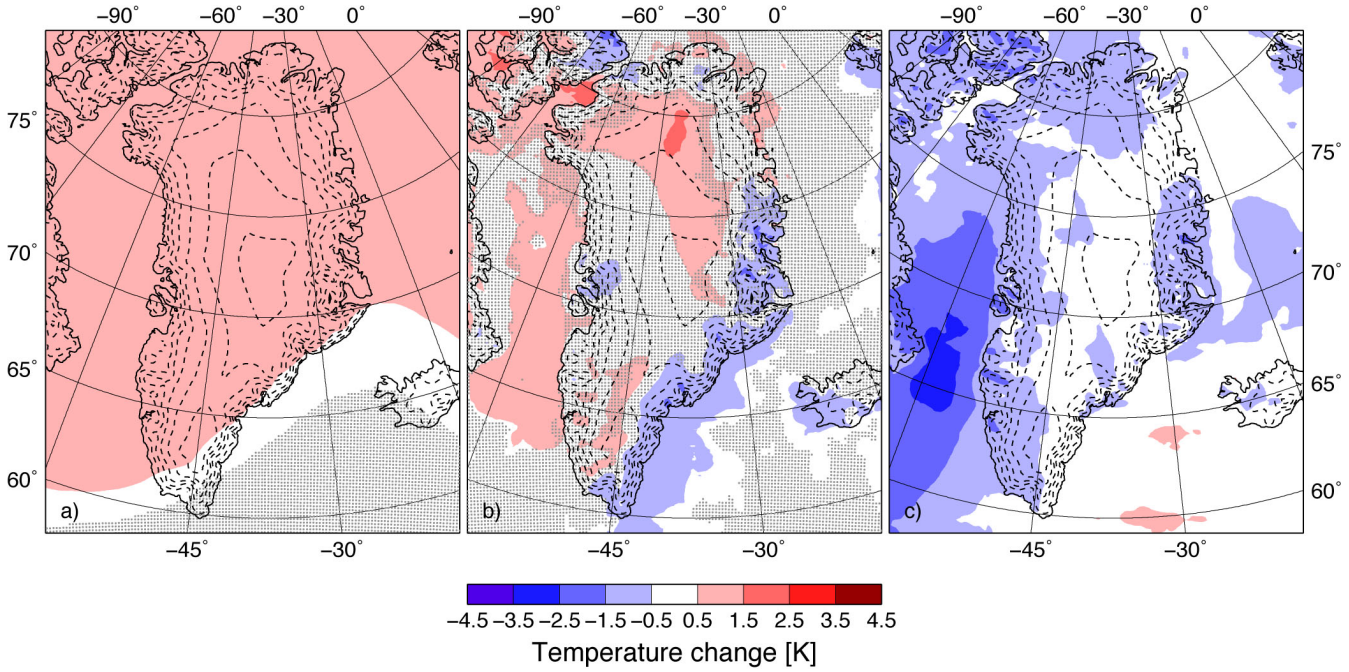

Fig. S3: *Changes in the Eemian with respect to the preindustrial simulation for* a) $T_{500\mathrm{hPa}}$, b) *the change in difference between* T_c *and* $T_{500\mathrm{hPa}}$ *and* c) *the change in difference between* T_{pp} *and* $T_{500\mathrm{hPa}}$. *In* a) *and* b), *areas with differences that fail to reach significance at* 2σ *level are dotted.*