Supplementary Materials for

Global coupled climate response to polar sea ice loss: Evaluating the effectiveness of different ice-constraining approaches

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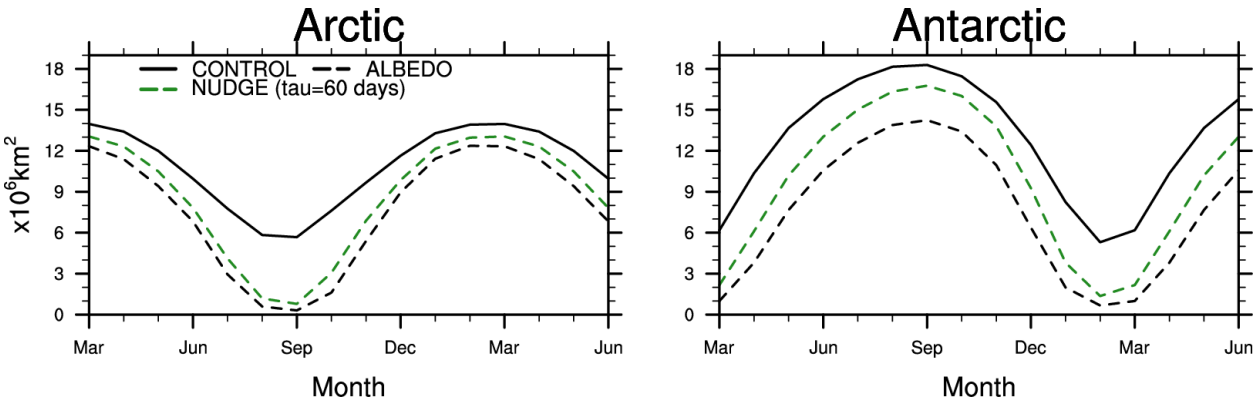

Figure S1: Monthly Arctic (left) and Antarctic (right) sea ice area (10^6 km^2) in the CCSM4 CONTROL (solid black line), ALBEDO (dashed black line), and NUDGE experiment with the nudging timescale of 60 days (dashed green line). The months March–June are repeated for clarity.

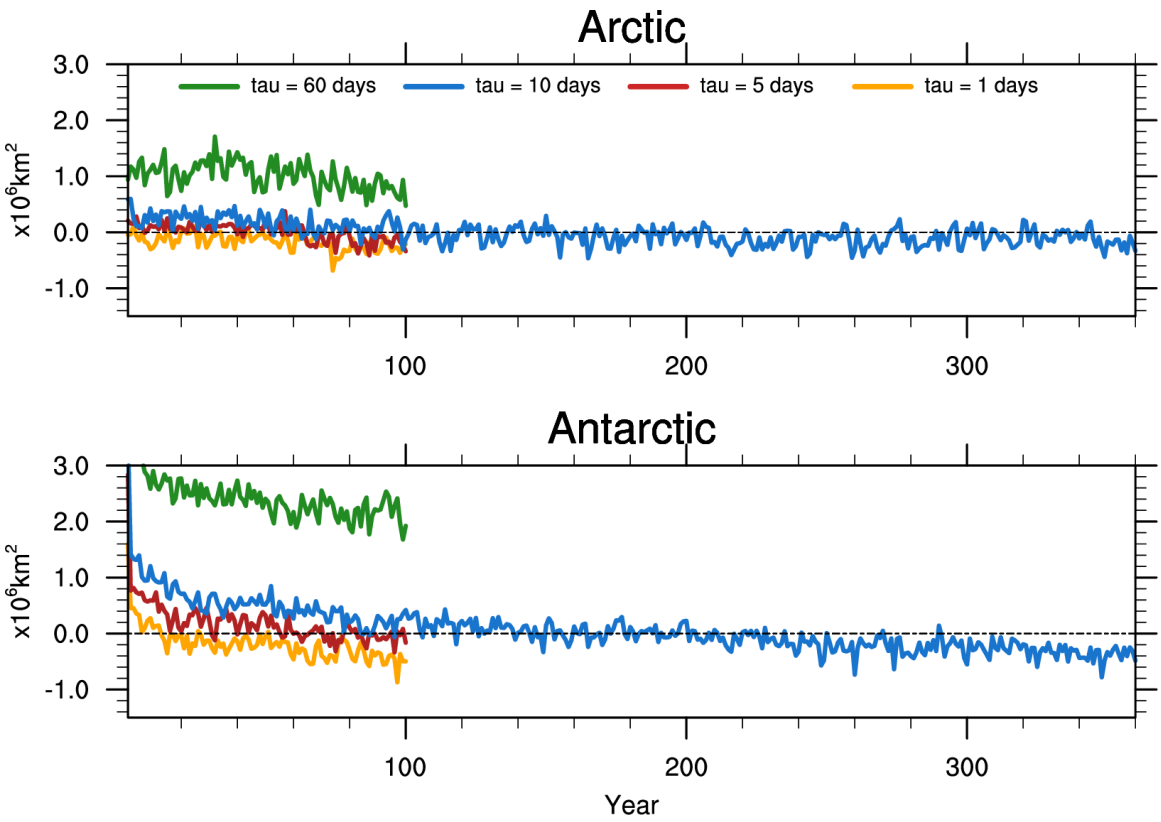

Figure S2: Annual (top) Arctic and (bottom) Antarctic sea ice area difference between NUDGE and ALBEDO experiments. The green, blue, red and orange lines denote the nudging timescale of 60, 10, 5 and 1 day, respectively.

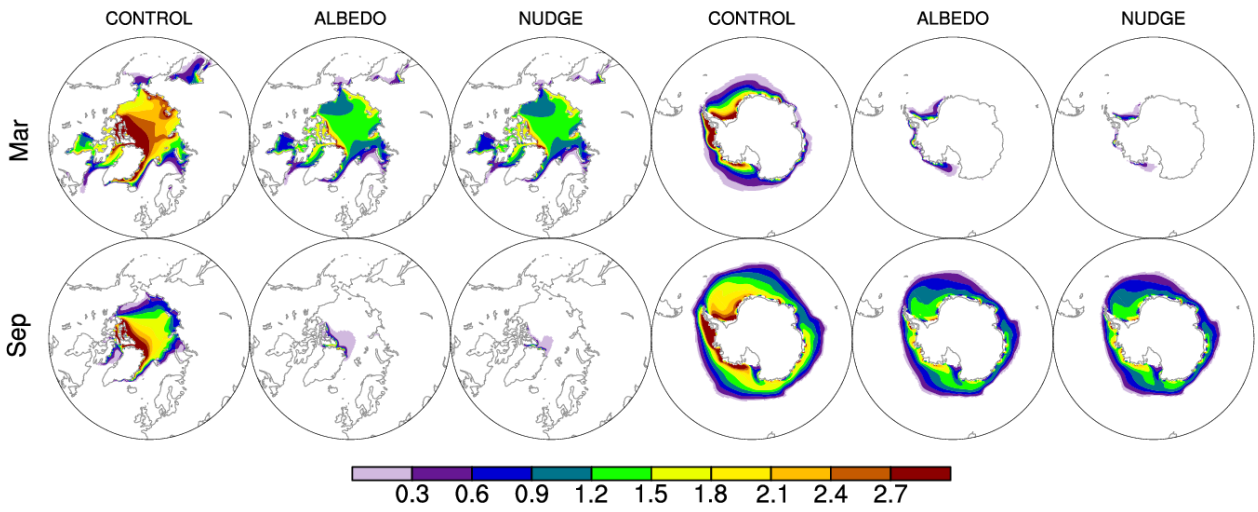

Figure S3: Arctic and Antarctic sea ice thickness (m) in September and March in the CONTROL, ALBEDO and NUDGE experiments.

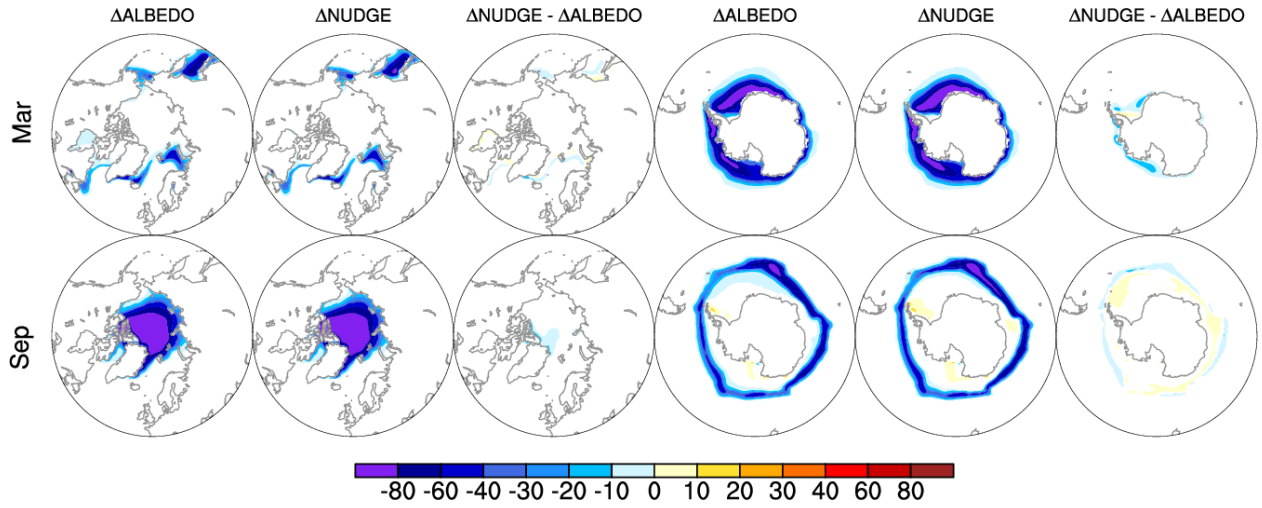

Figure S4: March (top) and September (bottom) Arctic and Antarctic sea ice loss (%) in ΔALBEDO, ΔNUDGE and their difference.

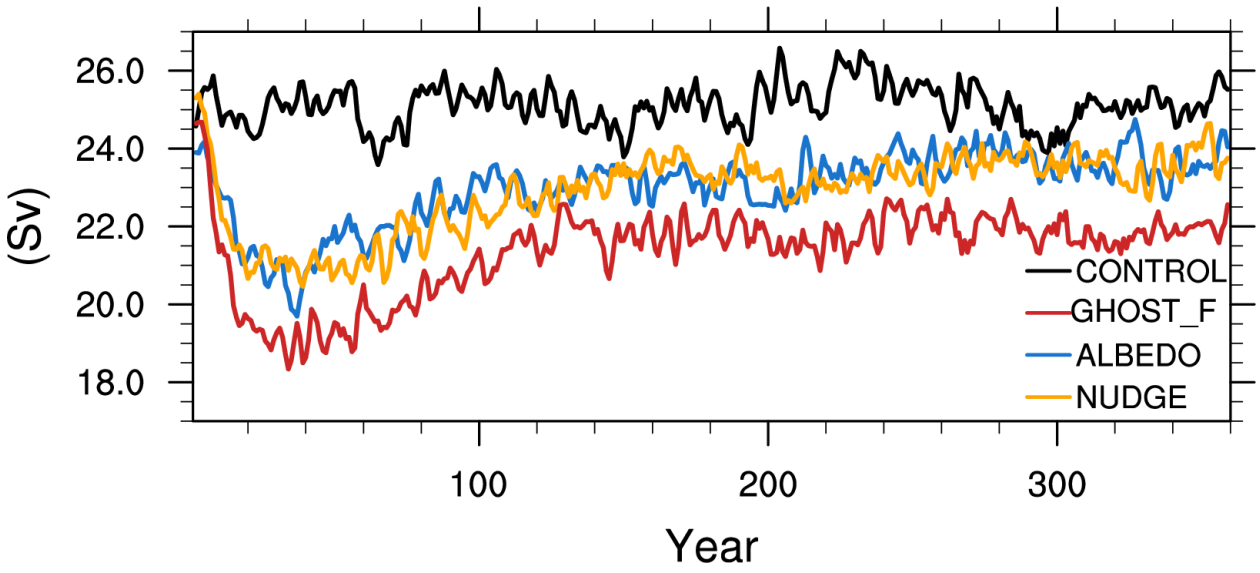

Figure S5: Annual AMOC time series in the CONTROL (black line), ALBEDO (blue line), NUDGE (orange line) and GHOST_F (red line) simulations. The AMOC index is evaluated based on the maximum Atlantic meridional overturning streamfunction (in units of Sv) between 20°N and 70°N and within the depth range 30-2000m.

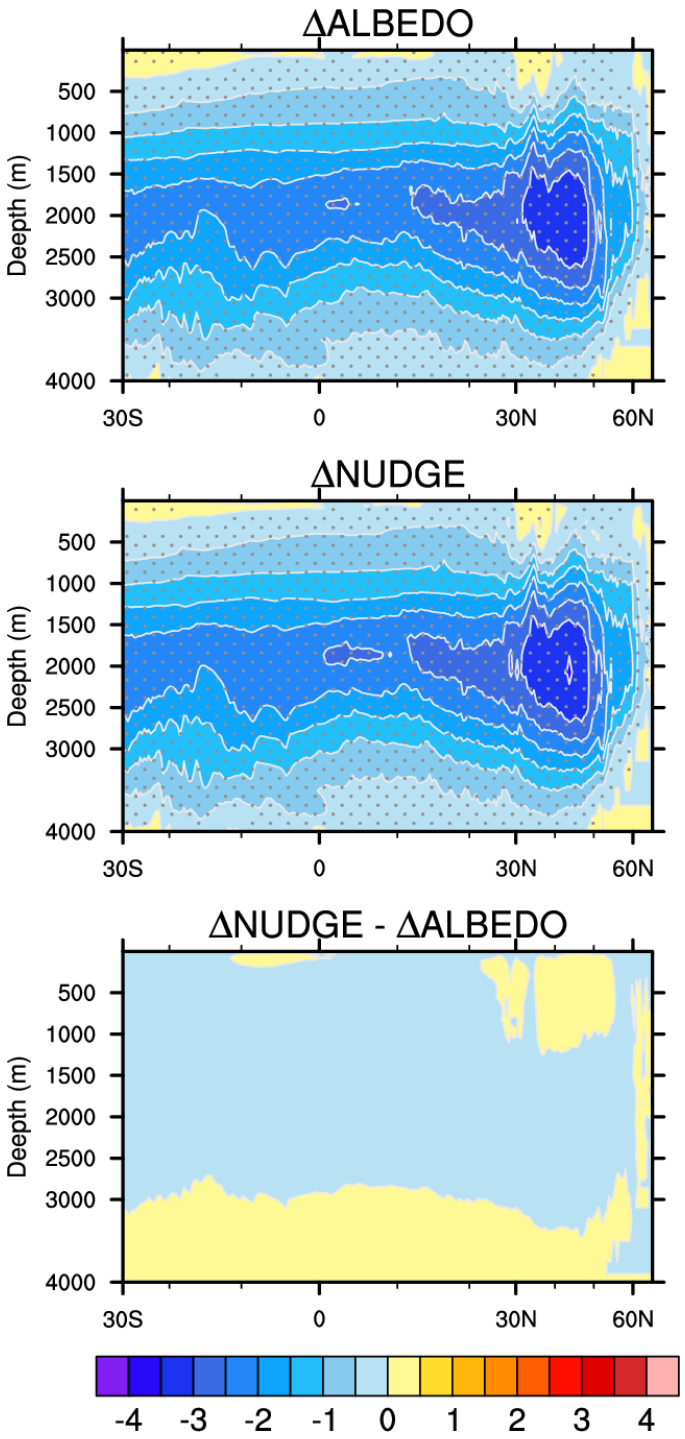

Figure S6: Response of Atlantic meridional overturning streamfunction to polar sea ice loss in ΔALBEDO, ΔNUDGE and their difference. The stippling denotes the 95% statistical significance based on two-sided Student's t-test.

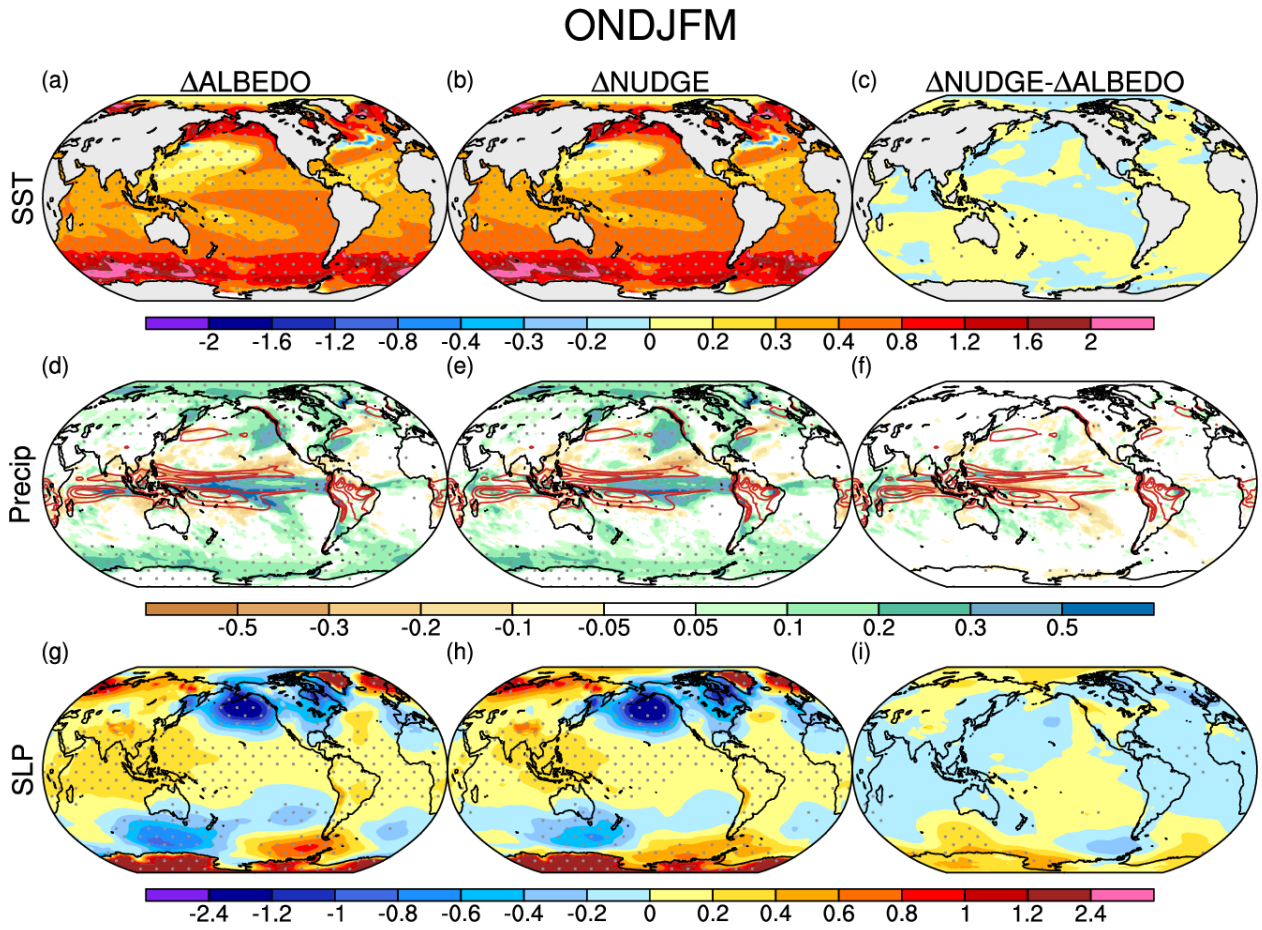

Figure S7: As in Figure 2, but for the extended boreal winter season (ONDJFM).

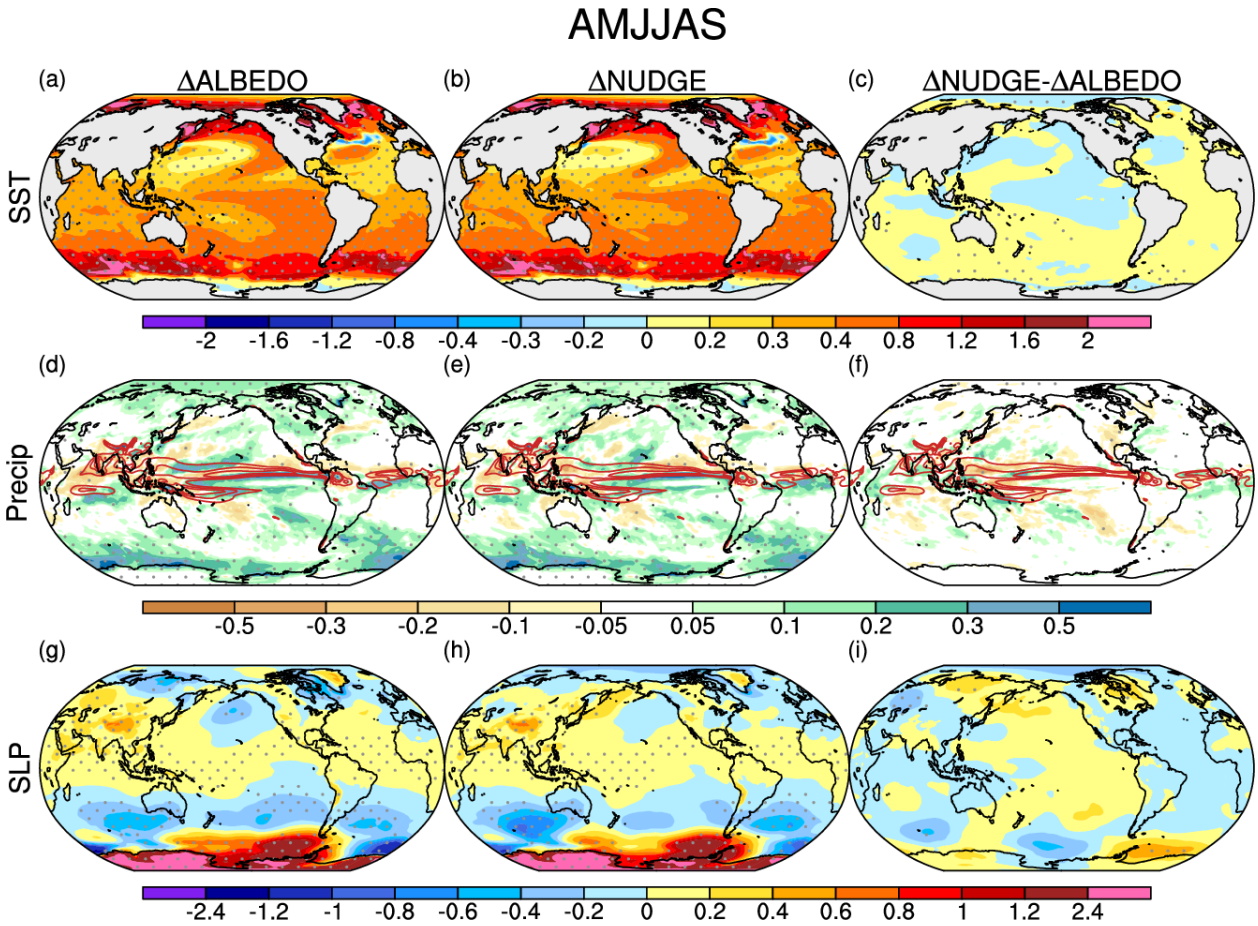

Figure S8: As in Figure 2, but for the extended boreal summer season (AMJJAS).

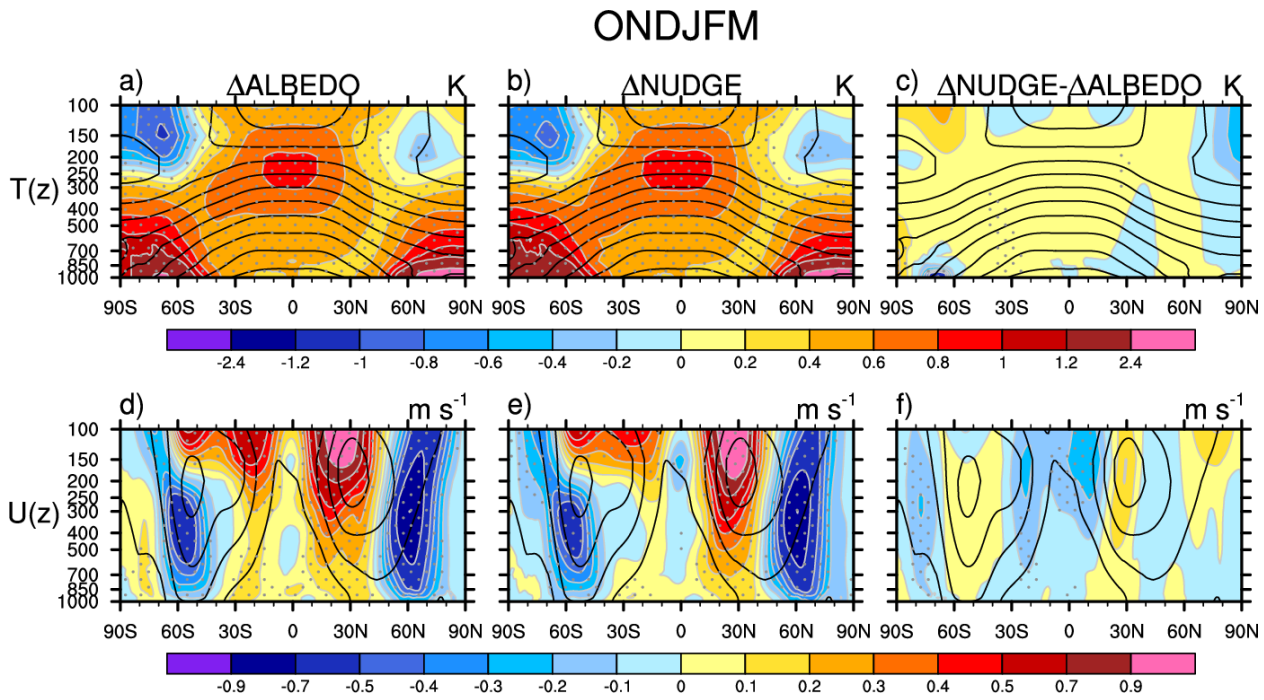

Figure S9: As in Figure 3, but for the extended boreal winter season (ONDJFM).

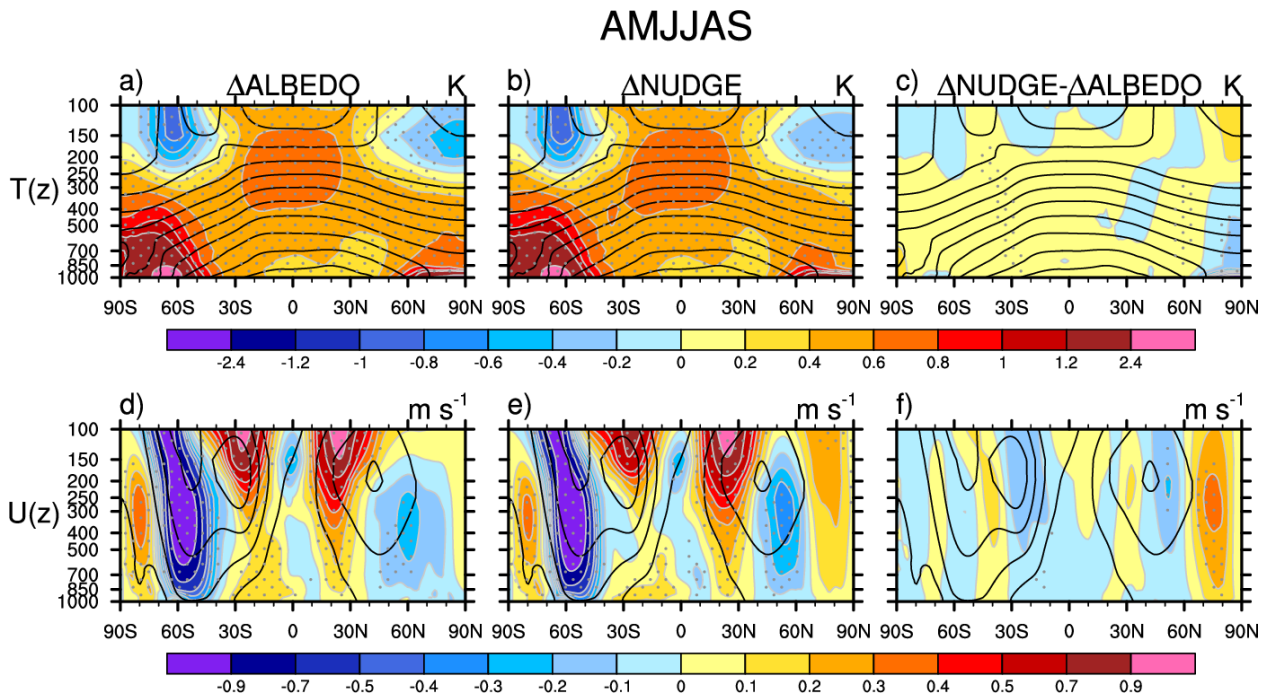

Figure S10: As in Figure 3, but for the extended boreal summer season (AMJJAS).

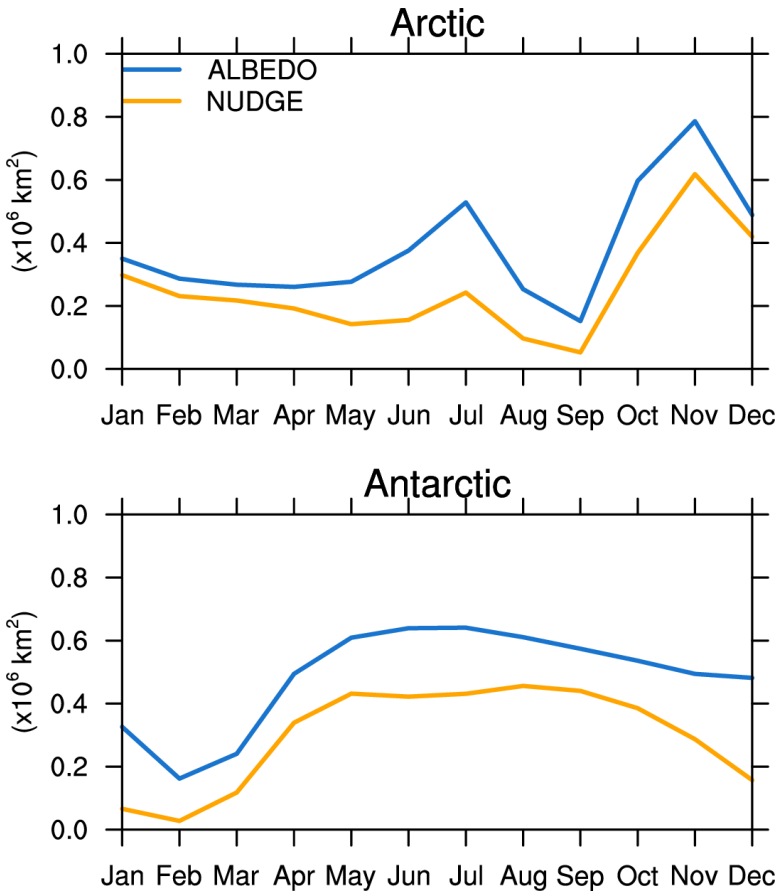

Figure S11: Arctic (top) and Antarctic (bottom) sea ice area standard deviation for the ALBEDO and NUDGE simulations.

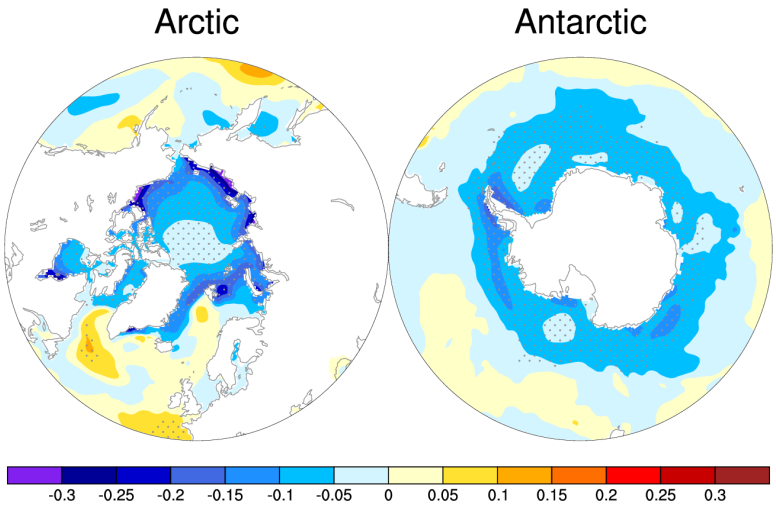

Figure S12: Arctic (left) and Antarctic (right) annual SST standard deviation difference between ALBEDO and NUDGE simulations (NUDGE – ALBEDO). The stippling denotes the statistical significance based on an F-test.