Supplemental Material

Supplementary Online Material to

Climate responses to aerosol geoengineering: a multi-method comparison

Authors: Helene Muri[1,2], Jerry Tjiputra[3], Odd Helge Otterå[3], Muralidhar Adakudlu[3], Siv K. Lauvset[3], Alf Grini[4], Michael Schulz[4], Ulrike Niemeier[5], Jón Egill Kristjánsson[1,†]

Affiliations:

[1]University of Oslo, Department of Geosciences, Section for Meteorology and Oceanography, Oslo, Norway

[2]Norwegian University of Science and Technology, Department of Energy and Process Engineering, Industrial Ecology Program, Trondheim, Norway

[3]Uni Research Climate, Bjerknes Centre for Climate Research, Bergen, Norway

[4]Meteorological Institute, Oslo, Norway

[5]Max Planck Institute for Meteorology, Hamburg, Germany

Corresponding author: helene.muri@ntnu.no

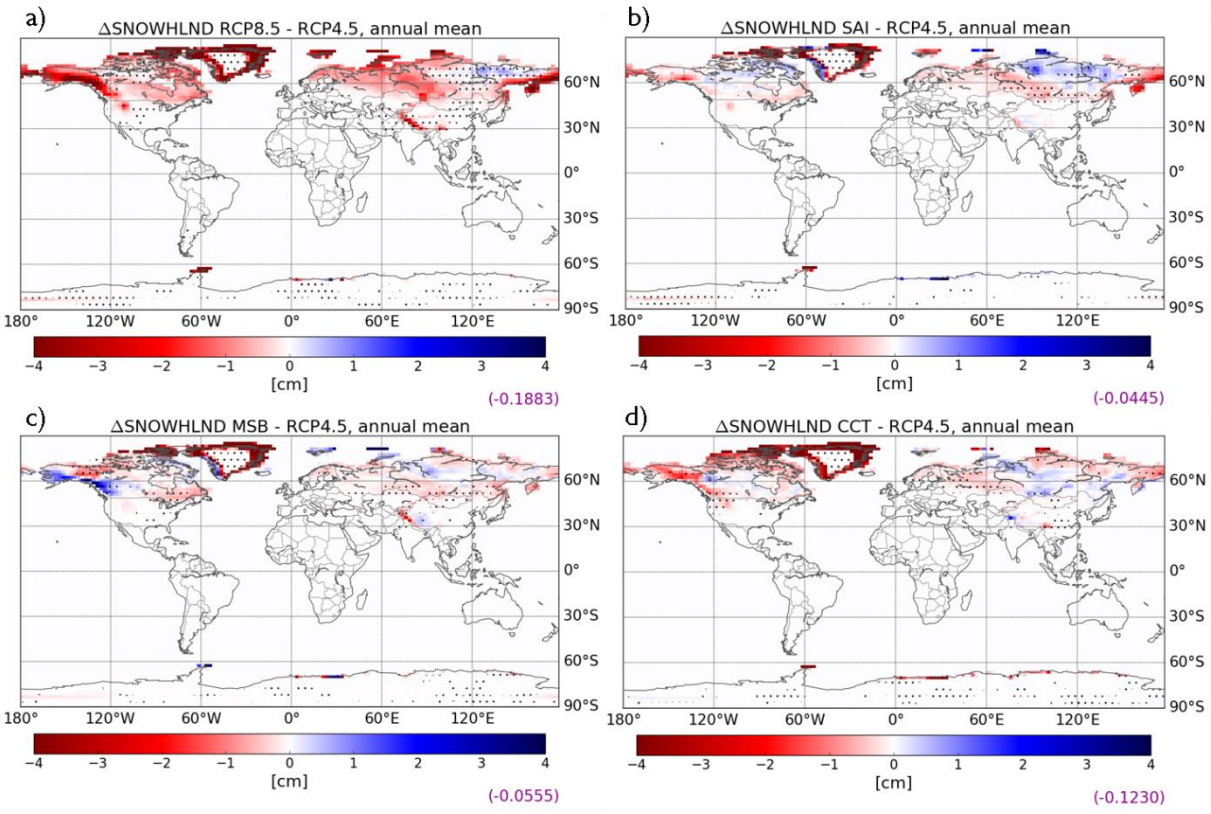


Figure S1: Annual mean land snow depth difference from RCP4.5 [cm]; a) RCP8.5, b) *RCP8.5+SAI*, c) *RCP8.5+MSB*, and d) *RCP8.5+CCT*. Means over all three ensemble member for each experiment over years 2060-2089. Non-stippling indicates a confidence level higher than 95% following Student's t-test. Global mean values in purple.

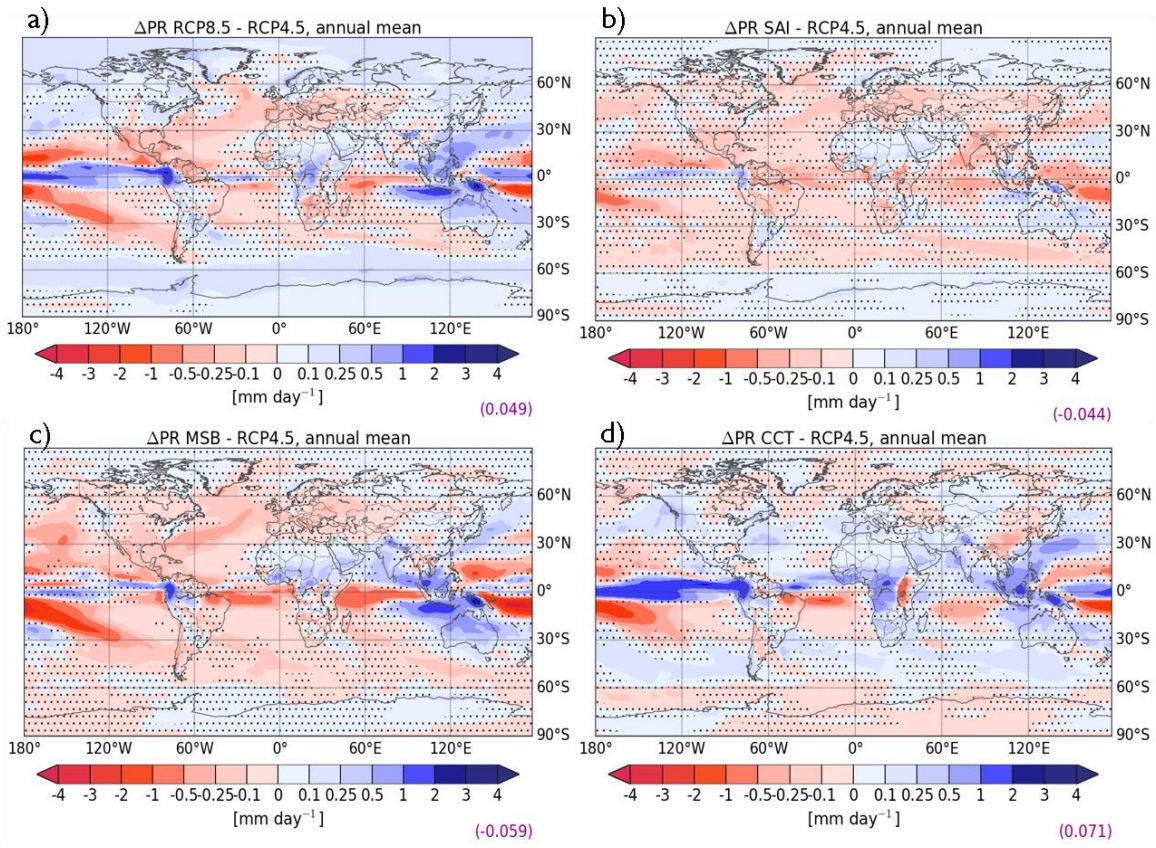


Figure S2: Annual mean precipitation rate difference [mm day^{-1}] from RCP4.5; a) RCP8.5, b) *RCP8.5+SAI*, c) *RCP8.5+MSB*, and d) *RCP8.5+CCT*. Means over all three ensemble member for each experiment over years 2060-2089. Non-stippling indicates a confidence level higher than 95% following Student's t-test. Global mean values in purple.

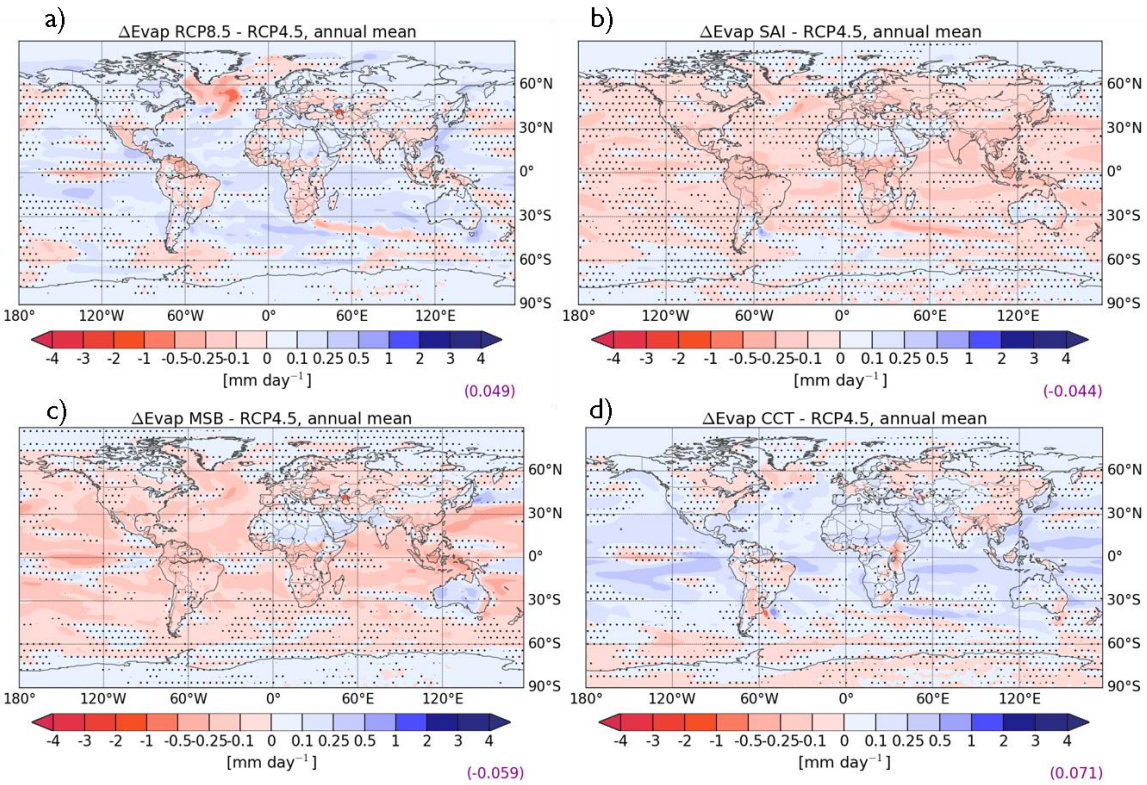


Figure S3: Annual mean evaporation rate difference [mm day^{-1}] from RCP4.5; a) RCP8.5, b) *RCP8.5+SAI*, c) *RCP8.5+MSB*, and d) *RCP8.5+CCT*. Means over all three ensemble member for each experiment over years 2060-2089. Non-stippling indicates a confidence level higher than 95% following Student's t-test. Global mean values in purple.

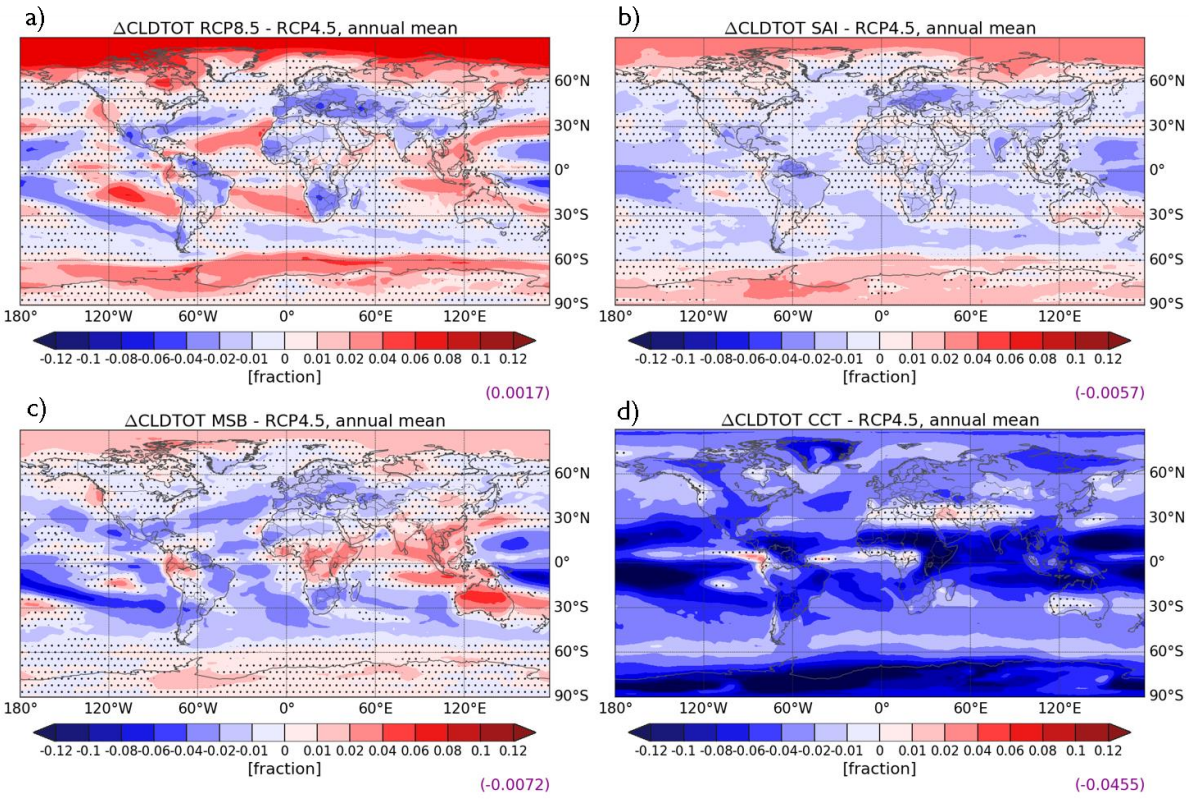


Figure S4: Annual mean total cloud fraction difference from RCP4.5 [fraction]; a) RCP8.5, b) *RCP8.5+SAI*, c) *RCP8.5+MSB*, and d) *RCP8.5+CCT*. Means over all three ensemble member for each experiment over years 2060-2089. Non-stippling indicates a confidence level higher than 95% following Student's t-test. Global mean values in purple.

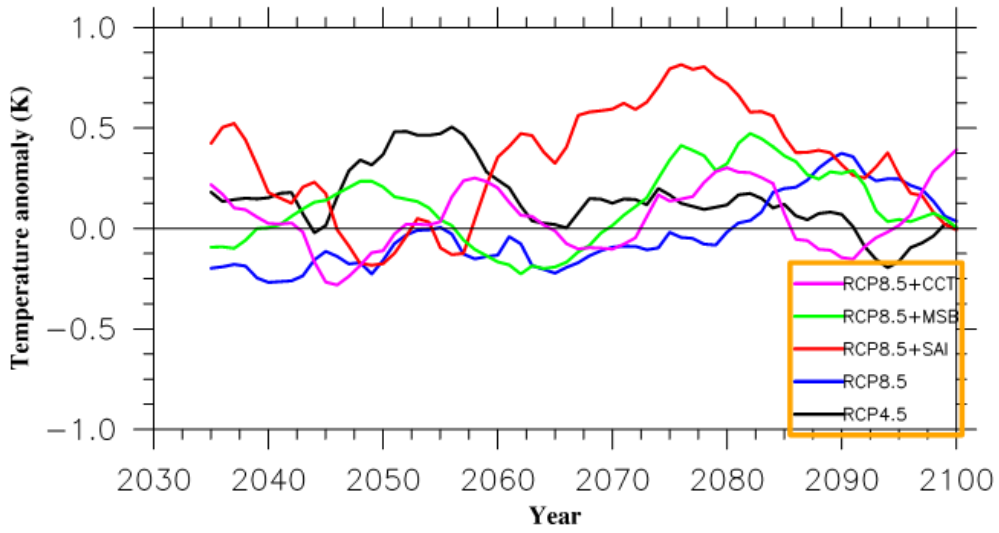


Figure S5: The ensemble mean 12-month running average of de-trended monthly temperature anomalies [K] at 50 hPa averaged between 30°S – 30°N for different experiments. Black curve: RCP4.5, blue: RCP8.5, red: *RCP8.5+SAI*, green: *RCP8.5+MSB* and pink: *RCP8.5+CCT* (note: different colour from previous plots).

The NAO index, obtained by projecting the monthly winter MSLP anomalies onto the first corresponding EOF mode, has an inter-annual variance of 0.23 in the RCP4.5 case (Figure S6). The variance increases roughly by 50% in the RCP8.5 case following the global warming. The aerosol injection geoengineering scenarios do not appear to have a strong influence on the variance of the NAO index.

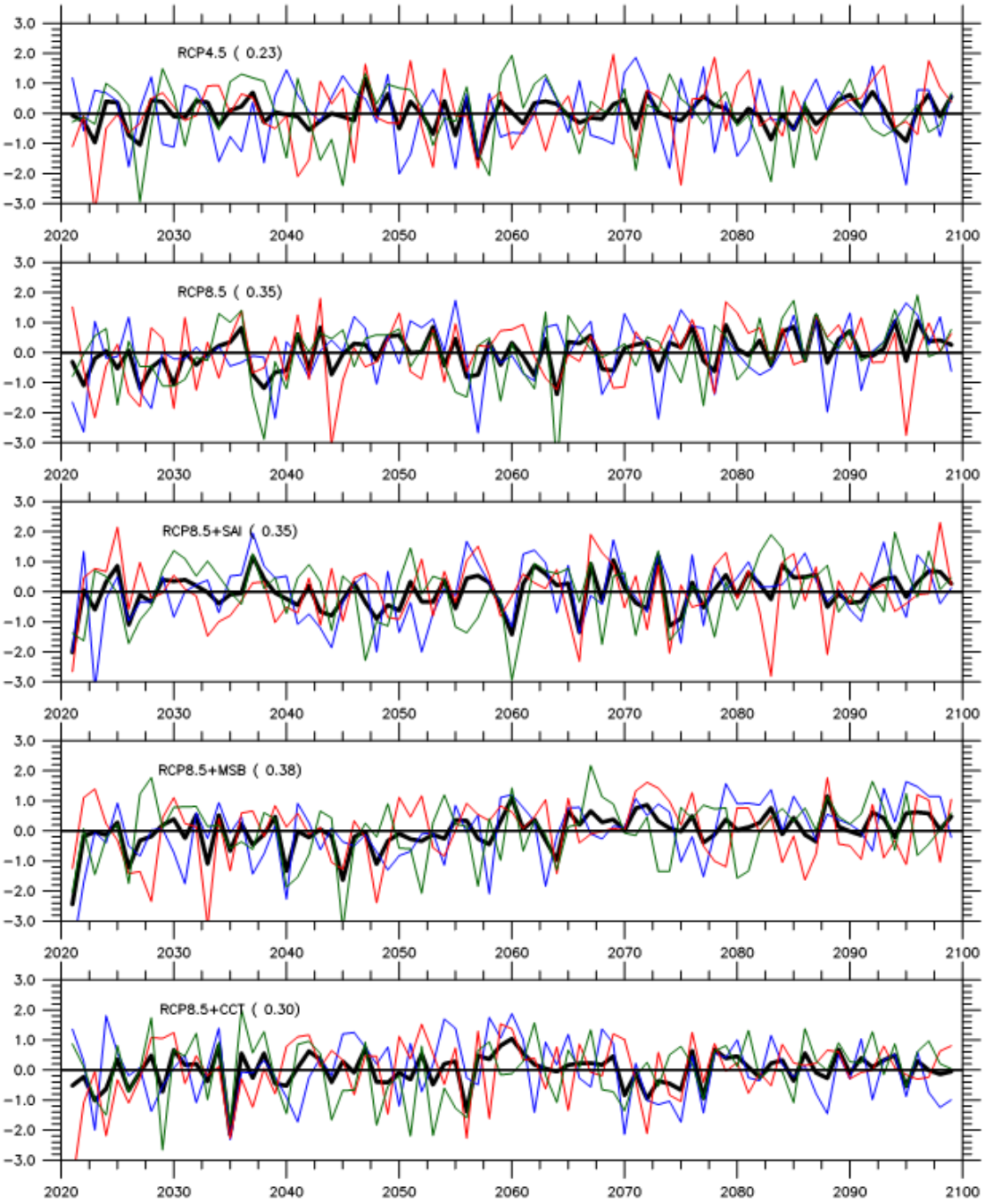
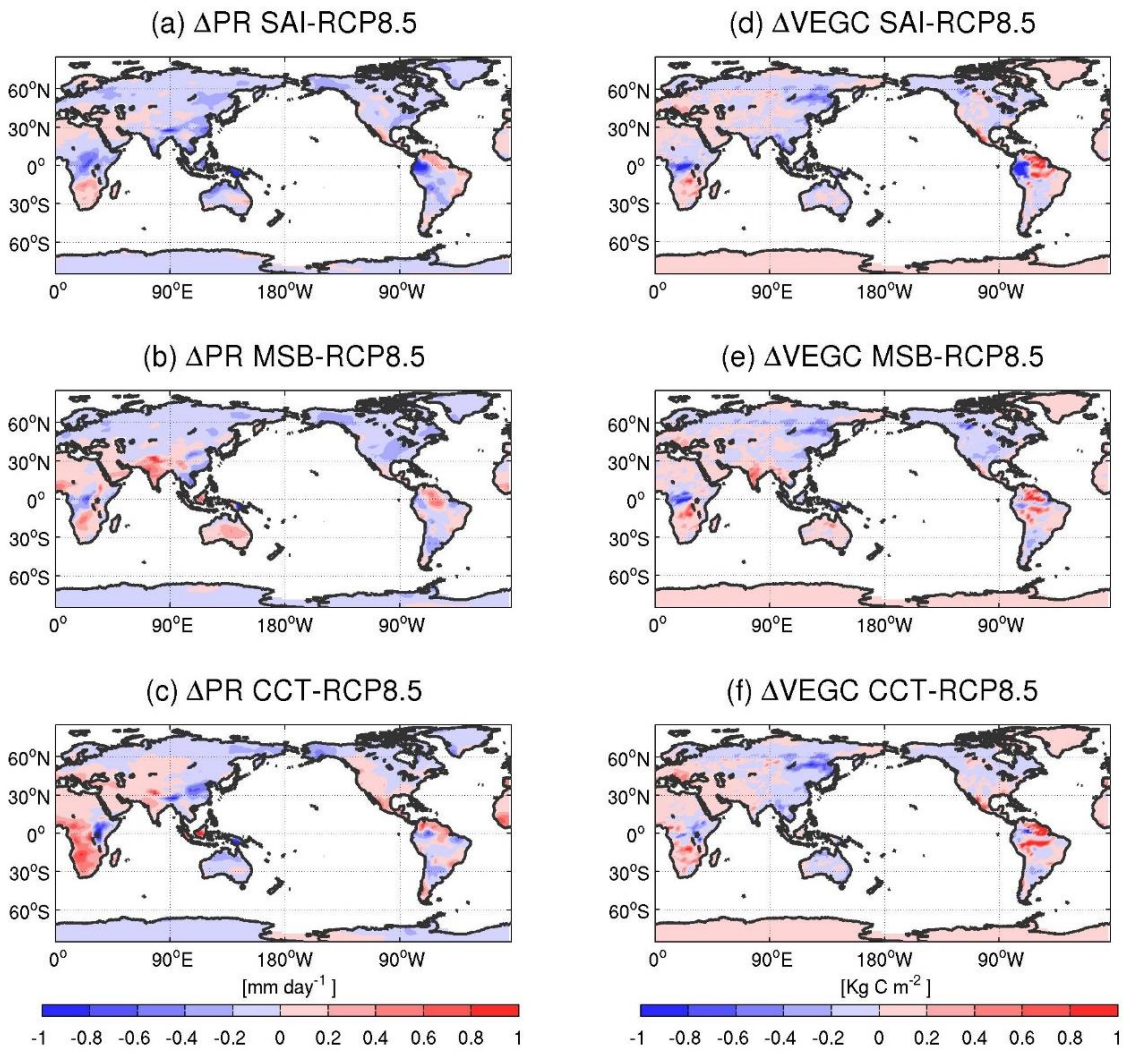


Figure S6: Standardized principal component time series indicating the inter-annual variability of the NAO index. Thin coloured lines correspond to individual ensemble members and the thick black line indicates the ensemble mean. The numbers inside the parenthesis represent the inter-annual variance.



55 Figure S7: Annual mean difference of precipitation on land from RCP8.5 [mm day^{-1}]; a)

56 *RCP8.5+SAI*, b) *RCP8.5+MSB*, and c) *RCP8.5+CCT*. Panels d-f vegetation carbon contents

57 [kg C m^{-2}] from the respective experiments.

58