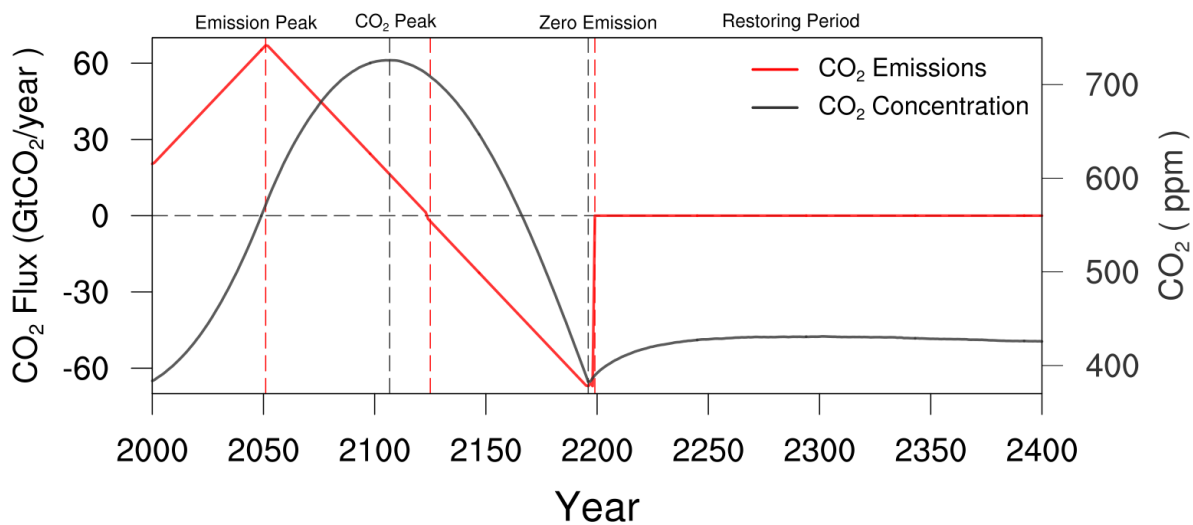# Extended Data for

Negative CO$_2$ emissions mitigate extremes of the terrestrial hydrological cycle via a vegetation physiological feedback
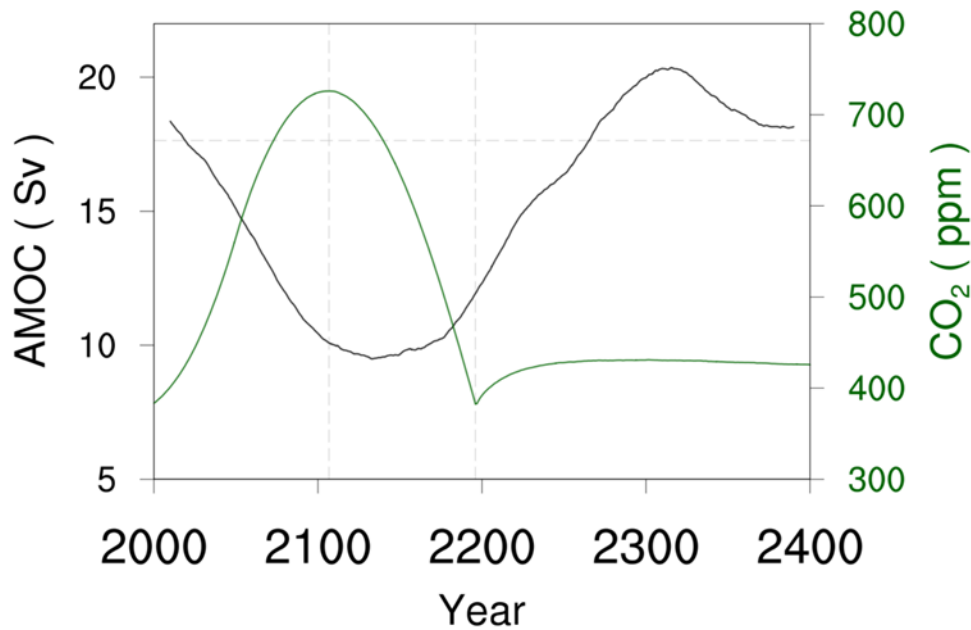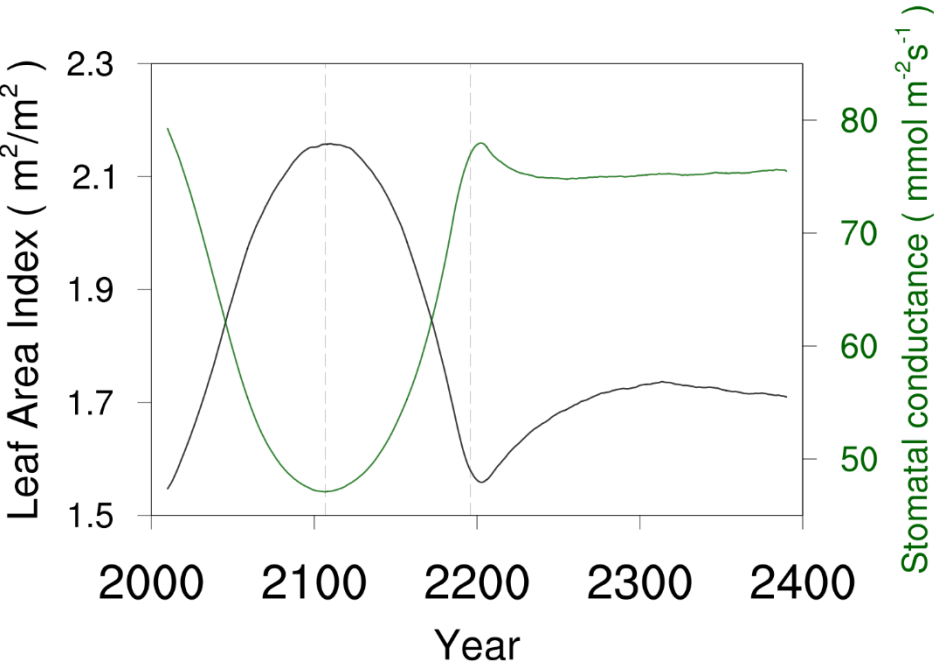
Extended Data Fig. 1 | Time evolution of CO_2 emissions and atmospheric CO_2 concentration.

Time series of anthropogenic CO_2 emissions (red) and ensemble mean CO_2 concentrations (gray)

Vertical gray dashed lines indicate the year of the emission peak and the onset of net-zero

emissions, respectively. Vertical red dashed lines indicate the year of the peak and restoration of

CO_2 concentrations, respectively.

Extended Data Fig. 2 | Time evolution of the AMOC index. Time series of annual mean the AMOC index (black) with CO_2 concentration (green). The AMOC index is defined as the maximum value of streamfunction of the meridional current at 26.7N in the Atlantic Ocean. The zonal dashed line is the period average of reference AMOC value for 2001 to 2030 years. Vertical dashed lines indicate the maximum or restored year of CO_2 concentration. All the calculations are conducted after taking the ensemble mean and the 21-year running mean.

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Extended Data Fig. 3 | Time evolution of LAI and stomatal conductance. Time series of global mean annual LAI (black) and stomatal conductance (green). Vertical dashed lines indicate the maximum or restored year of CO_2 concentration. All the calculations are conducted after taking the ensemble mean and the 21-year running mean.
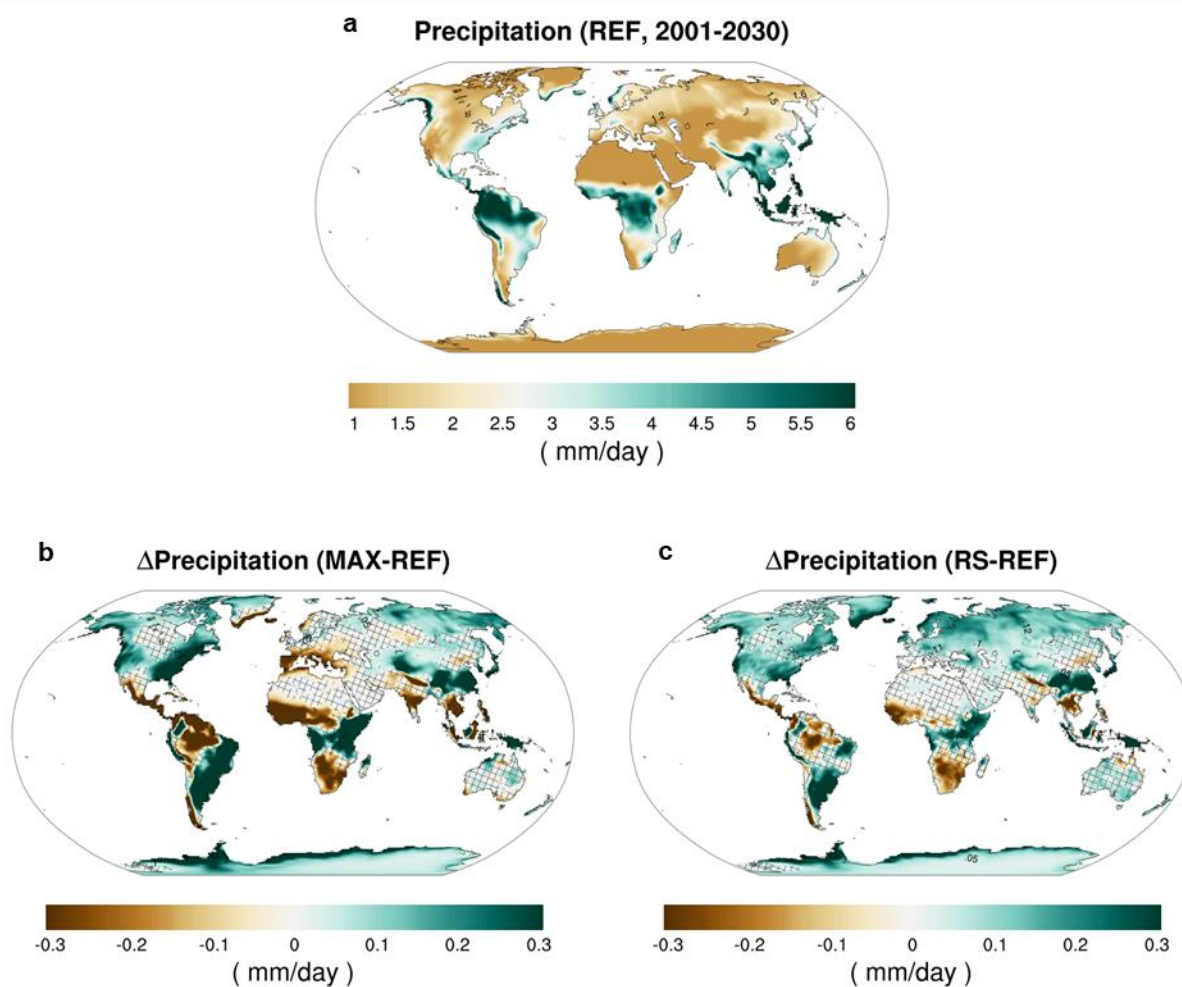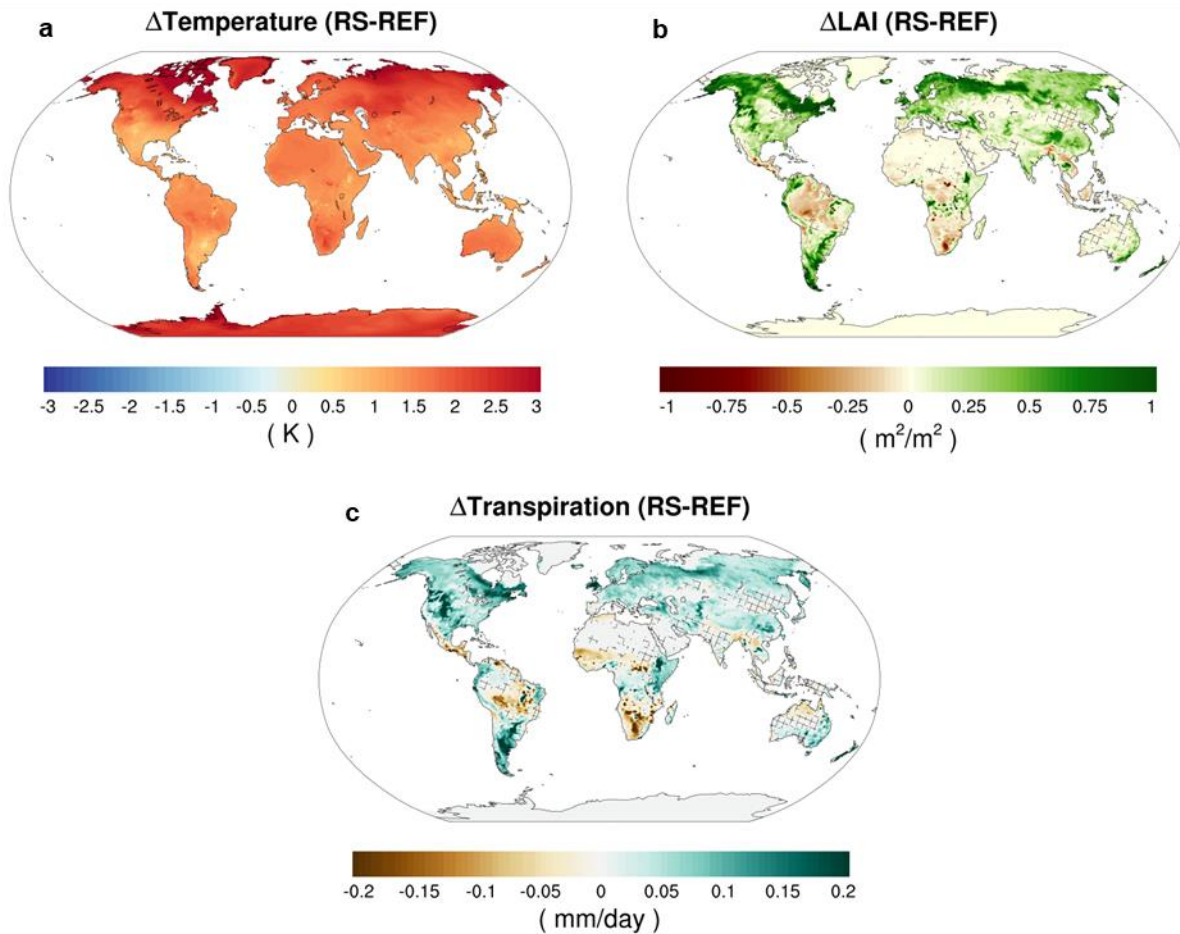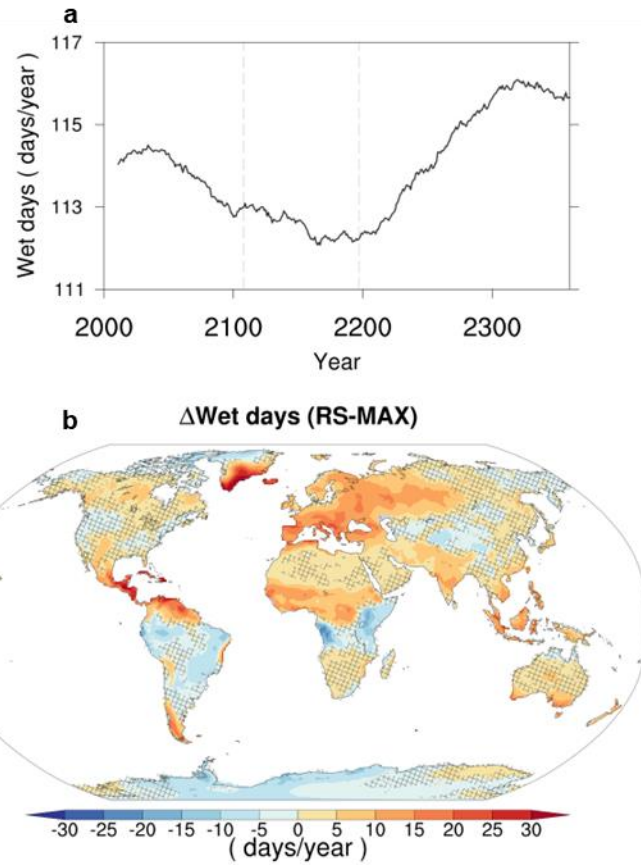
a Precipitation (REF, 2001-2030)

b ΔPrecipitation (MAX-REF)

c ΔPrecipitation (RS-REF)

Extended Data Fig. 4 | Changes in the precipitation. A, Ensemble annual mean precipitation

for 2001-2031 (REF). **b,c**, Difference in ensemble mean precipitation for MAX (2091-2120) (**b**)

and RS (2301-2330) (**c**) based on the REF period. Hatched areas denote statistical insignificance

at the 95% confidence level. The Δ symbol indicates change.

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Extended Data Fig. 5 | Changes in the temperature, LAI, and transpiration. a,b,c, Difference

in ensemble mean temperature (**a**), LAI (**b**), and transpiration (**c**) for the RS (2301-2330) period

based on the REF (2001-2030) period. Hatched areas denote statistical insignificance at the 95%

confidence level. The Δ symbol indicates change.

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Extended Data Fig. 6 | Changes in the wet days (daily precipitation > 1mm/day). a, Time series of wet days. Vertical dashed lines indicate the maximum or restored year of CO_2 concentration. All the calculations are conducted after taking the mean of three ensemble members and the 21-year running mean. **b**, Difference in wet days between RS (2301-2330) and MAX (2091-2120). Hatched areas denote statistical insignificance at the 95% confidence level. The Δ symbol indicates change.