



# Supplement of

## Potential of global land water recycling to mitigate local temperature extremes

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### **Supplementary Figures**

**Figure S1:** Central month of the warm season (three hottest consecutive months) during 1971 to 2000 in REF. Derived from the ensemble mean. Used for Figures 2, 4, 5, 6, S3, S6, and S7.



**Figure S2:** Selection of years with global mean temperature anomalies of  $\pm 1.5 \,^{\circ}$ C (red) and  $\pm 2.0 \,^{\circ}$ C (mangenta). The temperature anomalies are calculated with respect to 1861 to 1880 (grey shading). All years that are within  $\pm 0.15 \,^{\circ}$ C are selected (light red and magenta shading). From the three enseble members in REF this yields 19 model years for the  $\pm 1.5 \,^{\circ}$ C case and 18 model years for the  $\pm 2.0 \,^{\circ}$ C case.



**Figure S3:** Percentage of days when the SM conditions are below SMclim during the warm season. Depending on the grid point there are between 89 and 92 days in the warm season. The indicated value corresponds to the spatial median.



**Figure S4:** LWR-induced changes in precipitation. (top row) The same as  $\Delta$ Precip in Figure 3. (bottom row) Percentage of  $\Delta$ Precip that is due to changes in convective precipitation ( $\Delta$ Conv. P.). Blue marks regions where  $\Delta$ Conv. P. is of opposite sign as  $\Delta$ Precip. Magenta indicates regions where the absolute values of  $\Delta$ Conv. P. is larger than the absolute values of  $\Delta$ Precip. Thus, magenta and blue colors indicates that the change in convective ( $\Delta$ Conv. P.) and large scale ( $\Delta$ LS P.) precipitation are of opposite sign.

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**Figure S5:** *Changes in annual maximum 1-day precipitation (Rx1day) in absolute (top row) and relative (bottom row) terms.* 



**Figure S6:** Projected changes in hydrology for REF. Compares the future period (PROJ; 2070 to 2099) to the historical climatology (HIST; 1970 to 2000) for the whole year (left column) and the warm season (right column). Note that the colorbar spans twice the range as in Figure 3.



**Figure S7:** Changes in cloud cover between REF and the experiments. Note that the months of the warm season do not coincide with the switch in  $SW_{net}$  (Figure 5).



**Figure S8:** Temperature scaling with  $CO_2$  concentration/global mean temperature (Tg). (a) For the global land area (excluding Antarctica), (b) Central North America (CNA), (c) South Africa (SAF), and (d) South Asia (SAS). All temperatures are relative to the 1861 to 1880 mean of REF. Lines correspond to the ensemble-mean annual maximum of the area-weighted average of daily maximum temperatures (TXx) as a function of the  $CO_2$ -concentration. Grey shading indicates the ensemble spread of REF. Lines are smoothed with a LOWESS (locally weighted scatterplot smoothing) filter (Cleveland, 1979); using 6 % of the data.

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### References

Cleveland, W. (1979). "Robust Locally Weighted Regression And Smoothing Scatterplots". *Journal Of The American Statistical Association* 74.368, 829–836. DOI: 10.2307/2286407 (cit. on p. S5).