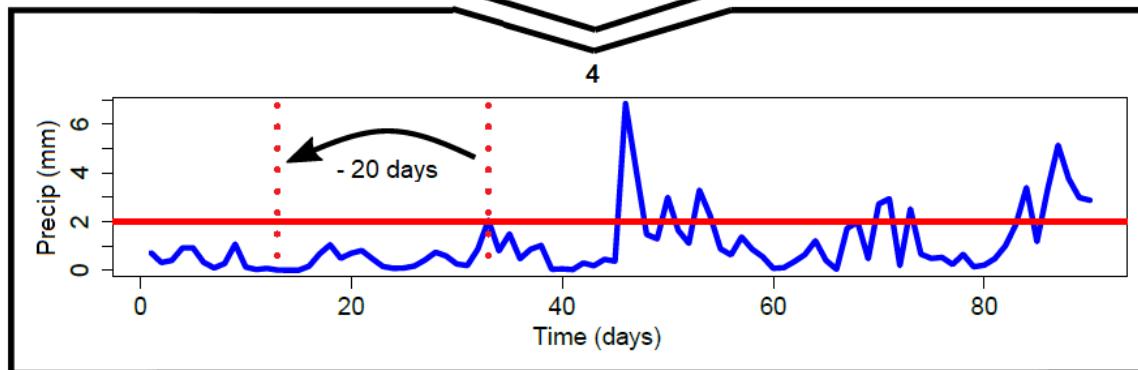
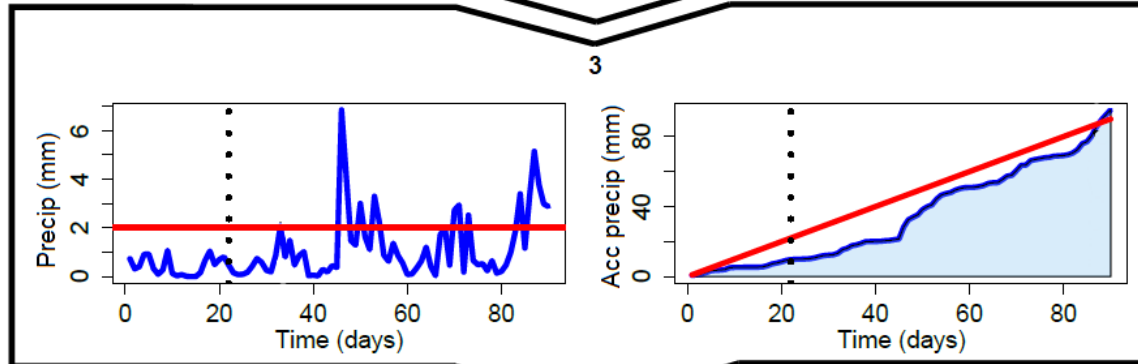
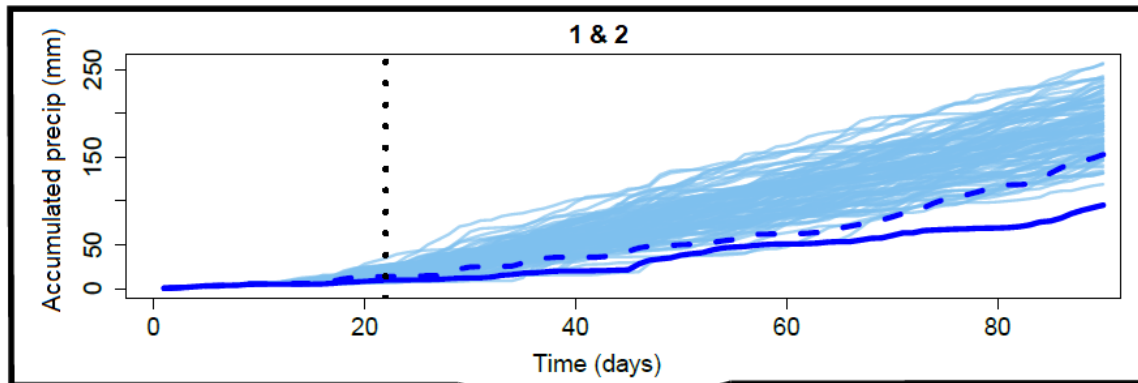
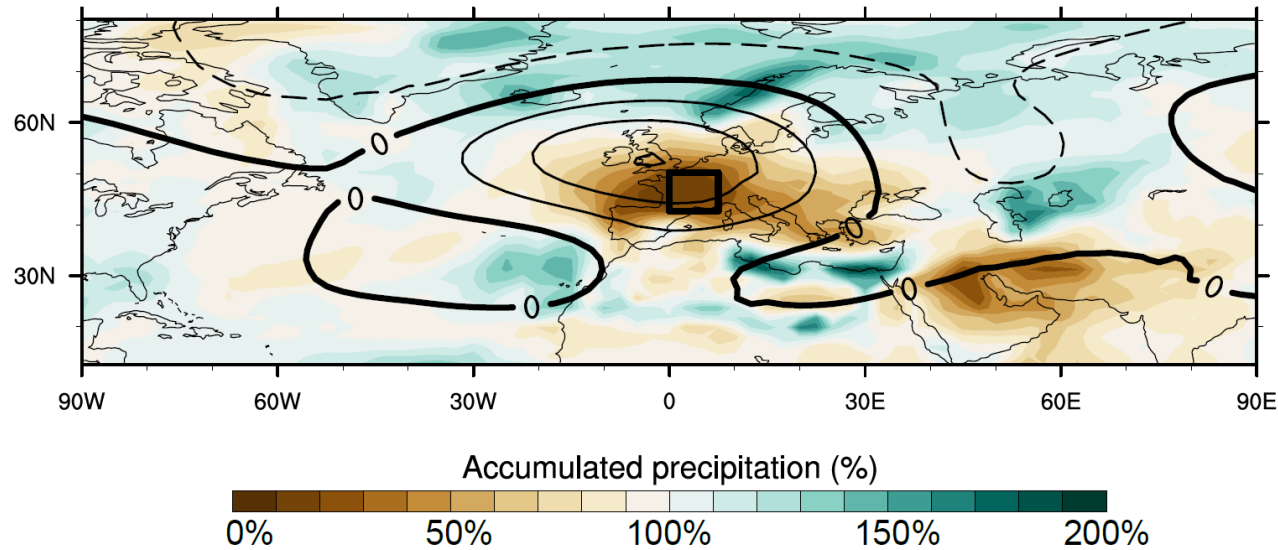


Generation of the 3-year drought storyline over western Europe



1. Run a 100-member initial condition-ensemble (solid light blue lines) and select the member with least accumulated precipitation after 90 days from the initialization (solid dark blue line).
2. Compare the new driest member (solid dark blue line) with the previous driest member (dashed dark blue line). Keep the new driest member only if it is drier than the previous driest member after 22 days (vertical dotted black line).
3. Identify the first precipitation event, i.e. a day with daily precipitation > 2 mm or a day for which the accumulated precipitation > 1 mm/day on average.
4. Jump 20 days back from the first precipitation event and run a new 100-member ensemble. Repeat from step 1.

Precipitation in the 3-year drought storyline

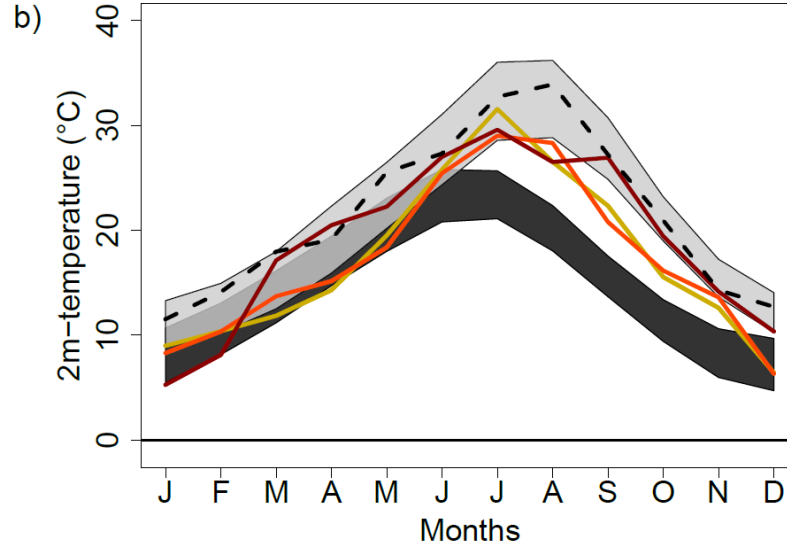
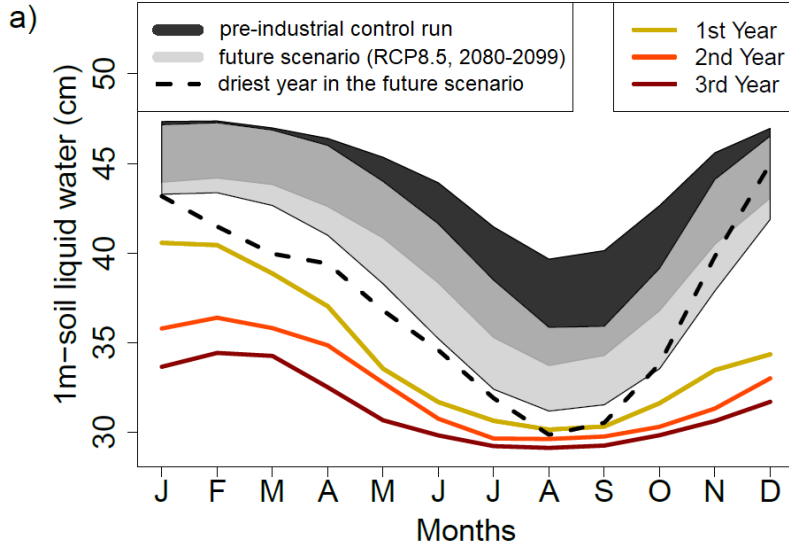


Map of accumulated precipitation (colour shading) in the full 3-year drought storyline, compared to the mean accumulated precipitation in the control run over the same period. The contour lines show the annual mean anomaly of 500 hPa geopotential height (25 gdm spacing). The black rectangle encloses western Europe, where precipitation is inhibited in the drought storyline.

Findings:

- Using ensemble resampling to inhibit precipitation can reduce the mean accumulated precipitation by ~80% over western Europe.

Soil moisture & 2m-temperature in the drought storyline

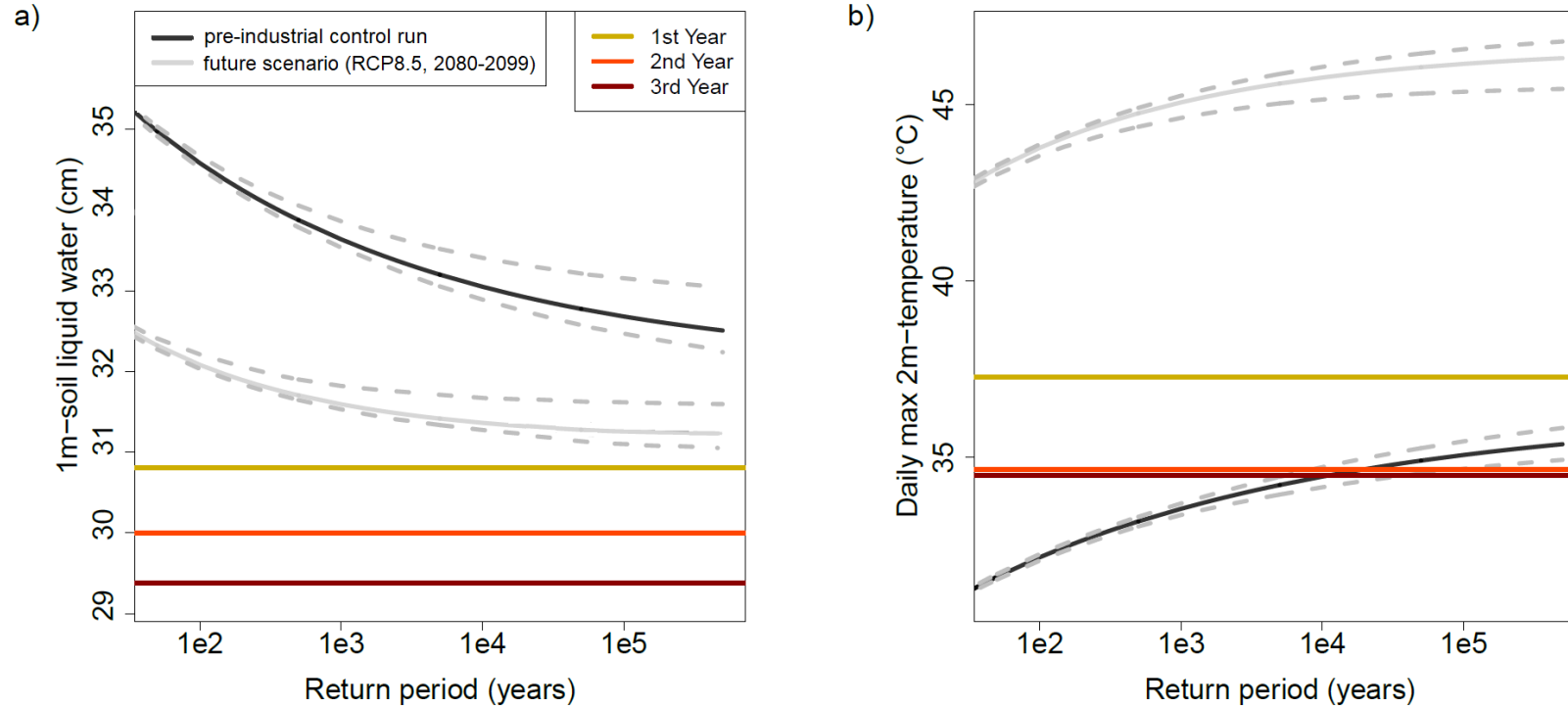


5-95% percentile range of soil liquid water (a) and daily max 2m-temperature (b) in the pre-industrial control run (black band) and future climate scenario (light grey band), averaged over western Europe. The dashed black line displays the development of the driest year in the future scenario. The colourful lines show the development for each year of the 3-year drought storyline.

Findings:

- Soils in the drought storyline are exceptional dry, compared to the pre-ind control run, but as dry as the driest event in the future scenario.
- 2m-temperatures in the drought storyline are exceptional high, compared to the pre-ind control run, but low in the future scenario.

Return periods of each year in the drought storyline

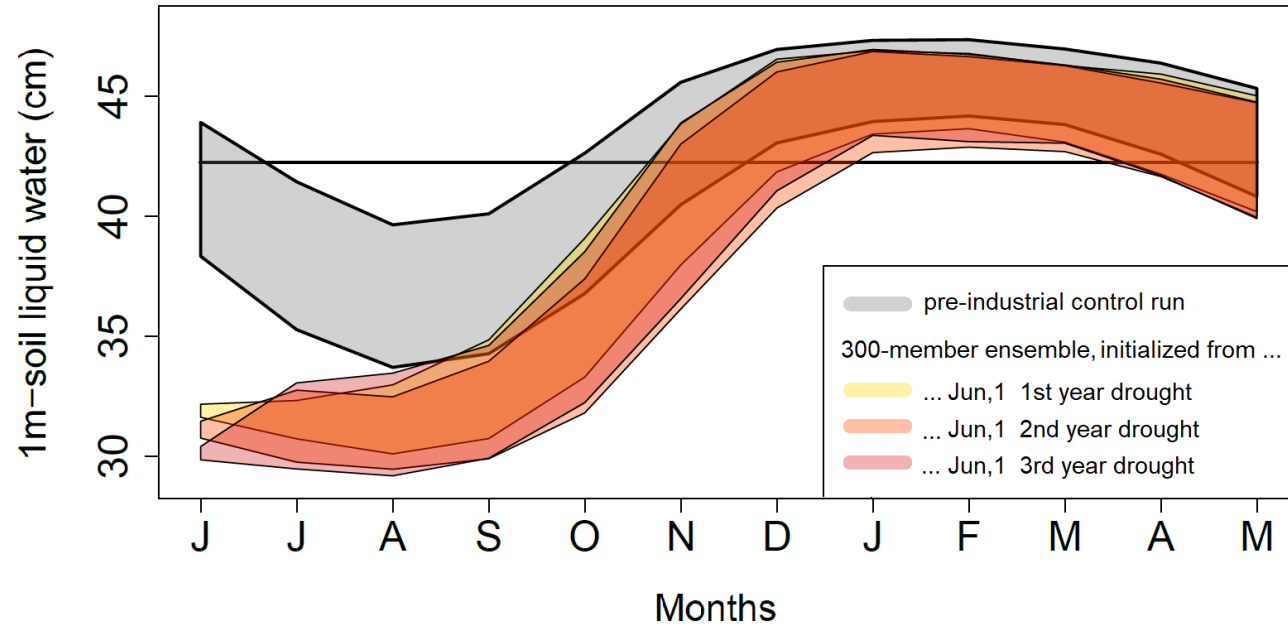


Findings:

- Very rare dehydration of the soils during the drought storyline with respect to the pre-ind control run and the future scenario.

The generalized extreme value (GEV) fit of 10-year block minima of JJA 1m-soil liquid water column (a) and 10-year block maxima of 7-day running mean 2m-temperature (b), both averaged over western Europe. The black line shows the result for the pre-industrial control run and the grey line is the future climate scenario. The horizontal colourful lines mark the respective values in each year of the 3-year drought storyline.

Recovery time of soil moisture



Findings:

- The recovery time of the soils takes more than one year, independent from which year of the drought storyline the ensemble was initialized.

5-95% percentile range of monthly mean 1m-soil liquid water in the control run (grey band) and the initial condition-ensemble with 300 members, initialized at June,1 each year of the 3-year drought storyline and running freely over the following 12 months (reddish bands). The horizontal black line shows the annual mean of soil liquid in the control run. Note that the time series starts from June.