Manuscript: Varying soil moisture-atmosphere feedbacks explain divergent temperature extremes and precipitation projections in Central Europe

Major remarks

The authors wrote an excellent paper that relates the differences in CMIP5 projections of temperature extremes (TXx) and precipitation projections over Central Europe to different soil moisture-atmosphere feedbacks in the respective GCMs. By constraining the full model ensemble with observed present-day correlations between summer precipitation and TXx, they were not only able to substantially reduce uncertainties in the projected changes of TXx, but they could also show that the constrained future changes in TXx in Central Europe are about 20% lower than projected by the full CMIP6 ensemble.

I suggest accepting the paper for publication after minor revisions have been conducted.

Minor remarks

In the following suggestions for editorial corrections are marked in *Italic*.

p. 2 - line 12
…; *Gudmundsson et al. 2017).*

p. 4 - line 10-11
It is written:
"The choice to use all available realizations was made because we found that the intra-model variability is similar to the inter-model variability for the investigated variables."

However, Table 1 indicates something different, as almost all ensemble members of the same model are located within the same group. Here, IPSL-CM5A-LR is the only exception, having one member among the wet models and all other members in the dry group. Please comment on this!

p. 5 – Sect. 3.1
You describe precipitation changes in mm/day. I suggest including also the respective changes in percentage in brackets.

p. 9 – Fig. 3 caption
It is written:
"Changes for GLACE CTL (violet) and GLACE SM20c (pink) are shown."

It seems that you mixed up violet and pink in the text.

It is also written:
"Density distributions are shown for changes during 2081-2100 (right) for the GLACE CTL (violet) and GLACE SM20c (pink)."

No density distribution are provided!

p. 10 – line 23-24
It is written:
"Until 1990 GPCC, GSWP3 and Princeton show very similar changes in precipitation indicating that the forcing datasets were using the same precipitation."

This statement is not correct. The forcing datasets are bias corrected on a monthly basis with gridded observational datasets: Princeton uses CRU precipitation (http://hydrology.princeton.edu/data.pgf.php), GSWP3 uses GPCC precipitation data.

Both CRU and GPCC are based on station data, where the set of stations may partially overlap.

p. 10 – line 34
…-028), *which* corresponds …

p. 11 – line 9
… projected to *decrease* by …

p. 11 – line 12
… the *projections are slightly* reduced …

p. 12 – Fig. 5 caption
… (orange), *very* dry …

p. 12 – line 13
We identified wet …

p. 13 – Fig. 6 caption
Green lines are mentioned, which I cannot identify in the figure. Please correct!

p. 14 – line 14
… lead *to increases* in …

p. 16 – line 14-15
It is written:
… "and enhance incoming shortwave radiation. This can directly decrease latent heat flux …"

Why an enhanced incoming shortwave radiation can directly decrease latent heat flux? Probably you mean *directly increase latent heat flux* as more energy is available at the surface?!

p. 17 – Fig. 9 caption
… (yellow) *feedback loops.*

p. 17 – line 6
… and changes *in* thermodynamics …

p. 18 – line 11
… shows *an* important …

p. 19 – line 16
… Europe, *Stegehuis* et *al. (2013)* concluded …

p. 19 – lines 14-26
For the discussion on RCMs, you may take into account results of Hagemann et al. (2009) who investigated projected changes in GCM and RCM simulations, where both models share almost the same physical packages. They found a stronger warming projected by the GCM in the summer over the Danube and Rhine catchments (representing CEU climate). They explained this difference by the finer resolution of the RCM that leads to a better representation of local scale processes at the surface that feed back to the atmosphere, i.e. an improved representation of soil moisture feedbacks to the atmosphere over the Danube and Rhine catchments.

Hagemann, S., H. Göttel, D. Jacob, P. Lorenz and E. Roeckner (2009) Improved regional scale processes reflected in projected hydrological changes over large European catchments. Climate Dynamics 32 (6), doi: 10.1007/s00382-008-0403-9: 767-781

p. 20 – line 16
Thus, this contributes …