Hydrology and Earth System Sciences Discussions

Interactive comment on "Future changes in extreme precipitation in the Rhine basin based on global and regional climate model simulations" *by* S. C. van Pelt et al.

Anonymous Referee #2

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Review of van Pelt et al "Future changes in extreme precipitation in the Rhine basin based on global and regional climate model simulations" This paper discusses future changes to precipitation as modelled by GCMs and RCMs over the Rhein basin. It applies a novel approach of bias correction of precipitation to assess future changes in return periods. The approach is tailored for hydrological applications, albeit this is not done within this study. The paper addresses an important area of climate impact studies and as I understand it develops an existing method of bias correction. However, I struggled with the method description, which was unnecessary long and complicated. Same goes for the experimental setup which made the evaluation of the results difficult.

Scientific content

The description of the method needs to be written in a more clear and concise manner. As it is now it is much too long, and quite trivial equations are excessively explained. I would suggest to try and cut it to half its current size. Even though the section is long it is not clear to me how the methodology was implemented to the climate simulations. Also, figure 1 does not add any clarity to the steps taken and should be revised to show the steps rather than resulting precipitation fields (which can be interesting to show in a figure by itself. I would also urge the authors to clarify the following points: 1.This method builds on previous work, and what is novel in this particular application? It was not clear to me which part of the methodology that was new developments. 2. Why was only 5 RCMs from the ENSEMBLES project used? There exists a much larger sample of RCMs, and I would suggest adding these to the paper, especially since the authors state that this would be useful. 3. The section on temperature correction should be deleted since it is not discussed further.

Structure and presentation

As mentioned before, the method description needs to shortened and clarified. This goes for the paper in general as well, where things are often repeated. The language is a bit too casual, and I would recommend to remove all "we" from the paper and rewriting it accordingly. There is also not necessary to describe in words what a table or figure is showing, that should be contained within the figure caption. It is also a mix of tenses, and I would suggest to stick to past tense when describing what has been done. The figures needs some improving, for example by removing the headers on figures and adding letters to describe them. That makes references in the text easier to follow as well.

Minor comments

1. P 6534, L24. You mention RCMs here, but it should be GCMs, or GCMs-RCMs

2. You mention the Rheinblick2050 project, but for a wider audience this is not known. Since you mention the ENSEMBLES project later, I would suggest to use this as reference for the RCMs.

3. P6535 L19. "better picture" is an example of a too casual language which is too fuzzy. What do you mean with a better picture?

4. P6537, L11. What is a "hydrologic winter"?

5. P6538, L15. Please provide a reference to the HBV model.

6. P6538, L16. Delete the sentence beginning with "We have…" since you mention in the following sentence which RCM was excluded and why.

7. P6538, L6. What is meant by "commonly available scenario"? The GCMs are projections of that emission scenario.

8. P6538, L8. HBV is short for "Hydrologiska Byråns Vattenbalansavdelning"

9. P6539, L9. Why mention this dataset if you did not use it? And why did you not use it?

10. The whole section 3.1.1 needs substantial rewriting and shortening, so I will nit comment on it in detail.

11. The whole section 3.1.2 is misplaced in this section, since it mixes method with results. I would suggest that you explain the smoothing, and then discuss and motivate it in the results and discussion.

12. Figure 3 is not clear to me. Is the comparison done between applying the smoothing filter or not? Or is it comparing the raw GCM compared with bias-corrected

13. The first part of section 4.1 is a method description and should be moved to that section.

14. The first sentences of section 4.2 and 4.3 are both examples of sentences that can

be deleted, since they are just repeating what is in the figures.

15. The results presented in figure 4 are not clear to me. Why compare with observed return periods and not with those over the control period?

16. Results in section 4.3 are confusing. You mention GCM and RCM ensembles created with the delta method and the bias-corrected RCMs. Perhaps I misunderstood the method, but the difference between the two datasets are not clear to me.

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