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Hydrology and Earth System Sciences
Discussions

Interactive comment on "On the importance of observational data properties when assessing regional climate model performance of extreme precipitation" *by* M. A. Sunyer et al.

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We appreciate the constructive comments of the referee, which will help to improve the quality of the manuscript. In this reply we have addressed the three issues pointed out by the reviewer and the modifications to be done to the manuscript.

1. Usefulness and properties of the 4 observational datasets:

1.1. Which observational data should one use and why?

It has never been the purpose of this manuscript to give the reader clear guidance on which data set to use when. The purpose is merely to show that observational

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data sets are very different and that the assessment of RCM performance to some extent depends on the observational data set used. Hence, the message we want to communicate to the scientific community is that one has to assess which data set is relevant to use in a given study and assess how this data set behaves with respect to relevant indices in comparison with other comparable data sets. In our opinion, much more research is needed to give a clear recommendation on which (combination of) data one should use based on an in-depth analysis of the observations, perhaps using RCM as a supplementary means of such an analysis. Hence we prefer not to give a recommendation on which observational data to use based on our study. See also our response to point 1.2.

1.2. Further elaboration on differences between the data sets

As the data sets are very different, originating from different station networks and measuring techniques we believe it is beyond the scope of this manuscript to quantify the individual influences of the different mentioned parameters. Excellent literature on the influence of different gridding techniques, of grid cell size and of measuring of precipitation are available and a more elaborate section on this can be added to the introduction to guide the reader for further studies. Specifically, we suggest that section '1.2 Precipitation observations' is extended with more elaborate referencing to previous studies in the same way as the results by Chen and Knutson (2008) are highlighted at page 7007 line 26-29. This will help the reader to literature shedding light on the matter and make us able to explain why we find it beyond the scope of this manuscript to treat it in depth.

2. Metrics used to compare different datasets:

2.1. Use of box-whisker plot

We agree that the range of the data shown in the box-whisker (or box plots) is a mix of both the magnitude of the bias and its pattern. Therefore, we appreciate the suggestion of using Taylor diagrams instead of box plots. We think that Taylor diagrams are a very good idea for the comparison of the different RCMs to the observational datasets.

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We have made these diagrams for each of the indicators used in the manuscript (see example in Figure 1), which further illustrates the differences between the RCMs when using different observational datasets as reference. However, we would like to keep the bias as the metric used to rank the RCMs, this metric is often used in comparison studies and it reflects the error in the magnitude of the indicator. Since the spread of the error and the spatial pattern are reflected in the Taylor diagram, Figure 5 in the manuscript could be simplified (for example, by only showing the value of the metric (absolute value of the median of the bias) for each RCM.

For the inter-comparison of the different observational data sets we find the Taylor diagram less appropriate, as it requires that one of the data sets act as reference and thus will appear more "right" than the others. As discussed in points 1.1 and 1.2 this is not the intention of the present work.

2.2. Use of semivariograms

We will brush up on the terminology to clarify the interpretation and use of semivariograms to avoid any confusion. We will address why we find semivariograms important and more appropriate than direct spatial correlations. Additionally, we will further emphasise that we are using semivariograms, as they have been previously used to compare RCMs performance (see e.g. Fowler and Ekström, 2009). That is why we considered them to define a metric of the RCMs performance in representing the spatial similarity.

3. E-OBS over-smoothing vs. larger data difference in semivariograms

E-OBS has been shown to over-smooth precipitation when it comes to absolute intensities; which is what is referred to at page 7024, line 6-9. This happens at the grid cell level where a lot of small-scale variation is removed in the gridding procedure. At the large scale level shown in the semivariograms this over-smoothing should mean less since it is a common bias for all cells. This difference will be clarified and highlighted in the manuscript.

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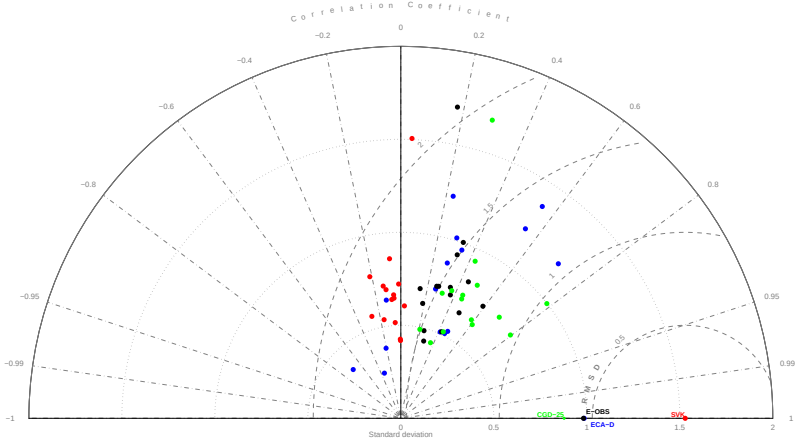

Fig. 1. Taylor diagram for the 95th percentile. The correlation coefficient, RMSD, and the standard deviation are shown for each of the RCMs when compared with each of the observational datasets.

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