Interactive comment on "Identifying robust bias adjustment methods for extreme precipitation in a pseudo-reality setting" *by* Torben Schmith et al.

Anonymous Referee #1

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This is an interesting contribution involving a lot of work. I have a few general issues that the authors should address in their revisions, followed by some specific comments.

Firstly - there needs to be a better discussion about the possible problems in using the psuedo-reality setting for assessment of precipitation extremes. Most models have a tendency to increase the probability of occurrence of rainfall, thereby increasing the size of the sample that could potentially constitute extremes. The authors have avoided this issue to some extent by performing a psuedo-reality assessment. I believe some discussion should be included as this could create difficulties in taking the findings from here to real applications.

Secondly, the paper is coming across as a bit of a report (and I sympathise with the authors as they do have a lot of information to present). Perhaps a more creative

discussion for differences in mountaineous areas versus not, coastal areas versus not, and daily durations versus hourly would be useful. I note the spatial resolution is 11km. Daily extremes should be simulated better at this resolution. Also, no mention is made of the causative GCMs that are interpolated using the RCMs. There are different extent of biases in these. Some discussion should be included on this as well.

Thirdly, the authors have missed with publications on this topic by Jingwan Li. Relevant papers are: Li, J., et al. (2017). "A comparison of methods for estimating climate change impact on design rainfall using a high-resolution RCM." Journal of Hydrology 547: 413-427. Li, J., et al. (2017). "A comparison of methods to estimate future sub-daily design rainfall." Advances in Water Resources 110: 215-227. Li, J., et al. (2018). "Addressing the mischaracterization of extreme rainfall in regional climate model simulations – A synoptic pattern based bias correction approach." Journal of Hydrology 556: 901-912. Li, J., et al. (2018). "Can Regional Climate Modeling Capture the Observed Changes in Spatial Organization of Extreme Storms at Higher Temperatures?" Geophysical Research Letters 45(9): 4475-4484.

I am a co-author on these papers hence have a conflict here. But I think these are very relevant to what the authors are attempting to do here, as she used an even finer resolution RCM with a high density of observed gauges at the same time resolution (hourly). The bias correction approach she adopted acknowledged the bias in simulating convection within the RCMs as well as the quantile bias convective and non-convective rainfall were exhibiting.

Now to the specific comments:

line 142 - missing section marker

line 225 - there is another way to create the partial series sample. It is to acknowledge that there may be a bias in the proportion of events that are say convective. If this proportion is biased, one is forming a biased sample effectively by selecting the series the way adopted here. This issue is the focus of Li, J., et al. (2018). "Addressing

the mischaracterization of extreme rainfall in regional climate model simulations – A synoptic pattern based bias correction approach." Journal of Hydrology 556: 901-912.

line497 - If the proportion of convective extreme events increases in the future (as it is expected to) then ignoring any bias in the representation of convection as discussed above, will create a non-stationary bias. This can be addressed though using the above mentioned approach.

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