Hydrology and Earth System Sciences Discussions

Hydrol. Earth Syst. Sci. Discuss., referee comment RC2
https://doi.org/10.5194/hess-2021-640-RC2, 2022
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Comment on hess-2021-640

Anonymous Referee #2

Referee comment on "Enhancing the usability of weather radar data for the statistical analysis of extreme precipitation events" by Andreas Hänsler and Markus Weiler, Hydrol. Earth Syst. Sci. Discuss., https://doi.org/10.5194/hess-2021-640-RC2, 2022

Review of „Enhancing the usability of weather radar data for the statistical analysis of extreme precipitation events”

The manuscript deals with the important and timely topic of determining design storms with return periods of up to 100 years from rather short time series of precipitation data from radar observations. The authors present a method to statistically extend time series of weather radar rainfall estimates by combining regional frequency analyses with subsequent bias correction. The results show improvement over the sampling approach by Goudenhoofdt et al. (2017) that is used as basis for their method, but uncertainties, e.g. a bias in the radar data for design storms with large return periods, still remain.

The study fits in the scope of HESS and is of interest to the research community. I have already reviewed an earlier version of the manuscript and the authors have taken some of my suggestions into account. However, some major concerns remain and new questions came up, that I listed below. I recommend major revisions of the manuscript before publishing it. I’d be happy to discuss my suggestions with the authors in the open discussion and clear up possible misunderstandings.

Major comments:

- A major concern is the minimum distance of the radar cells that are considered to statistically extend the time series of the cell of interest. As far as I understand the cells have to be at least 4 km apart. The authors mention that the typical size of a

convective cell in Germany is 40 km for hourly events according to Lengfeld et al. 2019 (p.5, l.150 in this manuscript). Therefore, the minimum distance of 4 km seems a bit too small to me, especially when considering also daily events that have a much larger typical spatial extent. The authors mention that more or less the same amount of events have been taken from all pixels, but did the authors perform any kind of independence check for the time series from the cells that are combined to a long time series, e.g. the correlation of the time series?

- The aim of the study is to determine design storms with a return period of 100 years. Therefore, a method to extend rather short time series (19 years) from radar data by using additional data from similar regions is presented and compared to a station-based interpolate product. It makes sense to have a time series of more or less the length of the return period for the radar data. Therefore, a length of 95 years has been chosen which equals a combination of 5 pixels. But there is no information on the length of the station-based products that are used as references here. To my knowledge KOSTRA is contains 60 years of data. How reliable are the estimations of design storms with a return period of 100 years from KOSTRA? How many years of data are included in BW-stat? I was wondering how fair the comparison is when using data sets with different lengths. It would be beneficial to the manuscript if the authors add some information about this.
- Although the authors extended Section 2.2 about the reference data sets some information are still missing (e.g. how many stations are considered, length of the time series, interpolation methods, etc.) A more detailed description of methods used in BW-stats and KOSTRA as well as the differences in the statistical approaches to determine design storms from those data sets is also desirable. The method for BW-Stat is briefly described in section 2.4. Maybe it would be better to have a general section about the methods first and then describe the data sets and their differences. Important information about the methods are missing that are crucial to understand the results and differences between the datasets.
- A more detailed description of the sampling process, the generation of the ensemble members, the bootstrapping method and the bias correction is needed to allow for better understanding of the results and of the choices made by the authors.
- Some findings are mentioned in the result section, but not sufficiently discussed in the discussion section. E.g. Why the spatial pattern in BW-stat is following the behaviour of RAD-BC for a return period of 1 year (p.10, l.295). Extending the discussion section and analysing the results in more depth is necessary to enhance the quality of the manuscript.

Minor comments:

p.1, l.6-8: This sentence sounds odd to me. Please rephrase.

p.1, l.17: A bracket seems to be missing here.

p.2, l.49: times series --> time series

p.2, l.62: …might not sufficient… --> …might not be sufficient…

p.4, l.107: What exactly are the methodological differences the authors mention here?

p.4, l.126: A word seems to be missing in this sentence.

p.5, l.127: Is the limitation to values between the 5th and 95th percentile really necessary? How large the outliers? Please justify this decision.

p.12, l.371: …the also the… --> ….also the…

p.12, l.372: approached --> approaches