

Interactive Discussion: Author Response to Referee #3

Brief Communication: On the extremeness of the July 2021 precipitation event in western Germany

Lengfeld et al.

EGUShpere, doi:10.5194/egusphere-2022-979

RC: *Reviewer Comment*, AR: *Author Response*, Manuscript text

Dear Referee,

we would like to thank you very much for your willingness to review this paper, and for your swift, positive and constructive response to the manuscript.

Please find our responses to your comments below. These should be considered as preliminary (part of the interactive discussion). The final implementation of changes also depends on another referee report.

Thanks again for your efforts!

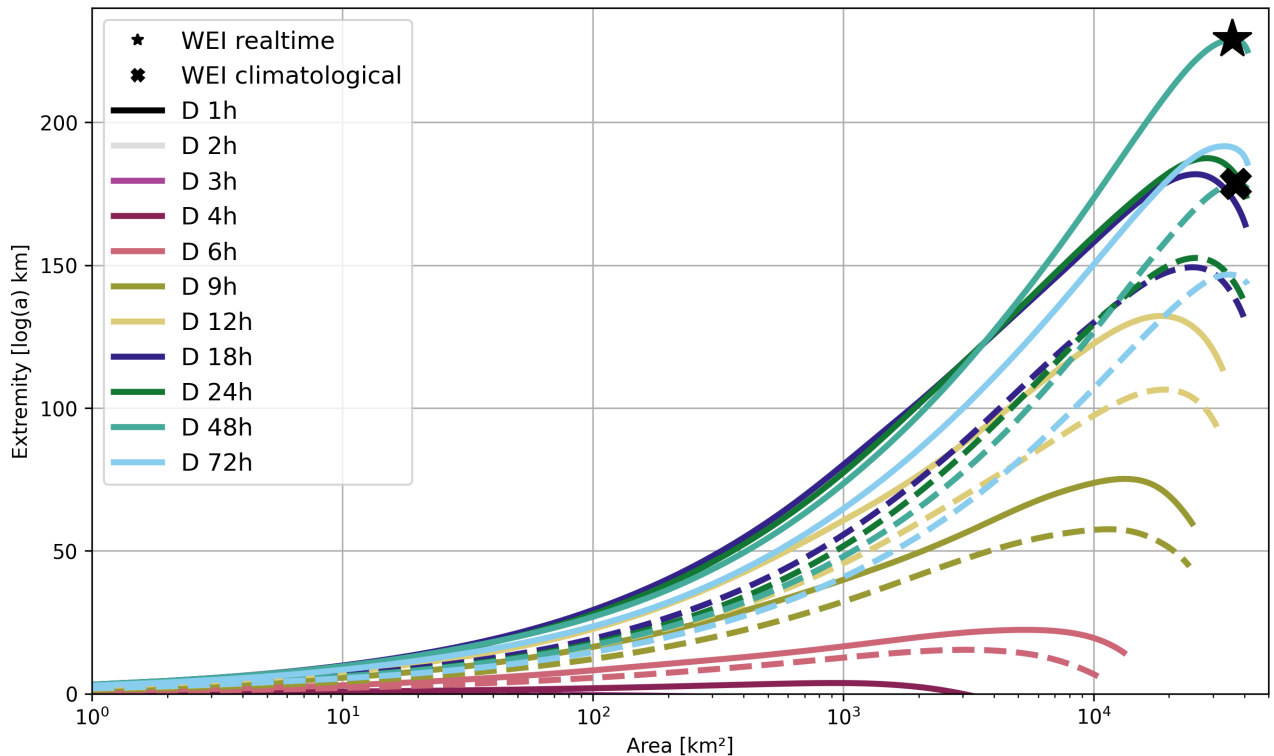
Kind regards,
Katharina Lengfeld (on behalf of the author team)

RC: *[...] The two WEI values are not obvious in Fig. 2. Moreover, they are labeled as “realtime” and “climatological” which is not the main factor of the difference as authors state at l. 66-67.*

AR: We will highlight the two WEI values with two different symbols instead of the grey lines (see new figure below) to make the difference clearer. The reviewer is right, the difference is mainly caused by including/excluding the year 2021 in the estimation of the GEV parameters. For the sake of simplicity, and to improve the readability of the manuscript, we had chosen the terms "realtime" and "climatological" for the two different scenarios as defined in lines 63-66, and hence use these names for the labels in Figure 2. To emphasize the difference between the two setups again in the figure, we will also mention it in the figure caption and change it as follows:

Extremity calculated for 14 July 2021, 23:50 UTC, with operational RADOLAN data and GEV parameters obtained from RADKLIM 2001-2020 (realtime setup: solid lines, without including the year 2021 in the GEV parameter estimation, WEI marked with a star) and from reprocessed RADKLIM data (Version 2017.002) and GEV parameters from RADKLIM 2001-2021 (climatological setup: including the year 2021 in the GEV parameter estimation, dashed lines, WEI marked with an X).

RC: *Significant decrease in both WEI and xWEI values when including the year 2021 proofs that the presented estimation of return periods is not very robust. It is natural because of the rather short length of the data series. Nevertheless, because this is the main concern of the communication, a short sensitivity analysis could be done, e.g. by the “leave-one-out” technique.*



AR: We agree that an analysis in terms of the suggested leave-one-out technique would be a useful extension in order to assess the sensitivity of the indices to the fact whether an event is included in the GEV parameter estimation or not. For the revised manuscript, we will calculate WEI and xWEI for the other four events in Tab. 1 using GEV parameters computed *without* the years of their occurrence, and add this information to Table 1.

RC: *The unique impacts of July 2021 were not only because of the precipitation event itself but partly also due to the enhanced soil moisture at its beginning. In my opinion, this fact should be more stressed in the discussion.*

AR: We agree with the reviewer that the antecedent soil moisture might have had an effect on runoff formation. We would prefer, however, to be a bit cautious with regard to that effect: first, the antecedent wetness is not directly related to the event-based extremity indices of precipitation; second, the role of antecedent wetness with regard to runoff formation and hence the impacts of the events is still subject to scientific discussion. On that basis, we suggest to add the following statement to the conclusions section, after l. 103 of the original manuscript:

Mohr et al. (2022) also suggested that, originating from the weeks before the event, the antecedent soil moisture in the affected region was relatively high, favoring the occurrence of saturation excess and thus an enhanced rainfall-runoff transformation.

RC: *line 80: adding the word “even” into the sentence (“are even less pronounced”) would make it more clear in my opinion;*

AR: Thanks for the comment. We will add the word "even" to the sentence.

RC: *line 84: I suggest to add “respectively” at the end of the sentence.*

AR: We will add "respectively" at the end of the sentence.

References

Mohr, S., Ehret, U., Kunz, M., Ludwig, P., Caldas-Alvarez, A., Daniell, J. E., Ehmele, F., Feldmann, H., Franca, M. J., Gattke, C., Hundhausen, M., Knippertz, P., Küpfer, K., Mühr, B., Pinto, J. G., Quinting, J., Schäfer, A. M., Scheibel, M., Seidel, F., and Wisotzky, C.: A multi-disciplinary analysis of the exceptional flood event of July 2021 in central Europe. Part 1: Event description and analysis, Nat. Hazards Earth Syst. Sci. Discuss. [preprint], <https://doi.org/10.5194/nhess-2022-137>, 2022.