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Hydrol. Earth Syst. Sci. Discuss., referee comment RC2
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Comment on hess-2022-70

Anonymous Referee #2

Referee comment on "Technical note: Modeling spatial fields of extreme precipitation – a hierarchical Bayesian approach" by Bianca Rahill-Marier et al., Hydrol. Earth Syst. Sci. Discuss., https://doi.org/10.5194/hess-2022-70-RC2, 2022

Comments on: Technical Note: Modeling Spatial Fields of Extreme Precipitation – A Hierarchical Bayesian Approach by Rahill-Marier et al.

The technical note presented a Hierarchical Bayesian Approach for modelling the spatial fields of extreme precipitation, aiming at simulate rainfall field when extreme rainfall occurring in one or more stations. Hierarchical Bayesian framework is applied for shrinking the rainfall in the space. In general, the technical note is well-written and mathematically rigorous. I am supportive of the publication of the manuscript if the following comments can be addressed.

- The contribution needs to be highlighted in the introduction. To my understanding, the key difference between a tradition regional rainfall frequency analysis and this spatial fields analysis is the input data, while the Hierarchical Bayesian model is not very different. Thus, it is important to clarify the contribution of this work.
- For a T-year return period, the return level at a gauge is usually calculated based on the quantile of the annual maxima, which should be independent of the model. In another word, even if calculated with different models or different subsets of data, the return level should be somehow consistent. On line 99, the logged-mean is pooled in the space, where annual maximum (from the target gauge) and non-annual maximum (from other gauges) are pooled. Since the non-annual maximum will usually be smaller than the annual maximum, will the T-year event be systematically under-estimated with the approach developed in this technical note? If so, there is a way of overcoming this shortage?
- Line 30, the definition of R_djki is hard to understand.
- Line 80. The simultaneous fraction analysis showed how many events are concurrent, while it does not provide any information on the spatial dependence of the intensity of extreme rainfall. Although considering spatial structure is important anyway, authors need to make a better justification for this sentence.