

Hydrol. Earth Syst. Sci. Discuss., referee comment RC4
<https://doi.org/10.5194/hess-2021-334-RC4>, 2021
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Comment on hess-2021-334

Anonymous Referee #4

Referee comment on "Flexible and Consistent Quantile Estimation for Intensity-Duration-Frequency Curves" by Felix S. Fauer et al., Hydrol. Earth Syst. Sci. Discuss.,
<https://doi.org/10.5194/hess-2021-334-RC4>, 2021

The authors provided a flexible model for constructing the consistent IDF curves by revising the duration-dependent formulation. They investigated the impacts of features like curvature, multi-scaling and flattening on the performance of deviation of IDF curves, and also considers the combination of these features. Overall, I think the novelty of this study is well, and that the paper is relatively well presented. Besides, I have several comments about the manuscript.

Comments:

1. In this study, the authors investigated the features of curvature, multi-scaling and flattening on the deviation of IDF curves under the stationary assumption. Particularly, the parameters of GEV are modelled as functions of duration. Do you consider the impacts of climate change on the IDF under a changing environment? There are studies who try to update the IDF curves considering the nonstationarity, such as Agilan and Umamahesh (2017) and Ganguli Coulibaly (2017), and Yan et al. (2021) provided a review about this topic. In a nonstationary model, the parameters are modelled as function of covariates, please make a discussion or outlook about this topic, which should be highlighted under the changing environment.

References:

Agilan, V., & Umamahesh, N. V. (2017). What are the best covariates for developing non-stationary rainfall intensity-duration-frequency relationship? *Advances in Water Resources*, 101, 11–22.
Ganguli, P., & Coulibaly, P. (2017). Does nonstationarity in rainfall require nonstationary intensity-duration-frequency curves? *Hydrology and Earth System Sciences*, 21(12), 6461–6483.
Yan L, Xiong L, Jiang C, Zhang M, Wang D, Xu C-Y. (2021) Updating intensity–duration–frequency curves for urban infrastructure design under a changing environment. *WIREs Water*. 2021; e1519.

2. In this study, the authors just consider the GEV distribution for the deviation of IDF, I think for the study area, lognormal or Gamma distribution may also exhibit comparative or better performance. It makes sense for engineering design to try other probability distributions and compare the results.

3. Make a discussion about the deviation of the copula-based IDF curves.
4. For Figure 3, the Quantile skill index is difficult to understand, please make a clearer legend for potential readers.