



## Comment on hess-2021-395

Anonymous Referee #1

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Referee comment on "Coastal and orographic effects on extreme precipitation revealed by weather radar observations" by Francesco Marra et al., Hydrol. Earth Syst. Sci. Discuss., <https://doi.org/10.5194/hess-2021-395-RC1>, 2021

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Investigation of extreme hydro-meteorological events in complex terrain, for example, the coastal and orographic areas, attracts increasing attention especially under the climate change. However, the interaction effect of weather system and terrain on extreme precipitation remains unclear. The manuscript entitled "Coastal and orographic effects on extreme precipitation revealed by weather radar observations" provides deep insights into the understanding of the interaction effect of weather system and terrain features on local extreme precipitation using radar rainfall data. It was high-quality from the experiment design to the effect analysis and discussion, as well as the excellent language expression. Nevertheless, I would like to point out several key questions and suggestion for the authors.

- In Abstract, the expression of "we obtain estimates of the 1 in 100 years intensities" was obscure. Did it mean the precipitation intensities?
- In Line 146 of Page 6, please list the mathematic equation of FSE index with detailed explanation of variables and parameters.
- How was the SMEV model constructed and applied to different extreme precipitation data? In Section 3.1, I highly advice the authors to use the mathematic equations to express the SMEV model structure, exceedance probability, and return levels. Math language is more precise than the text description. In addition, please introduce the novelty of SMEV.
- Were the storm and ordinary events defined only based on rain gauge data, or separately defined using rain gauge and radar extreme precipitation estimates? Furthermore, the storm events were individually extracted using multiple extreme precipitation datasets with various durations, is it right? Why the parameter  $n$  is the same for all durations? Please the author make it clear.
- About parameter  $n$ , how to use it in SMEV model in the Steps 3 and 4 of Page 7? Also, if using mathematic formula, it is easy to clarify the unnecessary confusion. Meanwhile, please make it italic here and hereinafter.
- In Line 217 of Page 8, it's doubtful that the authors implemented the bias correction and spatial interpolation of radar extreme precipitation (steps 3 to 5) based on SMEV parameters rather than precipitation itself. For the multiple parameter optimization

problem, there exists "parameter equifinality" phenomenon. Namely, very different parameter sets may lead to similar result (referring to probability distribution in this study). Therefore, a numerical value nearby the optimal parameter may be an unavailable one. Maybe we cannot "correct" or "interpolate" the estimated parameters derived from SEVE model. This is very important to the whole study. Please ensure it testable, refer and list several typical previous studies with this usage.

- The expression of "intensity distribution" occurs frequently throughout the manuscript. I know it meaning "precipitation intensity distribution" (as Line 49). However, to be accurate, I suggest the authors use "precipitation intensity distribution (PID)" or "probability density function (PDF)" instead of "intensity distribution".
- In Line 255, the GEV approach and its full name (generalized extreme value distribution) should be presented in Section 3 for the method.
- In Figure 3 (a-d), what does the proportion of the scale parameter represent? For the subplots (e-h) of shape parameter, there is no benchmark line in red, why?
- In Figure 5, only subplot (b) of 1 h duration displayed an increasing trend for the shape parameter with increasing elevation. However, the scatters and color shading in Fig. 5 (b) were very similar with those in Fig.5 (a). Please the authors recheck and discuss this inconsistency in trend.

Please also note the supplement to this comment:

<https://hess.copernicus.org/preprints/hess-2021-395/hess-2021-395-RC1-supplement.pdf>