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Hydrology and Earth System Sciences Discussions

Interactive comment on "Regional frequency analysis of heavy precipitation in the Czech Republic by improved region-of-influence method" *by* L. Gaál and J. Kyselý

Anonymous Referee #3

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GENERAL COMMENTS

The manuscript presents an application of the Region-of-Influence (ROI hereafter) pooling technique to the estimation of 1-day and 5-day annual maximum rainfall events in the Czech Republic. This topic falls, in my opinion, within the scope of HESS.

In terms of originality, this manuscript provides little advancement to the ROI technique. As a matter of fact, the manuscript appears to be a repetition of a previous research work conducted in Slovakia, only applied here to a new study area (Czech Republic). The previous work was published in HESS (Vol. 12, 2008).

Perhaps the main contribution of this manuscript is that it provides general guidelines for ROI rainfall frequency analysis in the Czech Republic. Of particular interest may be authors recommendations for selecting characteristics used for building rainfall pooling groups.

I have identified several issues related to the methods and assumptions used in the manuscript (see specific comments) that need to be resolved before the paper can be considered for publication. As such, at this point I recommend major revision and encourage the authors to improve the manuscript and re-submit it to HESS once all comments have been properly addressed.

Finally, I strongly recommend the authors to expand the current scope of the manuscript. One promising way to do that would be to analyze more (shorter) rainfall durations with the aim to ultimately develop ROI-based regional rainfall-duration-frequency models for the study area. This would bring originality, distinguish the study from the previously published work, and most importantly, would increase the practical value of the manuscript.

SPECIFIC COMMENTS

- I think what was (mostly) analyzed in this manuscript is not precipitation, but rainfall. One would want to avoid mixing solid and liquid forms of precipitation in the analysis. It would also be beneficial to run a seasonal frequency analysis and separate convective rainfall events from frontal rainfall events. This needs to be addressed in the manuscript and the terminology corrected accordingly.

- Section 2.1 states that a few errors in the dataset were corrected. Why just a few? Can all be corrected? Also, how did you define the 3-month threshold value for the exclusion of sites from the analysis?

- Section 2.2 lists the number of dry days as one of the climatic attributes and defines it as days with a precipitation amount of 0.1 mm or more. Did you mean the number of

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wet days then? Please clarify.

- Why did you not combine climatic and geographic attributes? They should have been combined in the first place. Add a new pooling to the revised manuscript that will combine the attributes and compare it to the rest of the results.

- Use regression analysis to define the weights for your dissimilarity matrices.

- The target site should not be included in the formation of pooling groups. This rule was apparently not followed here, see p281/20 and elsewhere in the text.

- Equations 6-8 should not be defined for i equals j. This would also simplify Equation 8.

- It is not clear if the size of the pooling groups varied according to the target return period, as it should.

- Some of the results are reported for 200-year rainfall events. It seems to me the 100-year pooling groups were also used to estimate the 200-year events (p292/10 - 5T set to 100 years herein). In any case, 200-year design storms are very rarely used in engineering design and should not be reported in the study.

- Did you do any sensitivity analysis on the number of Monte Carlo simulations?

- Why perform regional ROI analysis based on a single site attribute?

- The pooling groups are rather large. What significance level was used in the homogeneity testing? Perhaps a higher significance level should have been used instead.

- Are you sure the BIAS and RMSE values in the tables are already in [%]? They seem to be extremely small for indirect (regional) estimates. If the values were multiplied by 100, they would start to make more sense.

- I would like to see a table that would summarize the size, degree of homogeneity, and the average spread of sites for the different pooling approaches.

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Interactive Comment

- The English grammar needs to be improved.

TECHNICAL CORRECTIONS

- Abstract - does not read well because of the excessive use of passive sentences.

- p274/10 - input site attributes is an awkward term. Use pooling attributes instead. Also change: Finally, several rainfall frequency..

- p274/20 - I would call frequency analysis that aims at hydro-climatologic phenomena a specific field of statistical hydrology/climatology.

- p274/20 - change heavy hydro-climatologic phenomena to extreme.

- p275/5 - I do not think regional models are superior to at-site models. Regional models were developed for the estimation of design flows/storms at ungaged locations, and such complement, but should not compete with at-site models.

- p276/5 - change to north-central Italy.

- p276/20 - the three criteria need to be reformulated; e.g. the first criterion is really spatial coverage; the second relocation of stations, etc. The text does not read well when one expects criteria but gets statements instead.

- p276/20 - change to other sources of heterogeneity.

- p277/20 - precipitation climate is very unusual and confusing term.

- p277/25 - change the title of section 2.2 to Pooling attributes.

- p279/10 - was this normalization or rather standardization?

- p280/5 - target site is deemed to be ungaged, so there cannot be a single-site group.

- p280/10 - the process can also be terminated if 5T is reached.

- p282/10 - I do not think the analysis of Hosking & Wallis or any part of it has already become classical.

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Interactive Comment

- p282/15 - regionalization vs pooling and regions vs pooling groups; correct the terminology and use it consistently throughout the text.

- p282/20 - before we had 1-day and 5- day, now there is a 7-day amount. Explain.

- p283/5 - the index storm standardizes the data.

- References - incomplete; e.g. Clausen & Pearson is 1999 in the text and 1995 in the refs; did not find Baldassarre et al (2006), GREHYS et al (1996b), etc.. in the text.

- Table 4 - what is the target return period for these ROIs?

- Figure 1 and 4 - the symbols would be more discerned if the background image was turned off. I can hardly see the symbols because of the topo shading.

Interactive comment on Hydrol. Earth Syst. Sci. Discuss., 6, 273, 2009.