



Interactive comment on “Introducing empirical and probabilistic regional envelope curves into a mixed bounded distribution function” by B. Guse et al.

B. Guse et al.

bguse@hydrology.uni-kiel.de

Received and published: 6 October 2010

We would like to thank the anonymous referee#1 for the very helpful advices and the constructive suggestions to improve our manuscript. We listed below our comments to the remarks point-by-point.

Remark 1) This paper deals with the question how the uncertainty of flood frequency analysis can be reduced by inclusion of additional information. This is a relevant and very actual question of hydrology and water resources management, perfectly fitting in

Full Screen / Esc

Printer-friendly Version

Interactive Discussion

Discussion Paper



the scope of HESS. The authors propose a novel approach which allows using regional information of extreme floods, gained by probabilistic envelop curves to better model the upper tail of the extreme value distribution. In addition, a bounded behaviour of the EV distribution is assumed, and information from PMF considerations is used to give further guidance about the shape of the upper tail.

The paper is generally well structured. However, the overall presentation of the paper could be improved. After a nice introduction, the paper merely reads like a report, focusing on many pieces of results, rather than presenting the story to the reader. The writing could be more fluent. Some sections are not concise and need to be rephrased to transport the ideas of the authors more clearly (especially most parts of section 3). Section 4.1 gives extensive information, which could be condensed.

Answer 1) We are thankful for these general comments to our manuscript. We carefully check the sections 3 and 4.1 and improve the understanding of these sections and condense the information. Our revised manuscript will be more focused on the core points of our study.

Specific comments (addressing individual scientific questions/issues)

R 2) 4261 (6-9) Unclear how to calculate probability of PREC

A 2) We rephrase the description of the calculation algorithm of the probability of PREC. However, we think that it is not required to explain the full algorithm in detail, since the PREC algorithm is not in the focus of this manuscript. A very detail description of each step of the algorithm would lead to a different focus of this study. For further interest, we add the relevant references (Castellarin et al., 2005, Castellarin, 2007, Guse et al., 2009, 2010).

R 3) 4261 (19) – 4262 (9). The section is difficult to read, consider rephrasing. Focus on the main information for this paper.

A 3) We reduced this section to the main information, which is relevant for this paper.

Full Screen / Esc

Printer-friendly Version

Interactive Discussion

Discussion Paper



For further information, the relevant references are added.

R 4) Use the term “cross-validation” instead of “jackknifing” (many statisticians differentiate between the terms cross-validation (of model performance, like in this case) and jack-knifing (parameter testing. . .)).

A 4) We change “jack-knifing” into “cross-validation”.

R 5) Section 3.4: Again, you could present the story more clearly! What are the differences (in theory) and how they are fulfilled / or consequences for Saxony.

A 5) We clarify that we present in section 3.4 the differences between empirical and probabilistic regional envelope curves, which were particularly observed in the Saxon study. We do not repeat the theoretical differences which became clear in the Sect. 3.1-3.3. We rephrase Sect. 3.4 so that it becomes clear that we compare the results of the Saxon applications.

R 6) Line 23: Where do results come from?

A 6) The results come from the former studies (Guse et al., 2009, 2010). The values 6.7×10^{-4} and 6.7×10^{-3} are the inverse of 150 and 1500 years. We add this information and the reference to the revised manuscript.

R 7) 4271 (9-14) Comparison of GEVsim and GEVsim-prec: Why can inclusion of regional information lead to an increase all over the region? Where does this information come from, if not from observed data? Could this point to a possible bias of PREC?

A 7) GEVsim-prec estimates larger discharges than GEVsim for the majority of the sites, but not for all. It is clear that this information come from the observed data. This aspect illustrates a particularity of the PREC method. The magnitude of the PREC discharge is estimated by the largest standardised flood of record. Hence, for this site, the PREC discharge is identical with the observed flood of record. For all the other sites, the estimated PREC discharge is larger than the observed flood of record. The site which governs the magnitude of PREC differs among the different PREC realisa-

Full Screen / Esc

Printer-friendly Version

Interactive Discussion

Discussion Paper



tions. However, since the analysis is based on observed data, a couple of sites, i.e. in particular the sites with large unit floods of record, represent very often the largest standardised flood of record whereas a large number of the sites governs the PREC magnitude rarely or never. In the latter case, the difference between the PREC discharge and the at-site flood of record can be relatively high. These aspects explain that GEVsim-prec is larger than GEVsim for the majority of the sites. For further interest, we refer to Guse et al. (2010), in which the particularity of the largest standardised flood of record was considered in detail.

R 8) Section 5.4: This is a nice analysis. Can you also include quantifications of the individual effects?

A 8) In Figure 9 we compare the three different choices in an overall analysis. Furthermore, in Figure 10, we illustrated the relative influence of the three choices for each site. By doing so, the individual effects for each site are illustrated.

R 9) Section 6: The studies yields that the choice of the inflection point has a major effect on the estimated flood quantile. Can you give guidance how to choose the inflection point?

A 9) We selected the inflection point according to the aim of our study and the available data and PREC results, respectively. Based on the observed data, flood quantiles up to about 100 years can be estimated by at-site analysis. The recurrence interval of interest was 1000 years. Hence, we checked intermediate inflection points (200 and 500 years) to quantify the sensitivity of this choice. We finally selected an inflection point of 500 years, because the higher inflection point leads to a better consideration of the PREC flood quantiles. The larger the inflection point, the larger is the effect of the PREC flood quantiles.

Technical corrections (compact listing of purely technical corrections, e.g. typing errors)

R 10) 4254 (6) The large flood quantiles . . .

Full Screen / Esc

Printer-friendly Version

Interactive Discussion

Discussion Paper



A 10) We change it.

R 11) 4256 (6): extreme flood events

A 11) We change it.

R 12) 4256 (13): For instance, the two-component. . .

A 12) We change it.

R 13) 4257 (1): The key question is then how to derive an estimate of the upper bound. This should be highlighted in the text.

A 13) We add a comment as proposed.

R 14) 4257 (16-21) unclear

A 14) We restructure this section and clarify the main idea of PRECs.

R 15) 4257 (21) Include a sentence like: This is the basis for including ECs in unbounded distribution fct.

A 15) We add a sentence as proposed.

R 16) 4259 (10) rephrase and better explain: “floods of record of regional sites”?

A 16) We rephrase this sentence and clarify this term.

R 17) 4260 (18-23): This is partly not correct (18-19), partly redundant (22-23) and partly not easy to understand. You could say something like: The index flood method assumes similar higher moments. The mean of A.M.S. is commonly used as the index, which is closely related to catchment size. Hence, the slope . . . can be determined by . . . (Fig. 3). In addition, the maximum floods of each record are plotted, and the intercept a is estimated by shifting the regression line up to the largest unit flood of record (Castellarin et al., 2005).

A 17) We thankful for this very detailed suggestion. We clarify and improve this section

Full Screen / Esc

Printer-friendly Version

Interactive Discussion

Discussion Paper



and also include the recommendation of the other referee (remark 1). We think that the part in lines 22-23 is worth to be included because the particularity of the largest standardised flood of record needs to be clearly emphasised.

R 18) 4260 (28) In this paper, (?) the cross-correlation. . .

A 18) We restructure the description of the PREC calculation algorithm. In this context, this sentence is not included in the revised manuscript.

R 19) 4261 (4) I did not understand why so many (up to 127) PREC realisations emerge.

A 19) We used 20 candidate sets of catchment descriptors for 5 applications of cluster analysis (cluster sizes from 3-7) and 3 applications of the Region of Influence (three different thresholds in the Euclidean space) (Guse et al., 2010). Hence, for each site 160 pooling groups are constructed (100 by cluster analysis, 60 by Region of Influence). The number of 127 PREC realisations means that 127 of these 160 pooling groups are homogeneous ($H1 < 2$).

R 20) 4261 (6) replace “for the pair of the unit flood of record and its corresponding catchment size” with for each unit flood of record

A 20) We clarify this sentence. The exceedance probability is assigned to the pair of the unit flood of record and its corresponding catchment size which governs the REC and is valid for all sites of the region.

R 21) 4262 (1-3) Please explain why!

A 21) The idea of this manuscript is an improved estimation of flood quantiles by introducing PREC flood quantiles. In a former study, the performance of PRECs was checked (Guse et al., 2010). A PREC realisation with a lower performance error should give better additional information than those with a larger relative error. The upper tail of a distribution function won't gain by the inclusion of PREC flood quantiles with a large relative error. Hence, we decided to remove all PREC realisations with a performance

Full Screen / Esc

Printer-friendly Version

Interactive Discussion

Discussion Paper



error higher than two. A high performance error was estimated for sites with a relative small flood of record in comparison to the PREC discharge (see Fig. 7 in Guse et al., 2010).

R 22) 4271 (3) You could note that vast majority of basins follow the “Gera” type.

A 22) We agree that it is necessary to say that the majority of the sites belong to this group of sites (“Gera” type). Hence, we include this aspect in the revised manuscript.

R 23) 4271 (5) Change past tense to present tense (I first thought you are referring to an antecedent analysis rather than introducing the structure of the section. . .)

A 23) We change it.

R 24) 4271 (26) Include 1-2 sentences how Fig. 9 is organised.

A 24) We add two sentences to improve the understanding of the results of the sensitivity analysis which is shown in figure 9 including a link to Sect. 4.3 (methodical explanation of the sensitivity analysis).

REFERENCES

Castellarin, A.: Probabilistic envelope curves for design flood estimation at ungauged sites, *Water Resour. Res.*, 43(4), W04406, doi:10.1029/2005WR004384, 2007.

Castellarin, A., Vogel, R.M., Matalas, N.C.: Probabilistic behaviour of a regional envelope curve, *Water Resour. Res.*, 41, W06018, doi:10.1029/2004WR003042, 2005.

Guse, B., Castellarin, A., Thielen, A.H., Merz, B.: Effects of intersite dependence of nested catchment structures on probabilistic regional envelope curves, *Hydrol. Earth Syst. Sci.*, 13, 1699-1712, doi:10.5194/hess-13-1699-2009, 2009.

Guse, B., Thielen, A.H., Castellarin, A., Merz, B.: Deriving probabilistic regional envelope curves with two pooling methods, *J. Hydrol.*, 380(1-2), 14–26, 2010.

Full Screen / Esc

Printer-friendly Version

Interactive Discussion

Discussion Paper



Interactive
Comment

Full Screen / Esc

Printer-friendly Version

Interactive Discussion

Discussion Paper