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Hydrology and Earth System Sciences Discussions

Interactive comment on "Effects of intersite dependence of nested catchment structures on probabilistic regional envelope curves" *by* B. Guse et al.

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We would like to thank the anonymous Referee#2 for the precise comments to our manuscript. The Referee's main comments raise some very interesting points. We agree with the Referee that we should address these points to improve our manuscript. Our point-by-point replies are listed below.

1) The paper deals with regional flood frequency analysis, in particular the effects of intersite correlation in the presence of nested catchments, using the Probabilistic Regional Envelope Curve (PREC) method. Because this method requires a high degree

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of homogeneity, the paper also maintains a strong focus on the effects of different degrees of heterogeneity. Thus, the paper appears less focused than what could be expected.

In the revised version, we focused more on the effects of the different parameter sets of the cross-correlation function on the recurrence interval of PREC. Therefore we reduced the part that concerns the effects of heterogeneity.

We decided to summarise the section 4.8 and 4.9, which became one section in the revised manuscript, and we decided to drop Figures 10 and 12. In addition, in order to get a more concise and focused manuscript, we decided to drop entirely the part of the results reporting on the threshold of the heterogeneity measure to H1<4 (see original manuscript, section 4.9; figures 12 and 13) referring only to the thresholds H1<1 and H1<2.

The PREC concept is based on the assumption of homogeneous pooling groups (see Castellarin et al., 2005). The homogeneity was checked by the heterogeneity measure. In this test, H1<1 means that a region is homogeneous and H1<2 that the region is possibly heterogeneous. H1>2 indicates that the region is heterogeneous. By comparing H1<1 and H1<2 the relevance of different degrees of heterogeneity were examined without neglecting the PREC concept. Then, our results clearly coincided with the original PREC concept and the homogeneity criteria of the index flood hypothesis.

2) In their literature review the authors claim that “only little guidance is given on the effects of intersite correlation in estimating regional quantiles”. Several papers, however, have addressed this topic in detail, e.g. Madsen and Rosbjerg (1997a,b) in a partial duration series context, and Kjeldsen and Rosbjerg (2002), Kjeldsen and Jones (2006), and Rosbjerg (2007) in an annual maximum series context.

We are thankful to Referee#2 for the relevant references. In the revised manuscript, we emphasised the elements of novelty of our study relative to previously published works. We reorganised the introduction and, in particular the part, that considered

HESSD

6, C1375–C1378, 2009

the relevance of intersite correlation for regional flood frequency analysis by including these relevant references.

According to the recommendation, we removed the sentence on p2847, line 25 mentioned by the Referee.

3) Is the use of the Hazen plotting position (PP) an essential part the PREC method? If so, it is not well explained. If not, why is it chosen? Usually it is not an optimal choice.

Castellarin (2007) investigated the use of different plotting positions in detail by developing the PREC method. The author concluded: "Hazen PP is suitable for the GEV distribution and the PREC framework for a wide range of shape parameters k" (paragraph 65 in Castellarin (2007)). The GEV distribution is also a suitable parent distribution for the case study considered in our study and therefore, we adopted the Hazen PP. We referred to Castellarin (2007) and explained the conclusion of this study in the revised version of our manuscript.

Since we did not change any aspect of the original PREC concept except of the parameter sets of the cross-correlation function, we decided to refer to the original studies for backgrounds of the PREC method (Castellarin et al., 2005; Castellarin, 2007).

4) The structure of the paper could be improved by keeping theory and its application in the study area better apart and, as indicated above, maintaining a stronger focus on the main objective.

The revised version of the manuscript was characterised by a definitely stronger separation between theory and application.

We revised section "Results" more focused on the main objective of the study, i.e., the impact of different parameter sets for nested and unnested catchment relationships on the application of the PREC approach. Therefore we reduced the results of different threshold of the heterogeneity measure (see reply to Referee's comment 1).

Also in the introduction we focused more on our core idea. In this way, we restructured

HESSD

6, C1375–C1378, 2009

the description of our main idea and we emphasised the novelty of our study.

5) It should be considered if all the figures really are necessary.

We removed Figures 4, 6b, 10 and 12.

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