

Interactive comment on “On the quest for a pan-European flood frequency distribution: effect of scale and climate” by J. L. Salinas et al.

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Response to R. Romanowicz (Referee)

The authors acknowledge the referee for the review, specially for pointing out the importance of other important controls in flood regimes, particularly snow-dominated ones. Corrected manuscript(s) will be uploaded within the next days, including the changes cited below. The original referees comments will be formatted in *italics*, and the authors' response in **bold**.

The aim of the paper is to harmonise and homogenise (summarise) the current state of knowledge on the approach to flood frequency estimation across Europe based on the first available pan-European inventory database created as part of COST Action

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ES0901 (FloodFreq). The authors describe the present state of national guidelines for flood frequency estimation in Europe, which are available in 9 out of the 15 surveyed countries. The first reviewer rightly noticed that the paper has two separate parts that address two different questions. The first question is about the existence of parent distribution based on the whole pan-European database. The second question is looking for the relationship between the distribution characteristics, under a chosen classification scheme.

Indeed, there are two differentiated parts in the manuscript. The overall topic is regional flood frequency distributions in Europe, but two different science questions are addressed that could be regarded as independent, as the reviewer F.Laio has pointed out. Connected to point nr.3 (details below), a considerable amount of additional analysis has been performed on the “first part” of the paper, in particular a new set of Monte Carlo simulations taking into account, among others, the effect of sample length. Three new plots, two new tables and one subsection are included in the new corrected manuscript. Unfortunately, this substantial extension of the “first part” of the paper could cause, even more strongly, as the reviewer states, that the reader loses attention in the final part. Mainly for this reason, the authors have decided to split the manuscript in two parts, which are more balanced in length and content: Regional parent flood frequency distributions in Europe – Part 1: Is the GEV distribution a suitable pan-European parent? Regional parent flood frequency distributions in Europe – Part 2: Climate and scale controls. The authors think that now the two parts have even more differentiated and direct science questions with independent conclusions and take home messages. From the technical point of view (following instructions of the Ms Topfer from the Copernicus editorial team), the HESSD discussion of the paper that is being reviewed now will continue, and as “post-referee review corrected manuscript”, the two parts paper will be submitted. The final decision will be taken by the handling editor.

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The authors base their analysis on the ratio of L-moments derived from the data and they investigate links between hydrological processes and L-moment ratios. The classification is based on the MAP and the catchment size. These two catchment characteristics were chosen due to their general accessibility. However, it seems that the other catchment characteristics, such as catchment elevation (and gradient) or the existence of snow-induced floods should also be taken into account (Merz and Blöschl, 2003). The best approach would be to perform an analysis of different catchment characteristics to choose those that have the strongest influence on the flood frequency indices. **The authors completely agree on this comment of the reviewer. The two catchment descriptors were chosen fundamentally for their easy accessibility, but also because there seems to be a general agreement in the scientific community on the very important morphological control of scale (via catchment size) and of climate (via MAP, correlated with both precipitation extremes and maybe more important to antecedent soil moisture conditions) on flood regimes. The authors agree that a rigorous analysis would imply an inspection of a set of catchment descriptors, identifying the most influential ones on the statistical properties of the flood frequency distributions. The future lines of research will surely include other catchment descriptors, but for the moment the authors prefer to analyse the effect of area and MAP and acknowledge the influence of other factors like snow (via e.g. elevation and temperature) which are of interest in the given database, where the presence of mountain catchments is significant. An explicit reference to this research outlook is included in the conclusion of the Part 2 manuscript.**

The first question that comes to mind after reading the paper is whether parent distribution of annual flood extremes for Europe exists. The authors express this doubt, and the research presented indicates that the doubt is justified. Therefore, the title of the paper is misleading. I suggest changing the title to " The first pan-European flood frequency analysis". **The authors fully agree with the reviewer. The title could be misleading, as the main outcome of the first part of the manuscript is to reject the**

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GEV as a single pan-European frequency distribution. Also, some examples of the variety of flood process from the literature are addressed in the conclusions, making clear there does not necessarily need to exist one single pan-European frequency distribution; this fact is now stated explicitly in the introduction. The title of the Part 1 manuscript is also less ambiguous in this sense ("Regional parent flood frequency distributions in Europe – Part 1: Is the GEV distribution a suitable pan-European parent?")

There is no question that the research presented is just a first attempt to develop a methodology for the analysis of flood extremes in Europe. There is much to do but the paper outlines the methodology based on L-moment ratio that can be easily extended towards more sophisticated classification methods of catchment flow regimes. I look forward to the sequel. **The authors acknowledge the referee for encouraging and motivating this new approach.**

The paper is well written. There are few points that the authors do not describe clearly. The first is the method used to derive the GEV for all catchments from the pan-European database having different lengths of record (noticed by the first reviewer F. Laio). The second (and related to the first question) is the weighted moving averages (WMA) applied to derive sample L-Cs and L-Ck records used across all the catchments, weighted proportionally to their record length, but also across the classified catchments. Some more information about the procedures used (and their limitations) would be welcome. **In line with the comment 3 of referee F. Laio, the Monte Carlo simulation strategy has slightly changed, in order to address the effect of sample length. The authors hope that the new description of the procedure is clearer to the reader now.**

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