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Discussions

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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A very interesting and stimulating manuscript for researchers working on flood frequency analysis. The performed analyses are technically sound, the adopted database is exceptionally large, and the outcomes and conclusions are generally well supported. I therefore have no doubt to recommend the manuscript for publication in HESS. Still, in my opinion there may be room for improvement, in particular regarding the following points.

1) The manuscripts contains two papers in one: the first 12 pages are mainly devoted to try to understand if the GEV distribution is a suitable model to represent floods in Europe, while the remaining part of the manuscript focuses on the control of catchment

size and precipitation on the flood distribution. In a time when "salami publications" (http://en.wikipedia.org/wiki/Least_publishable_unit) are the standard, it is a very nice surprise to see that some researchers still try to build up robust and inclusive papers. But unfortunately this also carries some problems, including the fact that the two parts of the paper should be better linked one to the other, and the fact that some shortening could be useful, because there is an high risk that the reader loses attention in the final part. As for the linkage between the two parts of the paper, it is not clear why the Authors decided in the second part to concentrate their attention on a limited part of the database (Austria, Italy and Slovakia) only, instead of using the same data considered in the first part. If these were two different papers, nobody would have argued, because even the subset of the database used in the second part is a large one, but here the discrepancy is rather evident and requires some additional explanation.

2) I would like to see some more discussion about the "quest for a pan-European flood frequency distribution" (title of the manuscript): do we really need a unique probabilistic model to represent European floods? I understand trans-boundary discontinuities may be a problem, but I am also worried about attempts to standardize something which is highly uncertain and largely unknown, as also the present manuscript demonstrates. Maybe it would be also good to preserve some of the "biodiversity" in national procedures, which may be not only due to a lack of communication between scientists working in different countries, but also to an actual need to describe different processes and phenomena (e.g., flash floods in a small catchment in southern Italy versus one-week floods in the Danube river) with different tools, including the use of different probability distributions.

3) I am not fully convinced by the simulation strategy adopted to construct Figure 1b (page 6329-6330). In fact, I find it not completely correct to mix together data from samples with highly different record lengths, because this tends to hide the fact that the sample variability is expected to be much larger in smaller samples. I try to explain my point with an example. Consider a set of catchments with L-cs values around 0.3

(expected L-ck=0.2 for the GEV). Suppose to be in a rather extreme situation, where this subset of basins is made up of 100 catchments where the sample size is 10, and other 10 basins where the sample size is 100. The 100 shorter samples have been actually sampled from a GEV, and their observed L-ck will thus be distributed around the expected value 0.2, with a large variability because the sample size is small. The 10 longer samples have in contrast been extracted from another parent distribution, and have their L-ck values distributed around 0.33 with small variability. The simulation will likely not recognize that these 10 series have not been sampled from a GEV, because values of L-ck around 0.33 are included in the range of L-ck values typical of the smaller samples. The null hypothesis that the parent is a GEV would therefore be mistakenly accepted, while it would have been falsified rather easily by separating the samples based on their sample size; in this case, in fact, L-ck values around 0.33 would have been recognized as rather unlikely for GEV samples with L-cs=0.3 and size 100. As an alternative simulation strategy the Authors could consider the following: (i) take one catchment at a time, with its own sample length n, L-cs and L-ck; (ii) generate 50000 samples of size n from a GEV with the same L-cs as the considered sample; (iii) compare the observed L-ck with the distribution of the 50000 L-ck values obtained from the simulation, for example by finding z=P(L-ck), where P() is the empirical cumulative distribution function of the L-ck obtained from the simulation; (iv) repeat this procedure for each available catchment to obtain a sample of 4015 z values, which could be tested for uniformity to verify the hypothesis that each and every sample has been extracted from a GEV. Different z samples could also be obtained by binning the data based on their L-cs value, as done in Figure 1b. This procedure has the problem that sample L-cs values are used as population values, but this is the same hypothesis adopted when applying the method of L-moments to estimate the GEV parameters, and it is thus well supported in the hydrological practice. Moreover, other ancillary hypotheses, as the choice of the distribution of the L-cs and of the sample size (page 6329, line 15-20), may be avoided with this procedure.

4) In the part of the paper where the controls on the flood frequency curve are inves-

tigated, I think some very relevant controls are still missing, in particular regarding the effect of basin elevation and temperature (through snow accumulation and melting) on flood formation. Some of the comments reported in the discussion, in particular regarding small-size basins, do not seem to consider the fact that small basins are rather frequently situated at high elevation, and these high-elevation basins typically behave very differently of the low-elevation catchments with similar size. For example, the CV is typically smaller in mountain basins, due to the peak-attenuation effect of snow accumulation and melting. Considering also the mean catchment elevation, along with the catchment area and mean annual precipitation, would help disentangle some of the relations between statistical and morpho-climatic descriptors obtained in Figures 4-7.

Interactive comment on Hydrol. Earth Syst. Sci. Discuss., 10, 6321, 2013.