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Hydrology and Earth System Sciences Discussions

Interactive comment on "On the asymptotic behavior of flood peak distributions – theoretical results" *by* E. Gaume

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I appreciate the author's statements that my comments are "worth a new paper" and that "The proof proposed by the reviewer is very clever but brings only one part of the solution." In fact, as I noted in my review, I did not characterize this comment as a proof but I made it in a constructive way for the case that the author wishes to explore it in more detail (thus making a real proof). The statement that it "brings only one part of solution" may be not true. The shape parameter of a hyper-exponential distribution is a very informative quantity: it is a threshold value that determines (in a unique manner) which of the moments of the distribution exist and which do not exist (i.e., are infinite). Thus, if we assume that those moments of the distribution of rainfall that are finite remain finite under the rainfall-runoff transformation (as explained in the review) and those that are infinite remain infinite, we may conclude that the shape parameter of the flood will be the same as that of rainfall.

Another interesting statement in the author's reply is: "The distributions are what they are!" This emphasizes the fact that the neither EV1 nor EV2 describe exactly the actual flood or rainfall distribution. This is absolutely correct and relies on the fact that actual distributions of maxima converge very slowly to the asymptotic extreme value distributions (Koutsoyiannis, 2004). So, our duty is to find out "what they [really] are". As this may be difficult, it may be a good idea to find a theoretical model that approximates the real distribution more closely. Also, it is extremely useful to diagnose the behaviour in the tail, i.e. whether it is exponential or over-exponential. May I repeat that the importance of the distribution type (determined from the behaviour in the tail) could be indirectly inferred by the author's statement that the return period of an observed flood event is "some hundred million years if the EV1 distribution is used", whereas it is "a few thousand years if the EV II distribution is used" (p. 1848). In this respect, I think it is a pity that the emphasis is given to the exponential distribution especially in the reference to the "Gradex" statistical extrapolation method, which the author avoids to criticize, even though the probability plots in the paper seem to suggest a rather hyper-exponential distribution type. I still think that the paper would benefit if this very important issue would be discussed in more detail based on the real world example studied.

Reference

Koutsoyiannis, D. (2004). Statistics of extremes and estimation of extreme rainfall, 1, Theoretical investigation, Hydrological Sciences Journal, 49(4), 575-590.

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Interactive Comment