

## ***Interactive comment on “Effects of runoff thresholds on flood frequency distributions” by A. Gioia et al.***

**A. Gioia et al.**

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### **Response to Reviewer 2**

**RC:** The work done by the authors of the present paper is valuable in this sense but the presentation needs much improvement. The terminology and description of the two mechanisms of runoff generation referred to in the paper are rather imprecise.

**AC:** The terminology and description of runoff mechanisms was entirely revised. Significant changes have been made in the introduction, in section 2 and in the conclusions.

**RC:** What I find especially misleading is the description of the saturation overland flow.

**AC:** This term has been removed from the text. In the revised paper, the process description has been revised avoiding misleading terms following the same nomenclature

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used in the scientific papers we referred to (e.g., Sivapalan et al., 1990).

**RC:** I would suggest to include a worked out example of a selected catchment which would go step by step and would be documented by a small figure of the functions and observed data at each step. Also a list of symbols with the equations repeated would be helpful and more precise references to things overtaken from previous studies.

**AC:** We followed this reviewer's suggestion, by reorganizing all the parameters' estimation section, which is now subdivided in sections 5.1, 5.2.1, 5.2.2, 5.2.3. We also specified that the procedure, referred to a generic basin was repeated for all the study basins. Also, a list of model equations, and involved parameters is now present at the end of section 3.

**RC:** Technical suggestions (stylistics, specific questions) On several places "to individuate" - to distinguish?? 908/15 "

**AC:** In all the papers, sentences including "to individuate" were rephrased according to this suggestion.

**RC:** Effects....is explained" 908/2.

**AC:** The entire phrase has been removed.

**RC:** How are the IDF's constructed ? total or net rain??? Probably total??

**AC:** In the revised paper it is specified that we use "the intensity-duration-frequency (IDF) curve of the expected maximum annual rainfall intensity". We respectfully believe that it is quite obvious that we are talking of total rainfall.

**RC:** 908/3-4 What are the definitions of lag time and critical rainfall duration ? I have the same problem as the referee no.1

**AC:** The lag-time is intended as the temporal distance between the direct runoff centroid to effective rainfall centroid; the critical rainfall duration is the one maximizing the flood peak.

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**RC:** 908/6 Again the same problem but I know from the previous article. I agree with the referee 1 that a precise reference should be given.

**AC:** This sentence has been rephrased and the reference was better specified.

**RC:** 909/15 "...testifies the strong control of climate soil - vegetation factors on flood frequency" I think everyone is sure about that but some proportions of this for different cases would be helpful if it does not get lost in the uncertainty of the loss.

**AC:** Interactions of climate, soil and vegetation factors have various impacts on flood generation and a significant part concerns the hydrological losses. A deeper knowledge of hydrologic losses at basin scale, in fact, is one of the most important expected outcome of this research.

**RC:** 909/24 "rainfall are likely"

**AC:** This sentence has been rephrased.

**RC:** 910 The actual equation of the 2000 paper is not given.

**AC:** We believe that the equations reported in the present paper, taken from the previous work published in 2000, should suffice for the comprehension of the paper. Moreover, its cdf equation, besides being long and complex, is obtained by means of the combination of the reported equations, its extended formula would not add more information to the reader.

**RC:** 912/10 I do not understand about "the first threshold" eq. (18) Is there not  $\Lambda_H$  missing?

**AC:** The equation is correct.  $\Lambda_H$  is not missing because any exceedence of the higher threshold, obviously exceeds the lower threshold also.

**RC:** 916/15-19 How do the estimates of C compare to those computed from rainfall-runoff data? For how long period are they meant (just for the event??, how long falling limb would you consider?) C would very much depend on the antecedent precipitation.

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**AC:** The coefficient  $C$  proposed by De Smedt et al. (2000) depends only from land cover, soil-type and local slope; it provides the rate of infiltration in saturated soil thus it is independent from antecedent moisture condition and also from the event length. We use it here only as a reliable combination of soil, land cover and slope factors.

**RC:** 917/24 How many events were there in the tail? i.e. those you consider HIGH?? Have you tried e.g. bootstrap to look into the variability??

**AC:** The relationship between the high skewness of flood distributions and outlier events has been discussed for long time (e.g., Cunnane, 1986) and is already assessed in the statistical analysis of annual maximum floods. It is already contemplated as a cause of the condition of separation of Matalas (1975). Thus, for this matter the reader is kindly addressed to such references.

**RC:** 918/4 we are all hoping for new technologies but you should realize that for your problem we would need an estimate on the whole catchment and pretty deep in depth.

**AC:** We may agree with this point nevertheless one could not deny that big steps have been done already in remote sensing for land cover and topography at basin scale, and many advances are expected in this direction.

**RC:** 918/10 is the U.S. Weather Bureau data good for your part of Italy - what about orography??

**AC:** The application of Weather Bureau areal reduction factor in this framework was already assessed by Iacobellis in Fiorentino (2000). They showed that it mainly affects the scaling exponent of rainfall intensity  $\varepsilon$  while the effect of orography is included in the parameter  $p_1$ .

**RC:** Please check prepositions going with verbs

**AC:** done.

## References

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