Hydrol. Earth Syst. Sci. Discuss.,
https://doi.org/10.5194/hess-2017-267-RC2, 2017

Hydrology and Earth System Sciences
Discussions

Interactive comment on "A dimensionless approach for the runoff peak assessment: effects of the rainfall event structure" *by* Ilaria Gnecco et al.

Anonymous Referee #2

Received and published: 15 September 2017

The authors present a methodology based on the use of dimensionless rectangular hyetograph and a dimensionless IUH with the aim of predicting the hydrological response of a generic catchment with particular focus on the runoff peak. The method is applied to some events occurred in a small catchment of Northern Italy. My general idea is that I don't like very much the work because seems to me too related on a (useful but..) scholastic hydrology or in such a sense old style hydrology, anyway I admit that this is a little bit my personal and subjective opinion and I think it is not correct evaluate a work on this basis. I think that the topics of this work should be faced with most advanced modeling tools (at least in a research perspective), but I recognize that the presented work could be of a certain interest for those who study and apply

these kind of methodologies (for example on practical applications). In my opinion the paper needs further strong improvement especially on describe motivations, possible problems related to hypothesis, improve case study and application. As final review evaluation I would suggest: Major review Main points: 1)Reasons: the authors should better discuss the reasons of such kind of methodology. For what I understand on one side they propose the methodology as tool to deal with design storms (for example in a projecting process). On the other side refer constantly to internal structure of real event, so in such a way to "reduce" real events in constant intensity hyetographs of variable length. Why doing this? So at the end what is the scope of the method?

2)The hypothesis of constant hyetograph (from line 28 of page 2) is quite strong. This can be motivated in order to simplify the methodology but can lead to "distortion" of results . In the practice in order to produce a project storm, other methodologies are used. For example the Chicago Hyetograph (cited by authors), or individuating a typical duration t1 of rainfall events in a certain area and then nesting an event with duration equal to response time t2 (at the end to consider one of the worst configurations). I think authors should compare their method with something like the latter and discuss the hypothesis and differences in results.

3) The combination of constant hyetograph and a concentrated model (Nash) could lead to some difficulties. When drainage area of catchment increases, the response to intense events can be due to a part of the catchment and the operation of average of rain to obtain a unique hyetograph can lead far from reality. Moreover in a project perspective you should use a multiplicative factor (we can name it kA <1) to reduce the rainfall h derived by DDF, since they generally have punctual meaning; as a consequence kA can become a crucial factor in Qmax estimation when you move from dimensionless to "dimension" values. I think authors should evidence and discus all this issues, since they can have a not negligible effect for such kind of methods (or maybe with same order of magnitude).

4)Initial soil moisture conditions This element seems to be totally negletted, but it im-

pact very much on peak flows and is often a problem during the study of the impact of a certain rainfall storm. So it is possible that using the standard Chicago hyetograph method with AMC3 leads to higher peaks than the proposed method. The issue of contemporaneity of Rainfall with certain T and wet or dry initial condition is a classic problem. I think this should be evidenced and should faced in such way in the presented applications.

5)Application. I do not understand the scope of applying the method to real events. In this case, if I want estimate the Qpeak, supposing to have a calibrated model I should use the rainfall time history, estimate the initial soil moisture and run the model to estimate Qpeak. The analysis done seems to me unuseful (but maybe because it is not clear the scope), what is the reason to build constant hyetograph for different durations picking the magnitude from a real event? You are building un-real rainfall events (and so un real catchment response. . .) when you already have the truth (..or a truth estimation). If I well understand, in figure 10 a sort of DDF built with hr=80 mm (derived by the events, and which I suppose has a certain return period T*) and n=0.39 (from Mediterranean statistical analysis) is compared with rainfall depth obtained by various n derived for each single event. But what does it mean this comparison? Maybe exist various H(T) > hr (for increasing T) that give same rainfall depths for the different durations but with n=0.39. Maybe the information is only that for those events, for some durations > basin response time (tr) the rainfall depth has a T larger than hr. I suggest: a)on one side better explaining the reasons and motivations of the presented experiment. b)On the other side I would like to see a sort of "project" experiment. So suppose to have the need to estimate the Q for a certain T, considering other methodologies (example Chicago hyetograph ? events with rainfall peaks at the end of hyetograph? Other?), and make a comparison. I think authors should start for the same data (DDF? Rainfall annual maxima on different duration?...) and compare the proposed method with other ones. Moreover I would introduce the effects of Soil Moisture, it is in fact possible that the usage of different AMC introduce more differences than the usage of different methods. Maybe it would be interesting look at the results on different Basins (for example

different drainage area) In practice I would like see a comparison with other methods commonly used in order to evaluate differences in final results and sensitiveness on at least part of common parameters (soil moisture, rainfall reduction area factor kA).

Issues on the paper: 1) Page 1, lines 12-13. What are d* and n?, commonly parameters of equations should not mentioned along the abstract. Moreover in this case no definition is presented. 2) Page 2, lines7-9. Not clear, please explain better. 3) Page 3, line 1. What do you mean with "structure" exponent? 4) Page3, line 9. In general the tr is not fixed and even in case it is consider constant it could vary depending the estimation methodology. Please comment the fact and hypothesis done. 5) Page 4, lines 13-22. If I'm not wrong authors call with same variable tp* two different quantities: the peak of IUH and the peak of UH. 6) Page 4: equation seven, maybe a should be changed in alpha 7) Page 5 line 22: do you refer to equation 19? 8) Page 6 eq 22: what is phir? It is not defined. 9) Page 7 line 20: correct the sentence. It is not clear 10) Page 8 line 3, what is "short-short-short"??? 11) Page 8 line 10-16. It is not clear the sentence/comment about Chicago hyetograph since authors method bases on constant hyetograph while Chicago one not. I suggest to add an example in the results to support this finding. 12) General comment: what do the authors mean with soil abstraction? Do they refer to of th Cn method ?They indicates it with S but from the descriptions it seems they refer to I=0.2*S. 13) Looking at figure 3 and figure 6, apparently the differences are very small in many cases. It is difficult to perceive the effects when you estimate flow (not dimensionless..) 14) Page 9lines 13-20 and figure 9.It is not clear to me if the fact that "highest dimensionless increases with increasing ths S*. . ." is relevant or not. . .What does it happens when you go back to"dimension" case? Can you make some comments about the effects of what you found? 15) General comment: it seems to me that in the paper authors sometimes refer to "highest dimensionless runoff peak" and sometimes "maximum dimensionless runoff peaks" (example text on page 9 and figure 9). Con you check the coherence of the terms, variables..etc..along the text? 16) Figure 11 and comments on the text. Are the hyetographs built with "dotted lines" in figure 10? Since the hydrographs are not the

response to the real rainfall event (which is due to particular time sequence of rainfall) , what do they represent? How they vary with different soil moisture condition? What do the reference peak flow (estimated with the described method) represent, and in which sense it is considered a “reference”?

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