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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.

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General comments

This paper describes an interesting and heuristic analytical solution for the assessment of the peak runoff. By considering the SCS method and the IUH theory to model the soil abstraction and the hydrograph, respectively, a new approach to assess the peak runoff of a given catchment is presented. Thus, the Authors combine models already known; however, the dimensionless approach they used seems to be new and allows compacting the solution in order to also investigate the interesting feature of the rainfall even structure. Due to personal interest into the concept of peak discharge, I followed

the mathematical derivation and do confirm that it is sound and well described. I can find no flaws in their approach and agree with their findings and conclusions. I found the exposed methodology well developed and sufficiently comprehensive. I am of the opinion that these results are of interest for the readers of HESS, thus the manuscript is suitable for the publication.

Specific comments

The only concern about this paper is the lacking of a comparison of the analytical approach to the hydrological response with some available analytical model previously published in order to deepen its degree of applicability. Otherwise, the main findings could be compared with experimental or numerical data that are available in the literature. This should not be too much time consuming to achieve and it will significantly strengthen the paper. The application for the Bisagno catchment could not be considering as a test of the suggested solution. Therefore, my recommendation is to try to achieve such a task.

It is not clear to me how the rainfall structure exponent in the example of Figure 1 (at the bottom) and in the application for the Bisagno catchment at La Presa station (Figure 10 at the centre) is determined. Although based on previous studies, n exponent determination vs rainfall duration should be described. How does n qualitatively influence the rainfall structure ? I checked Figure 1 at the centre, is the estimated one a a simple power law ? Please, add parameters (the same for Fig. 10).

Figure 4 and 7 are very effective. However, to show the effect of the rainfall structure parameter, it could be useful also plotting the dimensionless hydrograph peak vs rainfall structure exponent, for both constant and time-varying psi. Moreover, A 3D figure could better evidence the influence of the rainfall structure on the dimensionless peak discharge and the saddle area. The actual Figure 4 and Fig. 7 could appear at the base of the 3D plots. Therefore, an attempt to illustrate both cases of constant and variable runoff coefficient could also be performed, highlighting an interesting compar-

ison between the two considered cases. However, it is not sure the feasibility.

Reference in the conclusion could be removed. Other general features could be pointed out in the conclusions that could strengthen the paper. An examples is a general conclusion about the influence of the rainfall structure on the dimentionless peak, also associated with the assumption of constant or variable runoff coefficient (see previous point).

The limiting assumptions in the original models, should be mentioned in the text (they are marginally reported in the conclusions). It is not sure that the majority of potential readers of this paper would be familiar with all of them.

A table reporting the parameters associated with the maximum rainfall depth (DDF) of Fig. 1 (at the centre) and Figure 10 (at the bottom) could be useful for the readers.

Although referred to the hillslope scale, a recent paper dealing with the feature considered by the Authors, could be considered for the m/s: Baiamonte, G., Singh, V. P. (2017). "Modelling the probability distribution of peak discharge for infiltrating hillslopes." Water Resour Res, Doi: 10.1002/2016WR020109. With reference to the dimensionless approach: Baiamonte, G., Singh, V.P. (2016). "Analytical Solutions of Kinematic Wave Time of Concentration for Overland Flow under Green-Ampt Infiltration" J Hydrol E – ASCE, 21(3), Doi: 10.1061/(ASCE)HE.1943-5584.0001266, 04015072. Baiamonte, G., Singh, V.P. (2016). "Overland Flow Times of Concentration for Hillslopes of Complex Topography" J Irrig Drain E-ASCE, 142(3), Doi: 10.1061/(ASCE)IR.1943-4774.0000984, 04015059.

Technical corrections

Pag. 3, Line 5. Modify the symbol Tr by typing r subscript

Pag. 3, Line 9. Modify the symbol tr by typing r subscript

Pag. 3, Line 15. Since many depth and time symbols are used, please further define: Rainfall depth, h, ... to the rainfall value of the maximum rainfall depth, hr. Similarly,

for the duration . . ...

Pag. 4, Line 3. Please, correct GIUH

Pag. 4, Eq. (12) can be simplified as (1/(1-exp(.))

Pag 8 Lines 1 -16 not clear. Recommend rewording

Pag 11 Please, insert commas ", corresponding to the scaling exponent of the DDF curves,"

I hope these suggestions can help the Authors to improve their manuscript.

Sincerely

Giorgio Baiamonte

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