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Hydrology and Earth System Sciences Discussions

Interactive comment on "Analysis of the runoff generation mechanism for the investigation of the SCS-CN method applicability to a partial area experimental watershed" *by* K. X. Soulis et al.

K. X. Soulis et al.

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We would like to thank the anonymous referee #2 for his/her thoughtful general comments and many detailed comments. We consider the comments very useful. In this response we answer to the general comments of the referee. All the detailed comments will be taken into account to prepare the revised version of our manuscript.

Our responses to the General Comments are given below.

Referee comment A:

"The catchments studied in this article are quite specific in that they show a quite good linear relationship between rainfall and runoff. The authors could test a reference ap-

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proach in which C is fixed to the slope of the linear relationship between Q and P observed on the catchments (0.0574 and 0.0953 for the upper and entire catchments respectively). These values may provide better results than those obtained using the values directly derived from the portions of impervious zones. Using this alternative estimation may indicate that the impervious zones are not the only descriptor to account for in the determination of C. Practically this C value could be considered as a coefficient to be optimized on half of the events. Of course, it would not be applicable on the case of ungauged catchments but would serve here only as a comparative reference."

Answer:

We agree with the referee#2 that using the C values which come from fitting the equation Q=C*P to the measured Q and P values provides better results than those obtained using the values directly derived from the portions of impervious zones, as it was expected because the fitted values are the best possible. We also noticed that these values are slightly bigger and this was our main motivation for the detailed analysis of the runoff generation mechanism for all the events with the help of the runoff generation numerical simulation model. The above analysis concluded that:

"These results provide physical evidence for the hypothesis that the watershed under study is a 'partial area' watershed and that the main source of direct runoff is the impervious surfaces. However, it is evident that in some extreme events with very high rainfall intensities, some 'inactive' parts of the watershed may generate additional surface runoff, resulting to unexpectedly high total surface runoff values."

The above conclusion agrees with the referee#2 comment that: "Using this alternative estimation may indicate that the impervious zones are not the only descriptor to account for in the determination of C."

As a conclusion we agree with referee#2 that adding the optimum C values in the revised version of our manuscript as a comparative reference, will improve its quality.

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Referee comment B:

"I am not fully convinced of the transposability of the conclusions to other catchments with permeable soils (comments at the bottom of page 377). For example, the studied catchments have steep slopes and the role of the slope is not discussed in the text. What is the impact on runoff generation process? Would conclusions be the same on flatter catchments? The results obtained by the authors on these catchments are quite convincing, but the fact that the fractions of impervious zones correspond approximately to the mean runoff coefficient may just be a matter of luck. The generalization of the results to other catchments should require more extensive tests on a larger set of catchments, to check the actual role of impervious zones on a more varied set of conditions. I think these aspects should be better discussed."

Answer:

We agree with the referee#2 that the results of the detailed analysis that was carried out in the case study are not a proof for the transposability of the conclusions to other catchments.

In our paper we mentioned the results of previous studies (Hawkins 1979, 1993) that indicated that this behavior may exist in other catchments too, and mainly in very permeable catchments. We also provided some indications that a significant number of very permeable catchments may exist (Dingman 2002; Soil Geographical Database of Eurasia 2004). However, those previous studies do not provide a detailed analysis of the runoff generation mechanism and they do not provide evidence on the existence of this behavior. Furthermore, the detailed analysis of the runoff generation mechanism requires a lot of good quality data, which is most of the time quite difficult to obtain.

As a conclusion we agree with referee#2 that it must be more clearly stated in the revised version of our manuscript that the generalization of the results to other catchments requires extensive tests on a larger set of catchments, to check the actual role of impervious zones on a more varied set of conditions.

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