

## ***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.**

Received and published: 23 March 2009

We would like to thank both the anonymous referee #2 and anonymous referee #1 for their comprehensive review and their many detailed comments. In addition to our previous Author Comments we explain how we addressed all the comments in the revised version of our manuscript.

Comments from anonymous referee #2:

General 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 approach 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

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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: the optimum C values were added as a comparative reference.

General 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 added the following text at the Results and Discussion section of our manuscript: "...However, the generalization of these results to other cases requires more tests on a larger set of watersheds, to examine the actual role of impervious zones on a more varied set of conditions..."

Detailed Comments 1, 2, 3: "spelling corrections". Answer: The proposed corrections were made.

Detailed Comment 4: "Eq. (8) could also be written to make the runoff coefficient  $C=Q/P$  appear, as it is extensively used in the article:  $CN=25400/\{5P.[1+2C\sqrt{(4.C.C+5C)}]+254\}$ " Answer: We believe that the addition of

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the above equation will not improve the clarity of our manuscript because it is not directly used in any part of the article.

Detailed Comment 5: "spelling correction". Answer: The proposed correction was made.

Detailed Comment 6: "Which criteria were used for event selection? Was there any rainfall threshold used? How the beginning and end of the events are determined?" Answer: The detailed description of the exact criteria that were used was added in the manuscript.

Detailed Comment 7: "Are the streams ephemeral or do they show permanent flow? What is the average value of BFI on these catchments? Can the author provide any reference on the method they use for flow separation?" Answer: Detailed information on the base flow and the BFI were included in the manuscript including the required references.

Detailed Comment 8: "spelling correction". Answer: The proposed correction was made.

Detailed Comment 9: "Please provide a few comments on data quality" Answer: Information on data quality is provided in section 4 Storm Events.

Detailed Comment 10: "Could the author give a quantitative estimation of "early enough"? What was the warm-up period used in the simulation? Did they make tests to check that initial conditions do not impact their results?" Answer: More detailed explanations were added. Various tests were carried out, which indicated that the result is not very sensitive to the anteceded precipitation. However the analysis and the presentation of these tests are vary long and we believe that they cannot be properly presented in this study.

Detailed Comment 11: "Why a number of 500 compartments was chosen? Was it due to numerical reasons?" Answer: The discretization into 500 soil compartments

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was chosen to enhance the numerical stability and the accuracy of the solution. The clarification was added in the manuscript.

Detailed Comment 12: "When commenting Fig. 3, it should be noticed that runoff is linearly correlated to rainfall on both catchments. The observed mean runoff coefficient Q/P (slope of the linear relationship on the graphs) equals 0.0574 and 0.0953 for the upper and entire catchments respectively. These values are indeed quite close to portions of impervious areas, but they are larger. Using these values may be better to limit the problem of runoff underestimation that is observed in Fig. 5." Answer: The proposed correction was made. The second part of the comment was answered in comment A.

Detailed Comment 13: "Make explicit in the Table 1 caption what S, C and I stand for (sand, clay and loam)". Answer: The proposed correction was made.

Detailed Comment 14: "Table 2: Why no values are available for event #30 for the entire watershed? Were there gaps in the series?" Answer: This event occurred at the end of the studied period. The data for the entire watershed were not available at the moment that the manuscript was written.

Detailed Comment 15: "A column giving the actual duration of the selected events (if significantly different from one day) could be added, to get a better idea of rainfall intensities occurring on the catchment." Answer: The column was added.

Detailed Comment 16: "spelling correction". Answer: The proposed correction was made.

Comments from anonymous referee #1:

General Comments: Answer: Corrections and additions were made at the title and the text of the manuscript in order to make it more clear that the main focus is the investigation of the SCS-CN method applicability through the analysis of the runoff generation mechanism and that our analysis concerns the direct runoff. We also rephrased the

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sentence: "These results provide physical evidence for the hypothesis that..." to clarify that the hypothesis was not proven but strong indications for its validity were given.

Detailed Comment 1: "The authors do not show relevant information on the catchment that is necessary to get a general idea of the functioning: mean annual precipitation and reference evapotranspiration, seasonality, relative role and duration of base-flow, time characteristics of the response... The existence of long-lasting base-flow might be difficult to conciliate with the proposed hypothesis." Answer: Information on the watershed like mean annual precipitation, reference evapotranspiration, seasonality, relative role and duration of base-flow, time characteristics of the response were added.

Detailed Comment 2: "The bare rock areas are near the upper divides of the basin, so if they are not well connected to the drainage net, overland flow produced on them might re-infiltrate when arriving in soil covered areas." Answer: More explanations were given.

Technical corrections: "The English style should be revised and the parts of the paper should be better organized; there are, for instance, some sentences in the last part of the introduction that correspond to results or conclusions". Answer: The last paragraph of the introduction was deleted.

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Interactive comment on Hydrol. Earth Syst. Sci. Discuss., 6, 373, 2009.

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