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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.

Anonymous Referee #2

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Analysis of runoff generation mechanism for the investigation of the SCS-CN method applicability to a partial area experimental watershed By K.X. Xoulis, J.D. Valiantzas, N. Dercas and P.A.Londra

General comments: This study presents a detailed analysis of two small nested catchments in Greece, for which the applicability of the SCS-CN formulation is evaluated. The catchments have steep slopes and are low yielding, with runoff coefficients lower than 0.1. The authors selected a set of 30 events over four years, on which they applied both a detailed numerical process-oriented model and the SCS formula. They show that the original SCS formulation does not apply on these catchments and that

considering a fixed runoff coefficient estimated as the portion of the impervious zones provides better results. The article is clear, well presented and organized, of acceptable length and easy to follow. The literature review seems good, with up-to-date references. The illustrations are generally of good quality and appropriate. The title and abstract are good summaries of the article content. I have two main comments: 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 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. 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. I advise moderate revision.

Detailed comments: 1. Page 376, line 8: should be “moisture conditions, to the temporal” instead of “moisture conditions to the temporal” 2. Page 376, line 20: should be “evaluate CN values from measured”

HESSD

6, S148–S151, 2009

Interactive Comment

instead of “evaluate CN values form measured runoff” 3. Page 377, line 23: should be “with caution to” instead of “with causion to” 4. Page 379: 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} 5. Page 381, line 6: should be “from September 2004 to August 2008” instead of “from September 2004 since August 2008” 6. Page 381, line 7: Which criteria were used for event selection? Was there any rainfall threshold used? How the beginning and end of the events are determined? 7. Page 381, line 10: 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? 8. Page 381, line 15: Indicate in brackets that AMC I and III conditions correspond to dry and wet respectively 9. Page 381, section 4: Please provide a few comments on data quality 10. Page 383, line 7: 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? 11. Page 383, line 9: Why a number of 500 compartments was chosen? Was it due to numerical reasons? 12. Page 384, section 6: 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. 13. Page 392: Make explicit in the Table 1 caption what S, C and L stand for (sand, clay and loam) 14. Page 393, Table 2: Why no values are available for event #30 for the entire watershed? Were there gaps in the series? 15. Page 393, Table 2: 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. 16. Page 397, Figure 2: In Fig. 2b, the maximum observed runoff value (14.6 mm) is missing. Change x and y

HESSD

6, S148–S151, 2009

axis to make it appear.

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