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Parameter sensitivity analysis of the mixed Green-Ampt/Curve-Number method for rainfall excess estimation in small ungauged catchments

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With the aim of combining the practical advantages of the Soil Conservation Service - Curve Number (SCS-CN) method and Green-Ampt (GA) infiltration model, we have developed a mixed procedure, which is referred to as CN4GA (Curve Number for Green-Ampt). The basic concept is that, for a given storm, the computed SCS-CN total net rainfall amount is used to calibrate the soil hydraulic conductivity parameter of the Green-Ampt model so as to distribute in time the information provided by the SCS-CN method. In a previous contribution, the proposed mixed procedure was evaluated on 100 observed events showing encouraging results. In this study, a sensitivity analysis is carried out to further explore the feasibility of applying the CN4GA tool in small ungauged catchments. The proposed mixed procedure constrains the GA model with boundary and initial conditions so that the GA soil hydraulic parameters are expected to be insensitive toward the net hyetograph peak. To verify and evaluate this behaviour, synthetic design hyetograph and synthetic rainfall time series are selected and used in a Monte Carlo analysis. The results are encouraging and confirm that the parameter variability makes the proposed method an appropriate tool for hydrologic predictions in ungauged catchments.

Keywords: SCS-CN method, Green-Ampt method, rainfall excess, ungauged basins, design hydrograph, rainfall-runoff modelling.