EGU2020-8346
https://doi.org/10.5194/egusphere-egu2020-8346
EGU General Assembly 2020

An approach to accommodate and estimate antecedent moisture in runoff curve number methodology- An experimental study

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Modelling of the event-based rainfall-runoff process has considerable importance in Hydrology, especially for assessment of water yield potential of a watershed, planning of soil and water conservation measures, reducing sedimentation, and flooding hazards downstream. Antecedent moisture (M) plays a significant role in governing the rainfall-runoff modelling process. It has been the focal point of research in the last decade for improving the Soil Conservation Service Curve Number (SCS-CN) method (also known as NRCS-CN method) for surface runoff computation. In this study, an innovative procedure is proposed to accommodate M in the basic structure of the SCS-CN methodology which otherwise was incorporated externally; to compute M using rainfall-runoff data and verify its applicability by comparing M with the in-situ soil moisture.

Natural rainfall, runoff, and soil moisture data from 6 small experimental farms with different land-use viz. Maize, Finger Millet, and Fallow land, located at Roorkee, India, are utilized. The M is computed by optimizing two parameters, i.e., absolute maximum potential retention (S_{abs}) and initial abstraction ratio (λ), and the optimization is accomplished by minimizing the root mean square error (RMSE). Results show that there exists a good correlation between theoretical M and measured in-situ moisture. Also, the optimized value of λ has the less error in computing M than the other standard values of λ (λ = 0.2; λ= 0.03). This study not only improves the SCS-CN method but also widens its application horizon in soil moisture studies.