Modeling of Runoff in the Arid Regions Using Remote Sensing and Geographic Information System (GIS)

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Abstract

One of the most important challenges in the field of engineering hydrology and water resources management, especially in arid regions such as the Iraqi Western Desert, is the process of predicting and quantifying the surface runoff. The limited available data about rainfall, runoff, soil properties, evaporation, and the lack of metrological stations make the process of predicting and calculating surface runoff a very difficult task. Modern technology can help with the purpose of compensating for the shortage of data and providing the information necessary to estimate the runoff and develop the system of water resources management in the region. The present study develops a model to determine the infiltration of soil from spectral reflectance using Artificial Neural Networks (ANN) integrated with a geographic information system (GIS) and remote sensing (RS). Field infiltration measurements for 105 soil samples in the Al-Ratga catchment area in the Iraqi western desert are achieved. The performance of the developed model was assessed both qualitatively and quantitatively (effective runoff depth) by comparing the results of actual and estimated basic infiltration rate values for each sample. The results refer to a good agreement between estimated and measured infiltration (R2=0.768). The developed model predicts the runoff depending on the water balance equation and the results refer to good agreement with the SCS-CN model that is one of the most widely used in this region