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## Hydrologic Modeling of the Bouregreg Watershed (Morocco) Using GIS and SWAT Model

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### ABSTRACT

The study of water resources at watershed scale is widely adopted as approach to manage, assess and simulate these important natural resources. The development of remote sensing and GIS techniques has allowed the use of spatially and physically based hydrologic models to simulate as simply and realistically as possible the functioning of watershed systems. Indeed, the major constraint that has hindered the expansion use of these tools was the unavailability or scarcity of data especially in the developing countries. In this context, the objective of this study is to model the hydrology in the Bouregreg basin, located at the north-central of Morocco, using the Soil and Water Assessment Tool (SWAT) in order to understand and determine the different watershed hydrological processes. Thus, it aims to simulate the stream flow, establish the water balance and estimate the monthly volume inflow to SMBA dam situated at the basin outlet. The ArcSWAT interface implemented in the ArcGIS software was used to delineate the basin and its sub-components, combine the data layers and edit the model database. The model parameters were analyzed, ranked and adjusted for hydrologic modeling purposes using daily temporal data series. They were calibrated using an auto-calibration method based on a Shuffled Complex Evolution Algorithm from 1989 to 1997 and validated from 1998 to 2005. Based on statistical indicators, the evaluation indicates that SWAT model had a good performance for both calibration and validation periods in Bouregreg Watershed. In fact, the model showed a good correlation between the observed and simulated monthly average river discharge with  $R^2$  and Nash coefficient of about 0.8. The water balance components were correctly estimated and the SMBA dam inflow was successfully reproduced with  $R^2$  of 0.9. These results revealed that if properly calibrated, SWAT model can be used efficiently in semi-arid regions to support water management policies.

### KEYWORDS

Hydrologic Modeling, Water Balance, Calibration, Bouregreg Watershed, GIS, SWAT, Arcswat

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