



The Use of the SWAT Model in the Simulation and Analysis of Hydrological Uncertainty Analysis

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Received: 19 December 2021

Revised: 14 January 2021

Accepted: 2 March 2022

Abstract

The SWAT model is a soil and water assessment tool recommended to improve watershed management. The cycle used in the SWAT model is quite similar to the hydrological cycle in nature. This tool supports effective watershed management and informed decision-making for better development. In the present study, the analysis aims to evaluate the efficiency of the semi-distributed-physical SWAT model in simulating daily and monthly runoff, optimizing the parameters affecting rainfall-runoff, and analyzing the hydrological uncertainty of the Kasilian watershed. In this research, SWAT-CUP software and SUFI-2 and PARASOL methods were used to simulate and analyze the uncertainty and calibration of the model. In the runoff calibration and validation stage, coefficients of R², bR², and NS between the observed and simulated data were used for validation. In general, the accuracy of the simulation in the monthly period is higher than that of the daily period. Also, in the daily period during calibration and validation, the accuracy of PARASOL is higher than SUFI2; however, in the monthly period, the accuracy of SUFI2 is higher in calibration and validation. In general, however, more repetitions are needed to get more accurate results. Overall, according to the results of model evaluation during the calibration and validation periods with statistical indicators R², bR², MSE, RMSE, and efficiency coefficient ENS, the model was proved to be successful in simulation. That is, it would simulate the hydrological processes of the basin with relatively good accuracy appeared. Finally, this model can be used to further analyze the basin and related sub-basins and study the various components of the hydrological cycle.

Keywords: SWAT Model, Kasilian Watershed, Calibration, Uncertainty

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How to cite this Article: Rasoolzadeh, D, N., Ahmadi, H., Moeini, A., Motamedvaziri, B. (2022). The use of the SWAT model in the simulation and analysis of hydrological uncertainty analysis, *Journal of Geography and Environmental Hazards*, 11(2), 77-96.

DOI: 10.22067/GEOEH.2022.74253.1144



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