University of Zabol

Graduate School

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Department of Rangeland and Watershed Management

Thesis for obtaining a master's degree in watershed management

Hydrological Simulation of Lar Watershed of Sistan and Baluchestan Province Using SWAT Model

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June 2022

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Hydrological models are a good tool for assessing the current state of water resources and predicting future conditions with knowledge and understanding of the interactions and interactions prevailing at the basin level. In this study, the soil and water assessment model (SWAT) has been used to simulate rainfall-runoff in Lar watershed of Sistan and Baluchestan province located in arid and semi-arid regions. For this purpose, daily data on precipitation, average maximum and minimum temperature and discharge during the years 1988-1987, digital model maps of height, land use and soil texture have been used. Preliminary simulation of the hydrological model was performed in the SWAT plugin and SWAT-CUP software was used to analyze the sensitivity, calibration and validation of the model and also the SUFI-2 method was used as an optimal algorithm. Based on the SWAT model, the study area was divided into 37 sub-basins and 308 units of hydrological response. Then, in order to maximally adapt the designed model to the prevailing conditions in the region, sensitivity analysis was performed on the parameters affecting the simulation of the average monthly output flow. Various parameters with different maximum and minimum ranges were examined; Based on the dominant characteristics of Lar watershed, 24 sensitive parameters were selected. After analyzing the overall sensitivity of the parameters, 7 parameters based on t-state and p-state values were selected as the most effective parameters and three parameters Curve number for medium humidity conditions, base flow return factor to main and average usable waterway were identified as the most sensitive parameters in runoff simulation. Became Then the statistical period (1988-2005) was selected for calibration and (2006-2017) for validation. Finally, the efficiency of the model was evaluated with NS, R^2, p-factor and r-factor coefficients. The values of these coefficients were estimated 0.80, 0.82, 0.80 and 0.33 during the calibration period and 0.90, 0.90, 0.39 and 0.43 during the validation period, respectively. The results show that despite the seasonal flow and days with zero flow, the SWAT model has a high capability to simulate the monthly discharge of Lar watershed. In addition, the temporal adaptation of the peak and landing points of the simulated and measured discharge hydrographs confirms the high accuracy of the model in the simulation. Then, in order to evaluate the accuracy of the digital elevation model on runoff simulation, digital elevation maps of the region with three accuracy of 30, 50 and 90 meters were used. The results obtained, with increasing the digital model cell height, the amount of runoff in Lar watershed of Sistan and Baluchestan province decreases. Also, calibration and validation for all three accuracy showed that there is no significant difference between the values of the criteria due to runoff simulation using three accuracy (30, 50 and 90 meters), which to provide better results, one-way analysis of variance test. Digital elevation model was used to compare the different accuracy. According to the results, the significance of the analysis of variance test in the calibration and validation stages was greater than 0.05 (1.07 and 0.418, respectively) that there was no significant difference at the level of 5%. The main reasons for this can be stated in the use of reverse modeling or SUFI-2 algorithm for all three accuracy in calibration and validation.