

Modeling the Hydrological Characteristics of Hangar Watershed, Ethiopia

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Abstract

Modelling the hydrological characteristics of watershed is a method of understanding behavior and simulating the water balance components of watershed for planning and development of integrated water resources management. The soil and water assessment tool (SWAT) physically based hydrological modelling was used for modelling hydrologic characteristics of the Hangar watershed. The data used for this study were digital elevation model (DEM), land use land cover data, soil map, climatological and hydrological data. The model calibrated and validated using measured streamflow data of 13 years (1990-2002) and 9 years (2003-2011) respectively including warm-up period. The SWAT model performs well for both calibration ($R^2 = 0.87$, $NSE = 0.82$ and $PBIAS = +1.4$) and validation ($R^2 = 0.89$, $NSE = 0.88$ and $PBIAS = +1.2$). The sensitivity analysis, which was carried out using 18 SWAT parameters, identified the 13 most sensitive parameters controlling the output variable and with which goodness-of-fit was reached. The analysis results indicated that the watershed receives around, 9.6%, 59.9%, and 30.5% precipitation during dry, wet and short rainy seasons respectively. The received precipitation was lost by 9.6 %, 40.5%, and 41.3% in the form of evapotranspiration for each seasons correspondingly. The surface runoff contribution to the Watershed were 3.8%, and 79.2% during dry and wet seasons respectively, whereas, it contributes by 17.0% during short rainy seasons.

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