Comparison of WetSpa Distributed Hydrological Model and Adaptive Neuro-Fuzzy Inference System for Rainfall-Runoff Modeling in Kasilian Watershed

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Abstract

Rainfall-runoff modeling and prediction of river discharge is one important parameter in flood control and management, hydraulic structure design, and drought management. The goal of this study is simulating the daily discharge in Kasilian watershed by using WetSpa model and adaptive neuro-fuzzy inference system (ANFIS). The WetSpa model is a distributed hydrological and physically based model, which is able to predict flood on the watershed scale with various time intervals. The ANFIS is a black box model which has attracted the attention of many researchers. The digital maps of topography, land use, and soil type are 3 base maps used in the model for the prediction of daily discharge while intelligent models use available hydrometric and meteorological stations' data. The results of WetSpa model showed that this model can simulate the river base flow with Nash- Sutcliff criteria of 64 percent in the validation period, but shows less accuracy with flooding discharges. The reason for this result can be the small and short Travel time noted. This model can simulate the water balance in Kasilian watershed as well. The sensitivity analysis showed that groundwater flow recession and rainfall degree-day parameters have the highest and lowest effect on the results, respectively. Also, ANFIS with the inputs of rainfall 1-day lag and evaporation 1-day lag, with Nash-Sutcliff criteria of 80, was superior to WetSpa model with Nash-Sutcliff criteria of 24 percent in the validation period.

Keywords: Rainfall-Runoff Modeling, WetSpa Model, ANFIS, Baseflow, Kasilian Watershed.

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