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Improvement of Continuous Hydrologic Models and HMS SMA Parameters Reduction

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Abstract

Hydrological models can help us to predict stream flows and associated runoff volumes of rainfall events within a watershed. There are many different reasons why we need to model the rainfall-runoff processes of for a watershed. However, the main reason is the limitation of hydrological measurement techniques and the costs of data collection at a fine scale. Generally, we are not able to measure all that we would like to know about a given hydrological systems. This is very particularly the case for ungauged catchments. Since the ultimate aim of prediction using models is to improve decision-making about a hydrological problem, therefore, having a robust and efficient modeling tool becomes an important factor. Among several hydrologic modeling approaches, continuous simulation has the best predictions because it can model dry and wet conditions during a long-term period. Continuous hydrologic models, unlike event based models, account for a watershed's soil moisture balance over a long-term period and are suitable for simulating daily, monthly, and seasonal streamflows. In this paper, we describe a soil moisture accounting (SMA) algorithm added to the hydrologic modeling system (HEC-HMS) computer program. As is well known in the hydrologic modeling community one of the ways for improving a model utility is the reduction of input parameters. The enhanced model developed in this study is applied to Khosrow Shirin Watershed, located in the north-west part of Fars Province in Iran, a data limited watershed. The HMS SMA algorithm divides the potential path of rainfall onto a watershed into five zones. The results showed that the output of HMS SMA is insensitive with the variation of many parameters such as soil storage and soil percolation rate. The study's objective is to remove insensitive parameters from the model input using Multi-objective sensitivity analysis.

Keywords: Continuous Hydrologic Modeling, HMS SMA, Multi-objective sensitivity analysis, SMA Parameters