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Comparing AWBM and SimHyd models in rainfall-runoff modeling (Case study: Nazlou Chay catchment in west Azarbijan)

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Extended Abstract

1- Introduction

The prediction of a watershed hydrologic condition is one of the most important studies in water engineering sciences. There are several methods to simulate rainfall-runoff processes, which one of them is the use of computer models. None of the models is completely reliable and modeling helps to make engineering acceptable decisions. The aim of this study is daily runoff estimation in Nazlou Chay watershed in west Azarbyjan. In order to predict the daily rainfall runoff relationships in watershed, AWBM and SimHyd models were used. Nazlou Chay watershed is one of the most important watersheds in the region and the results of this study can be beneficial to know its hydrologic conditions.

2-Methodology

In this study, the daily rainfall, runoff and evapotranspiration data were used for ten years period. Because of a lot of water removal by farmers in Nazlou Chay river downstream, the area of Abajalou sub-watershed was eliminated by GIS technique and the watershed residual part was studied which was about 1756.9 km^2. Three stations with the longest daily data records, Tapik, Marze sero and Karimabad, were used to simulate rainfall-runoff modeling process. Rainfall and evapotranspiration data have been modified with long term DEM maps in GIS in order to have more adaption with the watershed's real condition. By averaging data for 12 months in ten years period and comparing them with long term averages, the modifying coefficients were obtained and by multiplying them to individual data, the modified data were determined. The modeling process including calibration and verification was accomplished by entering the input data. The sum of 224

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times of calibration and verification for each model was accomplished and finally the optimized model parameters were obtained. The correlation coefficient and Nash criterion coefficient were used to determine the efficiency of the models.

3-Discussion:

By changing the optimization method and objective functions, the calibration was performed automatically. In this study optimization methods e.g. genetic algorithm and pattern search, were utilized and despite of many problems in input data, there was an acceptable adaption in model simulation comparing with the observed data. The correlation coefficient wasn't only adequate to investigate model efficiency and the better criterion was Nash efficiency coefficient. This was in the direction of former researches which showed the models with high correlation coefficient but high value of Nash coefficient haven't good fit but the models with medium correlation coefficient and low values of Nash coefficient show good fit (Tattgen and Van rijn 2010, 247-252).

After obtaining the optimized model parameters, the model sensitivity analysis was accomplished which is the most important part of each modeling study because the model sensitivity to parameter changing can be realized by this way. During data selection and parameter determination, this object causes more attention to the parameters that change the model.

4-Conclusion:

In this research, despite of many data deficiencies in the watershed and hydrologic stations, the models adaption is acceptable and the models can be the base of engineering decisions. In this study, like the previous researches about the correlation coefficient, it was obvious that the high correlation coefficient doesn't obligatory agree with suitable fitting. The highest correlation coefficient in SimHyd model series was obtained in 95th calibration that was about 0.766, and the model had an acceptable adaption with the observed data. The most preferable model in AWBM model series was obtained when the calibration method and optimization criterion were SCE-UA and sum of difference of logs, respectively. In this case the correlation coefficient and Nash criterion were 0.745 and -0.265, respectively. Opposite of the common imagination, model ability don't depend on its type or complexity, but it depend on input data accuracy. This point was clarified in present study by comparing the obtained results from modeling with the results of applying the same models in watersheds which had more accurate input data. The uncertainties can't be omitted in modeling and are more obvious in daily models rather than monthly or yearly ones.

Finally, appropriate models were obtained to simulated Nazlou Chay watershed condition.

Key words: rainfall runoff - Nash efficiency coefficient- Nazloo Chai watershed- sensitivity analysis - AWBM- SimHyd

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