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Evaluation of the effects of climate change on catchment scale surface and groundwater balances

Mohammad Taghi Dastorani *, S. Poormohammadi, A.R. Massah-Bavani, H. Jafari

Ferdowsi University of Mashhad, Faculty of Natural Resources and Environment, Mashhad, Iran

ABSTRACT

This research has focused on evaluation and determination of water balance components in semi-arid catchment of Toyserkan in Hamedan province in Iran. To be able to complete this research, different physical and experimental and computer based models and procedures have been used for evaluation and estimation of both surface and groundwater components. HEC-HMS was found to be suitable for rainfall-runoff simulation and estimation of flow discharge and volume in ungauged tributaries. For simulation and analysis of zonal groundwater budget GMS model was calibrated and implemented. To map annual real evapotranspiration, surface energy balance algorithm of land (SEBAL) was employed with the help of satellite time series data. Then the models were coupled with AOGCMs to project climate change impacts on water balance components for the future time periods. Furthermore, some management scenarios including higher efficiency of water use and therefore less extraction of groundwater as well as the effects of cloud seeding on water balance components were evaluated and discussed as alternatives for alleviation of water shortage especially in drought periods in such a region. Results showed a general negative trend of both for surface and groundwater resources in Toyserkan plain with a total value of -21.6 MCM for the year 2008-2009 as a sample. The results also show that with a probability of 80% and under both A1B and B1 emission scenarios, the water balance becomes more negative in the future shifting water resources of the plain to an intensified harsh condition. In this condition, the annual storage for 2011-2030 will reach -39.7 and -40.7 MCM respectively for the scenarios A1B and B1.

Key words: Water balance; Toyserkan; surface water; groundwater.

* Corresponding Author