Simulation of combined impacts of climate and land use changes on hydrologic processes in the upper Oum Er Rabia watershed (Morocco)

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Abstract (not more than 300 words)

In Morocco, basin hydrologic modelling can sustainably help in planning for the effect of anthropogenic actions and varying climate on scarce water resources. Studies indicate existence of proper policies developed by most resources management agencies. An impact-analysis study was conducted with the aim of investigating and evaluating land use change and climate variability influence on soil hydrological processes using the Hydrologic Engineering Canter's Hydrologic Modeling System (HEC-HMS). This work presents model development using HEC-HMS for event-based and continuous-process simulation of the Upper Oum Er Rabia watershed. The use of HEC-GeoHMS facilitated the digital data processing for coupling with the model. The basin's physical characteristics and the hydro-climatic data helped to generate a geospatial database for HEC-HMS model. Modelling focused on reproducing daily observed runoff for the 1980-2011 period using the SCS Curve Number and the Soil Moisture Accounting (SMA) loss methods. SMA was coupled with the Hargreaves evapotranspiration method. Model calibration focused on reproducing observed basin runoff hydrograph. To evaluate the model performance for both calibration and validation the Coefficient of determination (R^2), Nash-Sutcliffe efficiency (NSE), Root Mean Square Error (RSR) and Percent Bias (PBIAS) criteria were exploited. The average calibration NSE values were 0.740 and 0.585 for event-based (daily) and continuous-process (annual) respectively. The R^2, RSR and PBIAS values were 0.624, 0.634 and +16.7 respectively. This is rated as good performance besides the validation simulations were satisfactory for subsequent hydrologic analyses. It was concluded that the basin's hydrologic response to land use change and climate variability is significant to both positive and negative scenarios.

Keywords— Land use change, climate variability, HEC-HMS model, Simulation, Upper Oum Er Rabia watershed.

Professional Biography (100-150 words)

Prof. El Garouani received a PhD degree in Earth Sciences from Sidi Mohamed Ibn Abdellah University, Fez with emphasis in hydrology, GIS and remote sensing (2000). From 1996 to 2018, he was Associate to Full Professor in the Environment Department at the Faculty of Sciences and Techniques, Fez. Mr. El Garouani and his co-authors have produced over 50 scientific publications in professional journals and oral presentations in International Conferences (15 papers and 35 communications).



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