Experiments with clustering of catchments in PCA-reduced space and regionalization of a hydrological model (Central Alborz region, Iran)

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This study tested the possibility of simulating time series of daily streamflows in ungauged catchments based on climatic and physiographic similarity. The study area is located in central Alborz region in Iran. Fourteen (14) proper catchments, with the area ranged between 16 to 827Km2, in this region selected for testing. After applying Principal Component Analysis for selecting the most important parameters among the different climatic and physiographic parameters, five components which could explain more than 90% of variances of the data were selected and according to the values of the coefficients in selected PCA components, five parameters including: Area, Annual Rainfall, Annual temperature, gravelius compactness coefficient and mean elevation, were selected as the measures for clustering. Then mentioned parameters entered in K-means clustering analysis method to classify the catchments. Finally the catchments divided in three different clusters. Using the well known HBV model, we built a model for the closest catchment to the center of each cluster. Then, the thirteen (13) HBV model parameters were calibrated using Genetic Algorithm. We assumed that the remained catchments in each cluster are ungauged, and using the calibrated model, the daily time series of streamflows simulated in the remained catchments in the considered cluster (as the receiver catchments). Nash Sutcliffe and RMSE indices used to comparing the simulated and recorded data. The experiments with the considered case study confirmed that the model regionalization based on the physiographic and climatic characteristics could be a useful instrument in hydrological studies.

Key words: Regionalization, HBV, PCA, Cluster, Catchment, central Alborz region