

Regression Analysis in Estimating Stream-Flow and the Effect of Hierarchical Clustering Analysis: A Case Study in Euphrates-Tigris Basin

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Abstract : The scarcity of streamflow gauging stations and the increasing effects of global warming cause designing water management systems to be very difficult. This study is a significant contribution to assessing regional regression models for estimating streamflow. In this study, simulated meteorological data was related to the observed streamflow data from 1971 to 2020 for 33 stream gauging stations of the Euphrates-Tigris Basin. Ordinary least squares regression was used to predict flow for 2020-2100 with the simulated meteorological data. CORDEX- EURO and CORDEX-MENA domains were used with 0.11 and 0.22 grids, respectively, to estimate climate conditions under certain climate scenarios. Twelve meteorological variables simulated by two regional climate models, RCA4 and RegCM4, were used as independent variables in the ordinary least squares regression, where the observed streamflow was the dependent variable. The variability of streamflow was then calculated with 5-6 meteorological variables and watershed characteristics such as area and height prior to the application. Of the regression analysis of 31 stream gauging stations' data, the stations were subjected to a clustering analysis, which grouped the stations in two clusters in terms of their hydrometeorological properties. Two streamflow equations were found for the two clusters of stream gauging stations for every domain and every regional climate model, which increased the efficiency of streamflow estimation by a range of 10-15% for all the models. This study underlines the importance of homogeneity of a region in estimating streamflow not only in terms of the geographical location but also in terms of the meteorological characteristics of that region.

Keywords : hydrology, streamflow estimation, climate change, hydrologic modeling, HBV, hydropower

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