

# Simulating streamflow in ungauged catchments using regionalization methods in southeast Iran

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## Abstract

Simulating streamflow in ungauged catchments is a challenge for the management of surface water resources around the world, especially in dry regions. Here, we transfer parameters of two HBV and IHACRES hydrological models from gauged (donor) to ungauged catchments using three main regionalization approaches including Physical Similarity (PS), Multiple Regression (MR), Spatial Proximity (SP) and an integrated approach, which is basically an extension of PS approach through Inverse Distance Weighted (IDW) method (IDW-PS). We use a set of 21 catchments in Hamoun-Jazmourian River Basin in southeast Iran, to compare regionalization approaches. The results indicate that (1) generally, the HBV model performs slightly better than IHACRES model in calibration, verification, and regionalization, (2) the physical similarity method under 2 to 4 donor catchments and multiple regression method provide the best and least satisfactory results respectively. The IDW-PS method improves the performance of IDW method, (3) for the physical similarity, eight Catchment Descriptors (CDs) in four main groups of climate, physiographic, location, and land use perform best in prediction performance, (5) the HBV parameters related to snow and runoff components, are associated with highest and lowest uncertainties respectively. For the IHACRES, the most and least robustness parameters are plant stress threshold factor,  $f$  and the proportion of slow flow to total flow,  $vs$  respectively. Testing the parameter transferability using main approaches of regionalization at two distinct climate regions located in such an extensive river basin is a novelty. The results suggest that the methodology used in this study is rather suitable to simulate streamflow time series of ungauged catchments in the southeast Iran. However, further research is still needed to use this approach in other river basins of Iran.

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