



Regionalization of a conceptual rainfall runoff model based on similarity of the flow duration curve: a case study from Karkheh river basin, Iran

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Abstract

Streamflow data is a prerequisite for planning and management of water resources. However, in many cases, observed streamflow data are not available or the records are too short or of insufficient quality. This undermines the informed planning and management of water resources at a specific site and as well as at the river basin scale. The study examines the possibility of simulating time series of streamflows for ungauged catchments based on hydrological similarity, using the mountainous, semi-arid Karkheh river basin (55,000 km², Iran) as an example. The main research question examined in this paper is whether or not the parameters of a hydrological model applied to gauged catchments can be successfully transferred for simulating streamflows in hydrologically similar ungauged catchments. In this study, the HBV model is applied to simulate daily streamflow with parameters transferred from gauged basin counterparts. Different similarity measures were reviewed and finally the approach based on the shape of the flow duration curve (FDC) was used. FDCs are frequently

used for comparing the response of gauged catchments and for estimating hydrological indices for ungauged catchments, but their potential use for the regionalization of conceptual rainfall runoff models to ungauged catchments needs to be explored and is a subject of this paper. FDCs for ungauged basins are defined using developed regional regression relationships between the parameters of a logarithmic FDC model and physiographic catchment characteristics of eleven gauged catchments. The results suggest that the proposed method could be successfully applied for the estimation of ungauged streamflows in the mountainous parts of the Karkheh river basin. Then the estimated ungauged streamflows were used as an input to conduct water balance analysis of main river reaches of Karkheh river system. The utility of this information is demonstrated in closing the water balance, scenario analysis for surface water allocation and identification of river reaches where further hydrological investigations are crucial.

Keywords: Ungauged catchments, streamflow, regionalization, HBV model, catchment similarity, flow duration curve, river water balance