Inter-comparison of methods for estimating rainfall-runoff model parameters in ungauged basins (case study: Austria and Slovakia)

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In ungauged catchments, where no discharge data are available calibration and validation methods cannot be used for estimating rainfall - runoff model parameters. Parameter values of the model can be assessed (transferred) by regionalisation methods from gauged catchments, where parameters are specified by model calibration to observed runoff. In this case, the process of regionalisation can be defined as spatial transferring and generalising hydrological components, methods, models and model parameters, with a strong emphasis on scaling issues.

In this paper various methods for the estimation a rainfall–runoff model parameters in ungauged basins based on geographical location and geographical basin characteristics are presented. Several catchments in Austria and Slovakia with comparable rainfall-runoff processes and with available daily flow, precipitation and air temperature time series were selected in the study. The rainfall-runoff model was calibrated using a daily time step at these catchments. Global and local mean, inverse distance weighting and kriging interpolation methods, and other methods based on similarity of basin's characteristics were used to regionalise parameters of the model in the catchments. To verify the results of these methods, Jack-knife cross validation was applied. Finally, the effectiveness of the estimation method for ungauged basins was tested. This was performed by comparing the model simulations to observed hydrographs and computing Nash-Sutcliffe optimization criterion. Model parameters of the rainfall - runoff model estimated by all these methods and estimated by the model calibration were used for modelling mean daily discharges and the results were finally compared and discussed.