Runoff signatures prediction in ungauged basins – a comparative assessment in Austria

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In this study we assess the prediction of a range of runoff signatures for a consistent dataset. Daily runoff time series are predicted for 213 catchments in Austria by a regionalised rainfall-runoff model and by Top-Kriging, a geostatistical interpolation method that accounts for the river network hierarchy. From the runoff timeseries, six runoff signatures are extracted: annual runoff, seasonal runoff, flow duration curves, low flows, high flows and runoff hydrograph. The predictive performance is assessed by the bias, error spread and proportion of unexplained spatial variance of statistical measures of these signatures in cross-validation mode. Results of the comparative assessment show that the geostatistical approach (Top-Kriging) generally outperforms the regionalised rainfall-runoff model. The predictive performance increases with catchment area for both methods and all signatures, while the dependence on climate characteristics is weaker. Annual and seasonal runoff can be predicted more accurately than all other signatures. The spatial variability of high flows is the most difficult to capture followed by the low flows. The relative predictive performance of the signatures depends on the selected performance measures. It is therefore essential to report performance in a consistent way by more than one performance measure.