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Detecting similarities in watershed response behaviour

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We require detailed knowledge of watershed response behaviour to establish a regionalisation of flood frequencies for ungauged basins, to customise parameters of hydrologic models and for many other purposes.
For many areas data have been collected only for short time periods. To extend the basis of information, we reuse data from watersheds with a similar response behaviour or build homogeneous regions. But which watersheds behave in the same way and which indices indicate similar or different behaviour?
For watersheds in Rhineland-Palatinate, Germany, we study the response behaviours of gauged watersheds. We use data from 115 gauges with covering periods between 13 and 54 years, a wide range of topography, land use, geology, soil types, average annual precipitation and areas between 40 and 1000 km^2. For these runoff time series we developed several indices to describe the response behaviour.
Some indices, portraying flow variability like frequencies, maximum/mean flows at various times and timescales, are derived directly from runoff time series. Flow duration curves are the basis of other indices like slopes, areas under the curve and individual values on the curve. For some catchment areas, especially in the Nahe river basin and the Westerwald, we use runoff coefficients as additional information. The calculated indices for each catchment area show a wide range of values but also similarities between catchments.
Some of these indices are redundant or misleading for our selection process. To find most significant indices to combine catchments and thus improve the data base we use statistical methods like principal component or factor analysis and self-organizing maps.