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Multivariate testing of spatio-temporal consistence of daily precipitation records

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Compilation of high quality historical climate data sets still remains a challenge for weather services and climate research. In this contribution we present the application of Principal Component Analysis in S-mode including Varimax-rotation for quality control and preprocessing of the data for homogenization.
PCA can be used for daily precipitation records as well as for indices such as number of rainy days above a certain threshold, intensity and absolute daily maximum in monthly, seasonally or yearly resolution. The Varimax-rotation leads to a selection of well separated sub-regions (spatial patterns) of similar precipitation behaviour based on PC-loadings. In this step, single stations within the sub-regions which considerably differ from neighbouring stations can be easily detected. The highest loadings of each PC enable to identify the leading or most representative station in the sub-regions. Due to limited availability of long-term records this information plays an important role in the collection of historical climate data sets. Finally, the PC-scores (time-series) which correspond to the weighted sub-regional means could be applied as reference time-series in a homogenization process of the data.