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Forecasting the weather
- ensemble techniques
in probabilistic weather prediction

Construction of homogeneous long-term precipitation series in Germany

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Long-term homogeneous precipitation series are the base of robust time series analysis amongst others. The aim of this study is the construction of a monthly homogeneous data set spanning a period of 100 years.
The initial data base consists of 118 stations distributed in Germany, but predominant in the western part. The measured values were digitized during the KLIMADIGI project by the Deutscher Wetterdienst and the Meteorological Institute of the University of Bonn. The temporal resolution is daily with only few missing values, which allows the calculation of monthly indices.
The data series are classified into regional networks of related precipitation characteristics using a principal component analysis followed by a varimax rotation. Input data are monthly precipitation totals and indices such as number of precipitation days and intensity. The 30 years moving trend is removed which leads to much better defined regions. The ten resulting networks correspond clearly to geographical regions.
For the identification of changepoints the yearly precipitation totals and indices are scaled and compared to the other series within the network. The advantage of introducing indices to the algorithm lies in the additional information. Hidden changes that are difficult to locate in the totals, often appear clear in the indices. Here, the raw data of the particular target series is used and compared with, in previous runs, corrected neighbor series. The best breakpoint positions for each target series are estimated, in minimizing a cost function that includes all neighbor stations within the particular network and consists of a log likelihood and the Caussinus-Mestre criterion (Caussinus and Mestre, 2004) as penalty term. Other methods use reference stations and therefore loose part of the information or investigate the pairs separately which leads to the problem of combining the individual results. This is avoided by comparing the target series to the reference series simultaneous.
The detected breaks are corrected in the monthly raw data using multiple linear regression.
The sequence of detection and correction is repeated until the detected breakpoints are constant.