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Temporal and spatial variability of long-term daily precipitation observations

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Long time series of good-quality daily precipitation observations are essential for the assessment of extreme precipitation characteristics and for impact studies such as flood risk management. Those are, unfortunately, only sparsely available. In this study, we analyze a dataset of 118 stations in Germany which have been extended recently by the digitization project KLIDADIGI and which cover the whole 20th century with only few gaps. This data set allows new and more detailed insight into the long-term variability in time and space of daily precipitation characteristics in Germany. A special focus in our study is set on the possible changes in results which arise due to this extension, e.g. a change of trend signs over a longer period.

The observations are investigated by means of several indices which describe different characteristics of daily precipitation, including extremes. These indices are calculated for each season separately. Spatial variability is assessed with a principal component analysis using varimax rotation and with correlation versus distance plots. For the investigation of temporal variability, wavelet spectra are compared and linear trends are computed using the Kendall's tau non-parametric estimate. Only few trends are statistically significant, mainly in the south of Germany and in the winter season, and trend estimates are also quite variable throughout the century.