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In the context of statistical assessments of regional climate change an approach is developed, which puts its emphasis on nonstationarities in the relationships of large-scale atmospheric circulation and regional climate.

Mean and extreme precipitation from daily station-based data for the second half of the 20th century in the Mediterranean area are used to analyse the impact of non-stationarities on statistical downscaling results. For the analysis, precipitation at 94 weather stations are available, which have been regionalized by means of a principal component analysis (PCA). Depending on the season, there are 18 (spring) up to 23 (summer) precipitation regions composed by the PCA. Different variables of the NCEP/NCAR-reanalysis dataset are used as predictors, i.e. geopotential heights at the 700hPa level, as well as humidity and horizontal wind components. By means of s-mode PCA, centers of variation are determined and related to the precipitation time series.

A three-step censored quantile regression is used as transfer function. Predictors are selected according to their significance on the level of α=0.01 for different quantiles (τ=0.5, 0.55, ..., 0.95, 0.99). Subsequently, the daily dataset is seperated into training and target periods to assess the quality of the models using the „Censored Quantile Verification Skill Score“ (CQVSS, Friederichs and Hense (2007)). Following the approach of Hertig and Jacobeit (2013), scores are calculated on the basis of sliding timeslices. Then, the individual scores are related to the mean score of the whole period. If there are several successive years outside the confidence interval of the mean value, a nonstationarity is claimed, which is subsequently examined for the underlying changes in the predictor-predictand relationships. In case of nonstationarities for a particular station, statistical models which describe these nonstationary relationships are included in addition to the stationary model. This leads to the application of one statistical model in case of overall stationary model behavior at a specific station, or of a statistical model ensemble in case of nonstationarities.

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