

Generation of future high-resolution rainfall time series with a disaggregation model

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High-resolution rainfall data are needed in many fields of hydrology and water resources management. For analyzes of future rainfall condition climate scenarios exist with hourly values of rainfall. However, the direct usage of these data is associated with uncertainties which can be indicated by comparisons of observations and C20 control runs. An alternative is the derivation of changes of rainfall behavior over the time from climate simulations. Conclusions about future rainfall conditions can be drawn by adding these changes to observed time series.

A multiplicative cascade model is used in this investigation for the disaggregation of daily rainfall amounts to hourly values. Model parameters can be estimated by REMO rainfall time series (UBA-, BfG- and ENS-realization), based on ECHAM5. Parameter estimation is carried out for C20 period as well as near term and long term future (2021-2050 and 2071-2100). Change factors for both future periods are derived by parameter comparisons and added to the parameters estimated from observed time series. This enables the generation of hourly rainfall time series from observed daily values with respect to future changes.

The investigation is carried out for rain gauges in Lower Saxony. Generated Time series are analyzed regarding statistical characteristics, e.g. extreme values, event-based (wet spell duration and amounts, dry spell duration, ...) and continuum characteristics (average intensity, fraction of dry intervals, ...). The generation of the time series is validated by comparing the changes in the statistical characteristics from the REMO data and from the disaggregated data.