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Bias corrections of several time scales of climate model output

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Climate scenarios are necessary to study impacts of climate change. These climate scenarios are usually generated with the use of a set of climate models and statistical downscaling. Yet, due to biases in climate models, the direct output of these models can usually not be used directly for impact modelling. A climate model is said to be biased when the statistical characteristics significantly differ from the observed climate. In general, even key-parameters, such as mean precipitation, heavily biased.

Nevertheless impact modellers need future time series. There are roughly two common methods to generate plausible time series for the future:
- The direct method applies corrections to the biased climate model output.
- The delta change method applies change factors to observed climate data or weather generators representing a certain reference period.

Ideally, both methods would result in similar climate change impacts when the same climate model simulation is applied. In practise, this is not the case and the construction of time series is therefore often regarded as an additional source of uncertainty.

The discrepancy between assessed impacts has several causes. One of them, is that the methods are generally restricted to the correction of the probability density function of one, usually daily, time-scale. Temporal, spatial and inter-variable correlations are often neglected. Yet, these characteristics are important for the assessed impacts.

In this study, we compare several simple and attractive corrections/transformations that are able to incorporate different time-scales or temporal dependencies. The methods are tested on the basis of popular climate indices as cumulative precipitation deficit, growing season and heat waves in the Netherlands. Ultimately, it is tested if these transformations, which can be used in as well the direct as the delta change method, lead to more comparable changes in these climate indices.