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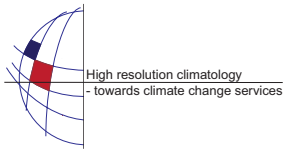

Generation of future time series for impact assessments

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A climate model is said to be biased if the statistical characteristics of the model output significantly differ from the observed climate. In general even key-parameters as the mean precipitation can be substantially biased. This makes the direct use of the climate model output in impact studies inconvenient.

However, climate impact models are regularly driven by climate time series. Therefore, plausible time series for the future need to be generated. Two commonly applied methods are the bias correction of climate model output and the transformation of observed climate data.

The bias correction is thought to be superior with respect to spatial consistency and consistency between different climate variables. Indeed, even implicit changes in relations are automatically taken into account. Accordingly, hidden biases within these interrelations will remain in the corrected output. In practice, all statistical properties, like the mean, the standard deviation and higher quantiles of a certain climate variable can be biased. Since all these variables and their characteristics are mutually dependent, corrections of one bias will by definition change other characteristics and relations with other variables. Some other biases will be (partly) solved, but new biases and artefacts will be introduced.

Transformation of observed time series is often referred to as the delta-change method or perturbation method. Precipitation is typically multiplied by a certain factor whereas a specific offset is added to variables as temperature. Of course it is possible to control variability characteristics separately, if more sophisticated transformations are used. The transformation method will not include all changes. Besides, every transformation may introduce new biases and artefacts. But time series generated by transformation will generally contain fewer biases than bias corrected climate model output.

Sometimes, a generic set of time series for the future can serve many different studies. But obviously, the relevant characteristics differ from study to study. For the assessment of extreme river discharges, typically the multiday precipitation extremes are of interest. In wind resource assessment monthly means will do. And in agricultural and ecological studies also the interannual variability is of key-importance.

The complexity of the method should be limited, since all increases in complexity of the method will introduce new artefacts. Consequently, not all characteristics can be taken into account. The challenge of generating time series for the future is to find an optimum between complexity and the magnitude of the remaining biases. Therefore, it should always be considered if tailor-made time series are necessary.