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# Uncertainty in projected point precipitation extremes for hydrological impact analysis of climate change

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Current trends in the hydro-meteorological variables indicate the potential impact of climate change on hydrological extremes. Therefore, they trigger an increased importance climate adaptation strategies in water management. The impact of climate change on hydro-meteorological and hydrological extremes is, however, highly uncertain. This is due to uncertainties introduced by the climate models, the internal variability inherent to the climate system, the greenhouse gas scenarios and the statistical downscaling methods. In view of the need to define sustainable climate adaptation strategies, there is a need to assess these uncertainties. This is commonly done by means of ensemble approaches. Because more and more climate models and statistical downscaling methods become available, there is a need to facilitate the climate impact and uncertainty analysis. A Climate Perturbation Tool has been developed for that purpose, which combines a set of statistical downscaling methods including weather typing, weather generator, transfer function and advanced perturbation based approaches. By use of an interactive interface, climate impact modelers can apply these statistical downscaling methods in a semi-automatic way to an ensemble of climate model runs.

The tool is applicable to any region, but has been demonstrated so far to cases in Belgium, Suriname, Vietnam and Bangladesh. Time series representing future local-scale precipitation, temperature and potential evapotranspiration (PET) conditions were obtained, starting from time series of historical observations. Uncertainties on the future meteorological conditions are represented in two different ways: through an ensemble of time series, and a reduced set of synthetic scenarios. The both aim to span the full uncertainty range as assessed from the ensemble of climate model runs and downscaling methods. For Belgium, for instance, use was made of 100-year time series of 10-minutes precipitation observations and daily temperature and PET observations at Uccle and a large ensemble of 160 global climate model runs (CMIP5). They cover all four representative concentration pathway based greenhouse gas scenarios. While evaluating the downscaled meteorological series, particular attention was given to the performance of extreme value metrics (e.g. for precipitation, by means of intensity-duration-frequency statistics). Moreover, the total uncertainty was decomposed in the fractional uncertainties for each of the uncertainty sources considered. Research assessing the additional uncertainty due to parameter and structural uncertainties of the hydrological impact model is ongoing.