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Developing future precipitation events from historic events: An Amsterdam case study.

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Due to climate change, the frequency and intensity of extreme precipitation events is expected to increase. It is therefore of high importance to develop climate change scenarios tailored towards the local and regional needs of policy makers in order to develop efficient adaptation strategies to reduce the risks from extreme weather events. Current approaches to tailor climate scenarios are often not well adopted in hazard management, since average changes in climate are not a main concern to policy makers, and tailoring climate scenarios to simulate future extremes can be complex. Therefore, a new concept has been introduced recently that uses known historic extreme events as a basis, and modifies the observed data for these events so that the outcome shows how the same event would occur in a warmer climate. This concept is introduced as 'Future Weather', and appeals to the experience of stakeholders and users.

This research presents a novel method of projecting a future extreme precipitation event, based on a historic event. The selected precipitation event took place over the broader area of Amsterdam, the Netherlands in the summer of 2014, which resulted in blocked highways, disruption of air transportation, flooded buildings and public facilities. An analysis of rain monitoring stations showed that an event of such intensity has a 5 to 15 years return period.

The method of projecting a future event follows a non-linear delta transformation that is applied directly on the observed event assuming a warmer climate to produce an "up-scaled" future precipitation event. The delta transformation is based on the observed behaviour of the precipitation intensity as a function of the dew point temperature during summers. The outcome is then compared to a benchmark method using the HARMONIE numerical weather prediction model, where the boundary conditions of the event from the Ensemble Prediction System of ECMWF (ENS) are perturbed to indicate a warmer climate.

The two methodologies are statistically compared and evaluated. The comparison between the historic event generated by the model and the observed event will give information on the realism of the model for this event. The comparison between the delta transformation method and the future simulation will provide information on how the dynamics would affect the precipitation field, as compared to the statistical method.