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Urban hydrologic design in the light of climate variability

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In general, hydrologic design is performed using statistical evaluations of long-term rainfall data. This data is either used for continuous hydrological modelling or for deriving intensity-frequency-duration (IDF) curves used in event-based modelling. However, this data refers to a certain period and thus represents a specific, virtually arbitrary state of the climate. Thus, climate variability and climate change cannot be addressed properly by this approach. Uncertainty involved in these analyses can be considered through safety factors which might be viewed a feasible way to address possible anticipated increases in heavy rainfall. In order to provide a more process-based approach, this presentation proposes an alternative way: Meteorological variables required for hydrological modelling are derived in high temporal resolution (i.e. 10 minutes) by means of quasi-dynamical downscaling of atmospheric analyses data. This method helps to shed light on local hydro-climatic extremes as response to global scale analyses data in a process-based way. In a numerical experiment, the Intermediate Complexity Atmospheric Research Model (ICAR) is applied for a domain covering parts of Europe using a subset of the Twentieth Century Reanalysis data ranging from 1850 to 2010. Due to simplifications regarding atmospheric dynamics, it is computational more efficient than traditional dynamical downscaling approaches which can help to reduce computational costs. Moreover, relating the frequency of hydro-climatic extremes to certain periods and thus explicitly considering climate variability might help to overcome hydromythologies.