



Joint modeling of annual maximum precipitation across different duration levels

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The statistical modeling of rainfall maxima in terms of their intensity for different durations, often known as IDF-curves (intensity-duration-frequency curves), is widely used for flood design. Typically, the single duration levels are modelled separately and combined under the assumption of independence. Nevertheless, the dependence among them has to be taken into account. For this, an approach is proposed where a set of generalized extreme value distributions and a D-vine copula are flexibly parameterized by the set of duration levels of interest. A priori, it is not necessary to fix the duration levels nor the number of duration levels. This joint model produces increasing values for both, longer duration levels and larger return periods. It is flexible enough to capture variations across the duration levels while reproducing the correlation structure of the data. An application is given by estimating the conditional distribution of a nested sub-basin with different areas, urban and rural. The different reaction times of the areas are taken into account by modelling the dependence structure whereas this is not the case for an independent model. We consider the annual maximum rainfall events as well as nested events.