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Intensity-Duration Relation in the Bartlett-Lewis Rectangular Pulse Model

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For several hydrological modelling tasks precipitation time series with a high (sub-daily) resolution are indispensable. This data is, however, not always available and thus replaced by model data. A canonical class of stochastic models for sub-daily precipitation is the class of Poisson cluster processes, e.g. the Bartlett-Lewis rectangular pulse model (BLRPM). The BLRPM has been shown to be able to well reproduce certain characteristics found in observations.

Our focus is on intensity-duration relationship which are of particular importance in the context of hydrological modelling. We analyse several high resolution precipitation time series (5min) from Berlin and derive empirical intensity-duration relations for several return levels of intensities (intensity-duration-frequency curves, IDF curves). In a second step, we investigate to what extent the variants of a BLRPM are able to reproduce these relations (i.e. the IDF curves) for different situations (e.g., seasons) and for the various return-levels of intensities. By means of a sensitivity study with the BLRPM, we investigate to what extent the ability to reproduce the intensity-duration relationships is related to certain relations between the model parameters. Such relations are typically useful to reduce the complexity of the model and thus robustify and facilitate parameter estimation.