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

Christoph Ritschel, Henning Rust, Uwe Ulbrich, and Peter Névir
Institute of Meteorology, Freie Universität Berlin, Germany

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 extend
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 extend 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.