Scaling based estimation of IDF curves in Slovakia

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Rainfall intensity-duration-frequency (IDF) curves are of a great practical importance in water resources management e.g. for the design of hydraulic structures and urban drainage systems, and for the estimation of flash flood risk. However the lack of rainfall data with sufficient temporal resolution (usually caused by limited number of rain gauges with continuous recording and short series of measurements) does not generally allow for constructing maps of extreme short-duration rainfall with the desired spatial resolution. In such cases the simple scaling model, which has proved its applicability in various regions of the world, offers a solution to this problem.

In this study the simple scaling theory was applied in the whole territory of Slovakia for the estimation of the intensity-duration-frequency characteristics of short duration rainfall. For the analysis the data series in one minute time step from 91 rainfall gauging stations were used. To estimate T-year rainfall quantiles of sub-daily duration at ungauged sites we applied an indirect estimation method based on local estimated scaling exponents which were interpolated using the Hardy Multiquadratic method based on radial basis functions. The results of interpolated estimates were compared with the statistical estimates at the stations, and showed great consistency with them. Finally we used RCM model scenarios to detect possible changes in the scaling exponents at selected stations in Slovakia up to the horizon 2010.