EGU21-7562
https://doi.org/10.5194/egusphere-egu21-7562
EGU General Assembly 2021
© Author(s) 2022. This work is distributed under
the Creative Commons Attribution 4.0 License.

# An Extended Model in Estimating Consistent Quantiles for Intensity-Duration-Frequency Curves

**Felix Fauer**, Jana Ulrich, Oscar E. Jurado, Uwe Ulbrich, and Henning W. Rust
Freie Universität Berlin, Meteorology, Statistical Meteorology, Berlin, Germany (felix.fauer@met.fu-berlin.de)

Intensity-Duration-Frequency (IDF) curves describe the main statistical characteristics of extreme precipitation events. Providing information on the exceedance probability or return period of certain precipitation intensities for a range of durations, IDF curves are an important tool for the design of hydrological structures.

Although the Generalized-Extreme-Value (GEV) distribution is an adequate model for annual precipitation maxima of a certain duration, the core problem of extreme value statistics remains: the limited data availability. Hence, it is reasonable to use a model that can describe all durations simultaneously. This reduces the total number of parameters and a more efficient usage of data is achieved. The idea of implementing a duration dependence directly into the parameters of the extreme value distribution and therefore obtaining a single distribution for a range of durations was proposed by Koutsoyiannis et al. (1998). However, while the use of the GEV is justified by a strong theoretical basis, only empirical models exist for the dependence of the parameters on duration.

In this study, we compare different models regarding the dependence of the GEV parameters on duration with the aim of finding a model for a wide duration range (1 min - 5 days). We use a combination of existing model features, especially curvature for small durations and multi-scaling for all durations, and extend them by a new feature that allows flattening of the IDF curves for long durations. Using the quantile score in a cross-validation setting, we provide detailed information on the duration and probability ranges for which specific features or a systematic combination of features lead to improved modeling skill.

Our results show that allowing curvature or multi-scaling improves the model only for very short or long durations, respectively, but leads to disadvantages in modeling the other duration ranges. In contrast, allowing flattening of the IDF curves leads to an improvement for medium durations between 1 hour and 1 day without affecting other duration regimes.