



## **Exploring upper tail estimators to assess the heavy-tail behavior of extreme precipitation in Germany**

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Extreme value distributions of hydro-meteorological variables often exhibit heavy-tail behavior. Since hydro-meteorological extremes are of high relevance to society and ecosystems, a reliable identification of upper tail behavior is of great importance. Several methods are applied to identify and quantify the upper tail behavior of distributions, including graphical and numerical methods. Numerical methods (e. g. Shape parameter of GEV, L-skewness, Upper tail ratio, Mean absolute deviation, Obesity index) are objective and more suitable for large data sets, however, the choice of appropriate numeric estimators remains challenging.

Our aim in this study is therefore to compare different numerical methods in order to identify robust upper tail estimators for the analysis of large data sets. We focus on a long-term and gap-free data set of daily precipitation from 1200 German weather stations and test different approaches of calculating the set of numerical estimators. Even though all upper tail estimators focus on the same sample of extremes, their application leads to significant differences in their estimation of upper tail behavior. Moreover, seasonal differences are found between upper tail estimators. We recommend to use a set of upper tail estimators to obtain an overall better impression of the tail behavior of hydro-meteorological extremes.