



## **How extreme is extreme hourly precipitation?**

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The importance of accurate representation of precipitation at fine time scales (e.g., hourly), directly associated with flash flood events, is crucial in hydrological design and prediction. The upper part of a probability distribution, known as the distribution tail, determines the behavior of extreme events. In general, and loosely speaking, tails can be categorized in two families: the subexponential and the hyperexponential family, with the first generating more intense and more frequent extremes compared to the latter. In past studies, the focus has been mainly on daily precipitation, with the Gamma distribution being the most popular model. Here, we investigate the behaviour of tails of hourly precipitation by comparing the upper part of empirical distributions of thousands of records with three general types of tails corresponding to the Pareto, Lognormal, and Weibull distributions. Specifically, we use thousands of hourly rainfall records from all over the USA. The analysis indicates that heavier-tailed distributions describe better the observed hourly rainfall extremes in comparison to lighter tails. Traditional representations of the marginal distribution of hourly rainfall may significantly deviate from observed behaviours of extremes, with direct implications on hydroclimatic variables modelling and engineering design.