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Assessing extreme values for water management purposes in the context of climate change

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Extreme events are often defined as rare events, for example floods or heavy precipitation events. Then very extreme events cannot be counted any more, and the use of a theoretical distribution to extrapolate to yet not observed quantiles is a general approach. Extreme value theory (EVT) deals with the specific characteristics of extreme values, for example their asymmetric distribution, and provides according theoretical distributions. In hydrology, the use of EVT has a long tradition. A prominent example is the estimation of 100-year flood return levels for water management purposes.

It is likely that changes to hydrological extremes due to climate change will have a great impact on human society in the future: Temperature increase might amplify the occurrence of heavy precipitation events due to an increased water-holding capacity of the atmosphere. On the other hand, regions, which are already vulnerable to water stress, might have to cope with an intensification of droughts. The adequate description of the characteristics of extreme hydrological events and their changes is thus a core element of risk assessment and water management.

In this talk, examples of the use of EVT to assess hydrological extremes are given. Results for flood occurrence in Southern Germany and droughts in Central Spain will be presented. A focus will be set on the treatment of temporal or spatial evolving extremes, and the assessment of future changes.