Modeling Seasonal Variations of Extreme Rainfall on Different Time Scales in Germany

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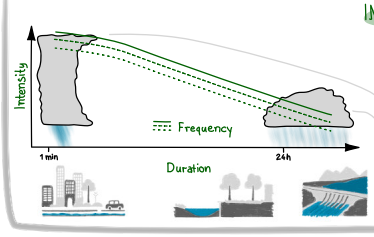
Motivation

IDF curves provide information about precipitation

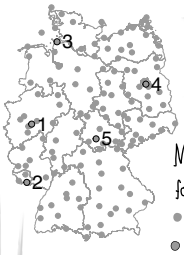
INTENSITY, DURATION and FREQUENCY used by different stakeholders.

Extremes might occur in different SEASONS

- summer
- autumn / winter



Data & Methods



Monthly maxima of precipitation measurements for durations: 1, 2, 4, 8, ..., 8192 min (≈6 days)

- stations used in study
- stations used on this poster

1	Bever-Talsperre	51 yrs
2	Saarbrücken-Ensheim	24 yrs
3	Cuxhaven	19 yrs
4	Berlin-Tempelhof	26 yrs
5	Schmücke	28 yrs

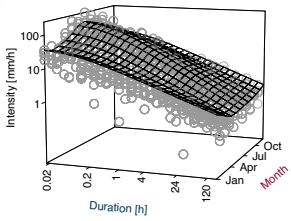
Generalized Extreme Value distribution

$$G(I,d,m) = \exp\left\{-\left[1+\xi\left(\frac{I-\mu(d,m)}{\sigma(d,m)}\right)\right]^{-1/\xi}\right\}$$

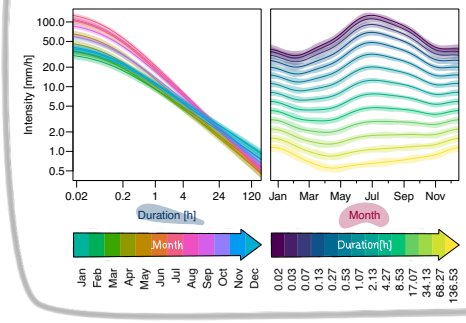
dependent on

DURATION MONTH

How does the IDF-relationship change throughout the year?



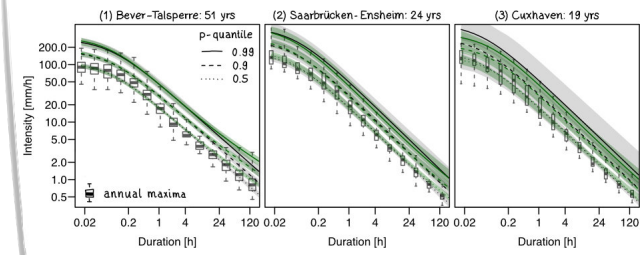
(1) Bever-Talsperre
- monthly maxima
- estimated 0.9-quantile



- IDF curves
  - more steep in summer
- Intensity maxima
  - short durations: summer
  - long durations: autumn / winter

How can we improve annual IDF curves?

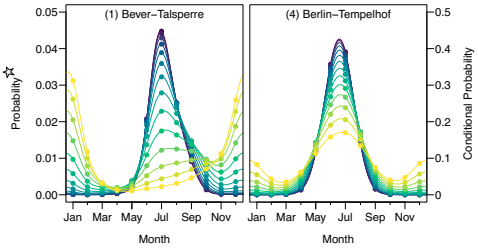
Estimated annual IDF curves based on
- annual maxima
- monthly maxima



- reduced uncertainties
  - especially stations with short time series
- less restricted dependence on duration
  - deviation from simple scaling

When do extreme events occur?

- short convective extremes conditionally very likely in summer
- seasonality of long-lasting extreme events depends on location
  - (1) events conditionally more likely in autumn/winter
  - (4) events occur spread throughout the whole year



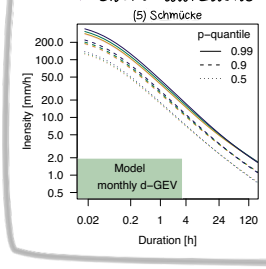
*Probability that annual 0.9-quantile is exceeded in a certain month

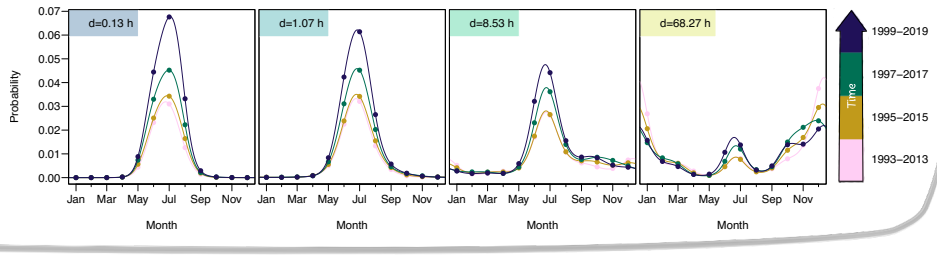
Outlook

How do intensity and seasonality change over time?

Estimated IDF curves and monthly exceedance probabilities using a moving time window

- short durations: increasing intensities
- long durations: changes in seasonality





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