Comparative Evaluation of Two Stochastic Weather Generators for Estimating synthetic Precipitation in the Rhine Basin

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Objectives:

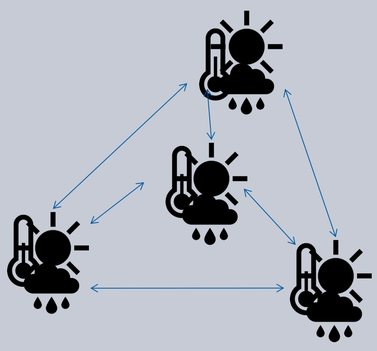
- Often insufficient spatial and temporal resolution of observational meteorological records
- Generation of synthetic meteorological time series with weather generator (WGN)
- Improving design discharge level estimation of extreme floods

Research Questions:

- How well do the weather generator results reproduce the input data characteristics on different spatial scales?
- How suitable are the two applied weather generation techniques for generating synthetic precipitation extremes?

Weather generation:

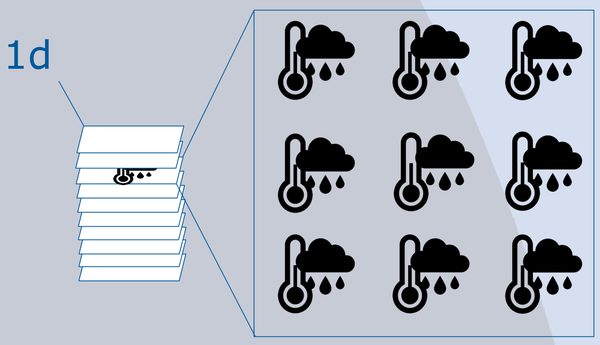
Auto-regressive weather generator

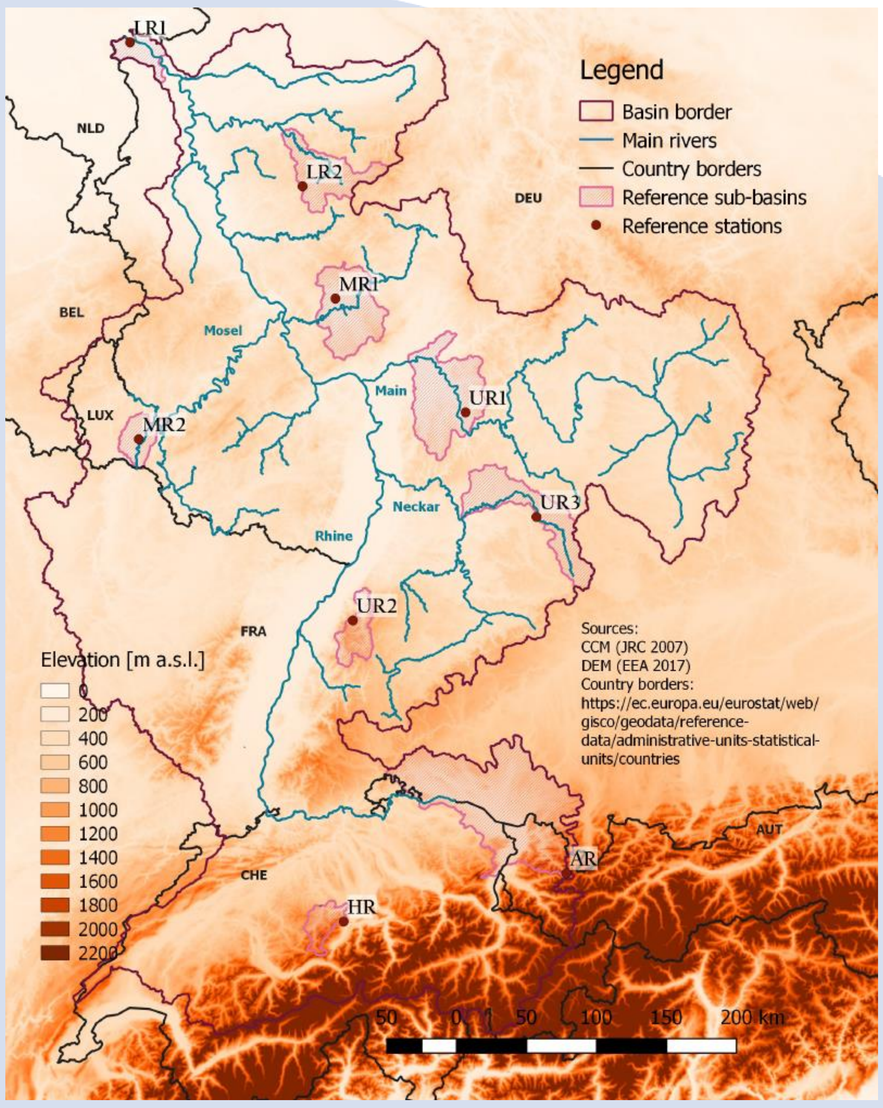


- Station-based input
- Correlation structure matrix
- Fitted mixed distribution
- Generated extremes may exceed observed records

Resampling weather generator

- Grid-based input
- Reshuffling days by nearest neighbour resampling
- Generated extremes within range of observed records

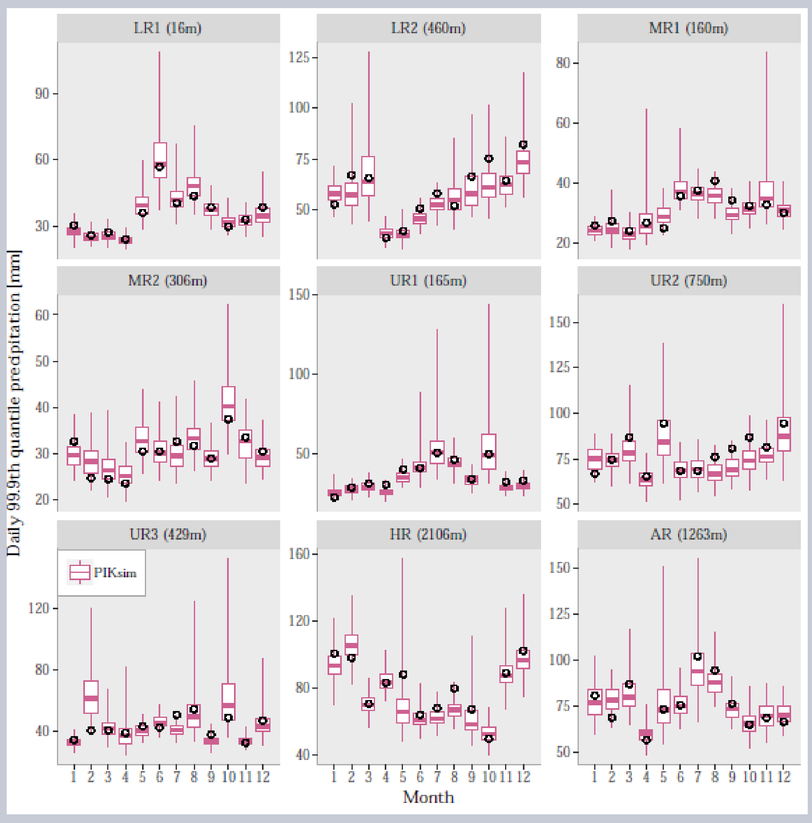




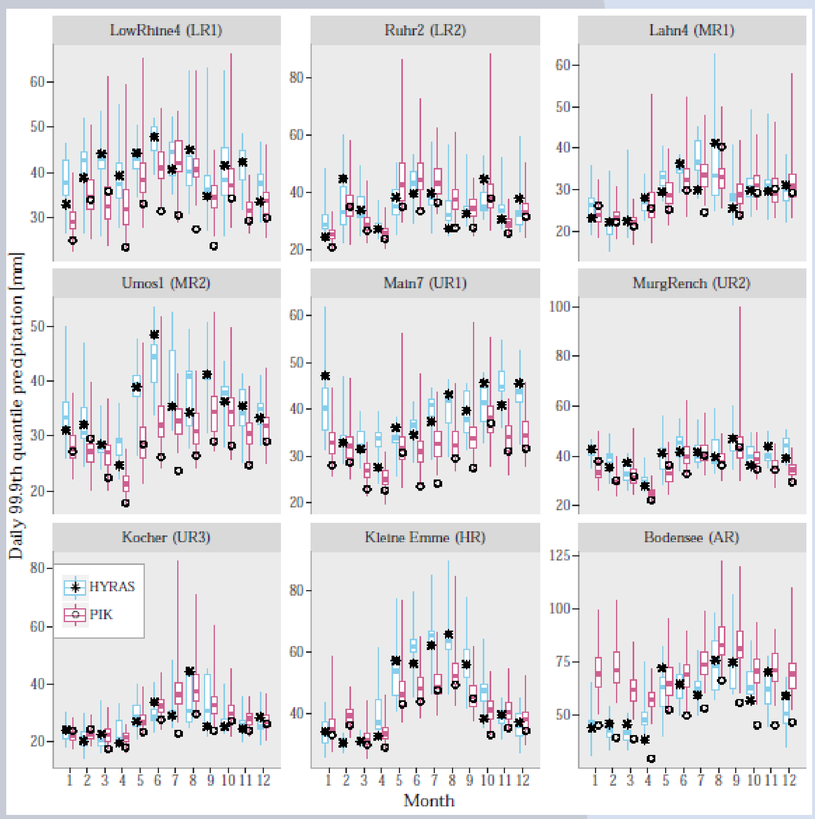
Rhine basin with main river, main tributaries and nine reference stations

Precipitation extremes:

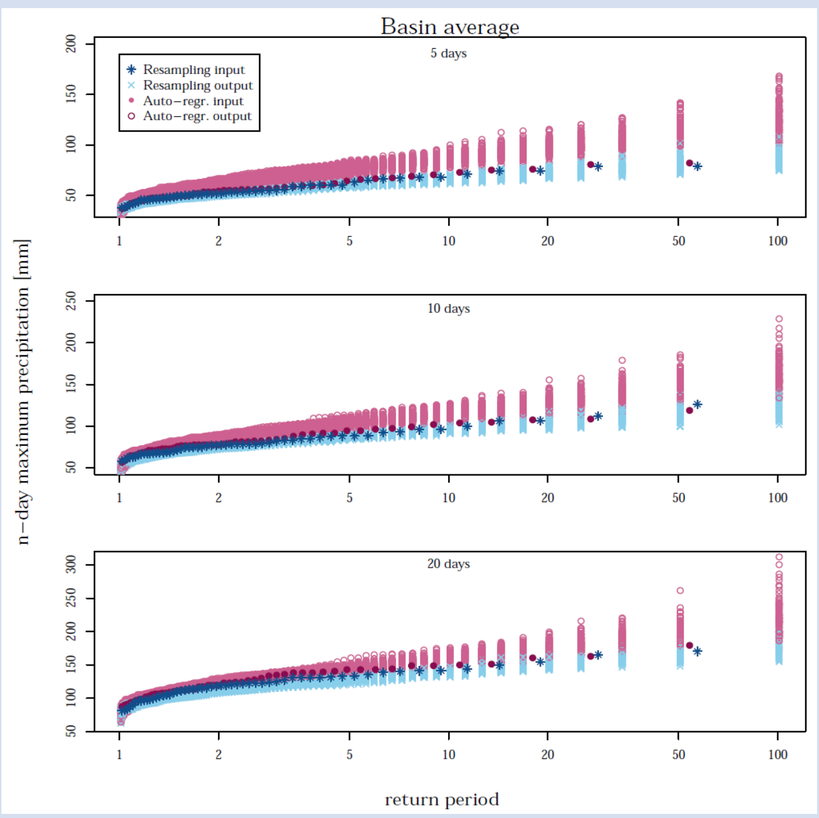
Daily extremes of auto-regressive WGN on station scale



Daily extremes of auto-regressive & resampling WGN on sub-basin scale



Multi-day extremes of auto-regressive & resampling WGN on basin scale



Conclusions:

- Auto-regressive weather generator performs well on station level but overestimates extremes on sub-basin level
- Overestimation of interstational correlations for extreme precipitation results in too high areal precipitation, particularly in summer
- Resampling weather generator is able to produce multi-day extremes exceeding observed records
- High uncertainty regarding the generated extremes due to limited observational record length

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