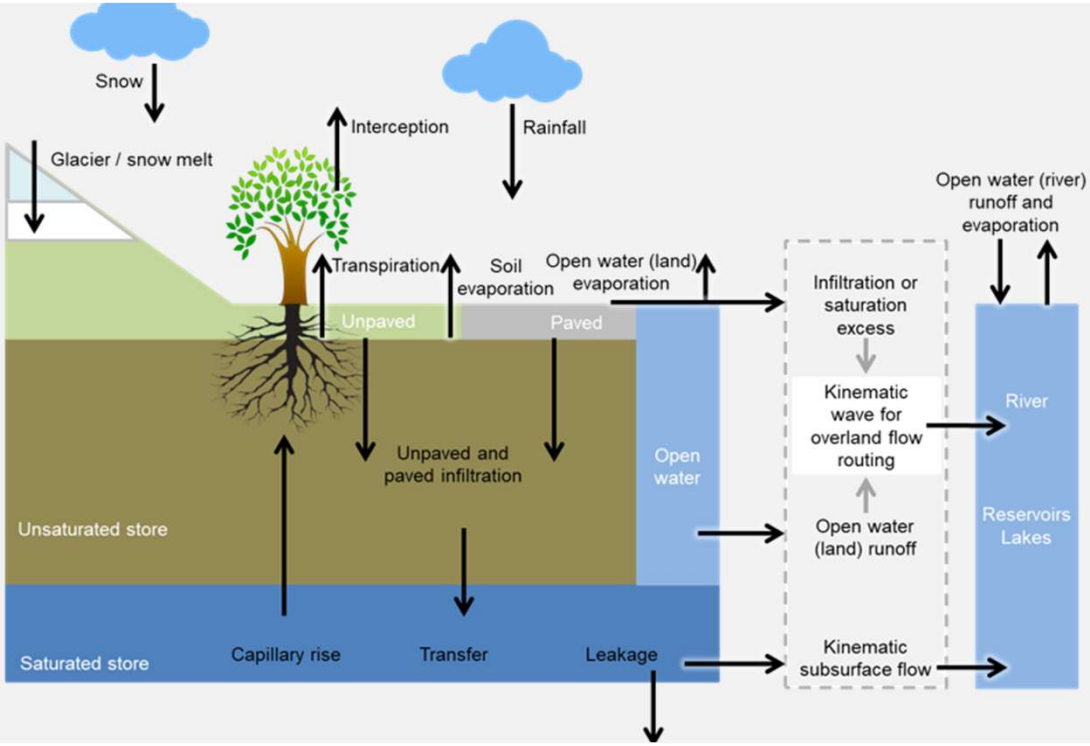
Interreg

Co-funded by the European Union

Meuse – Rhine (NL – BE – DE)

Flood Wisdom



Laurène Bouaziz & Anaïs Couasnon

Interreg – Flood Wisdom

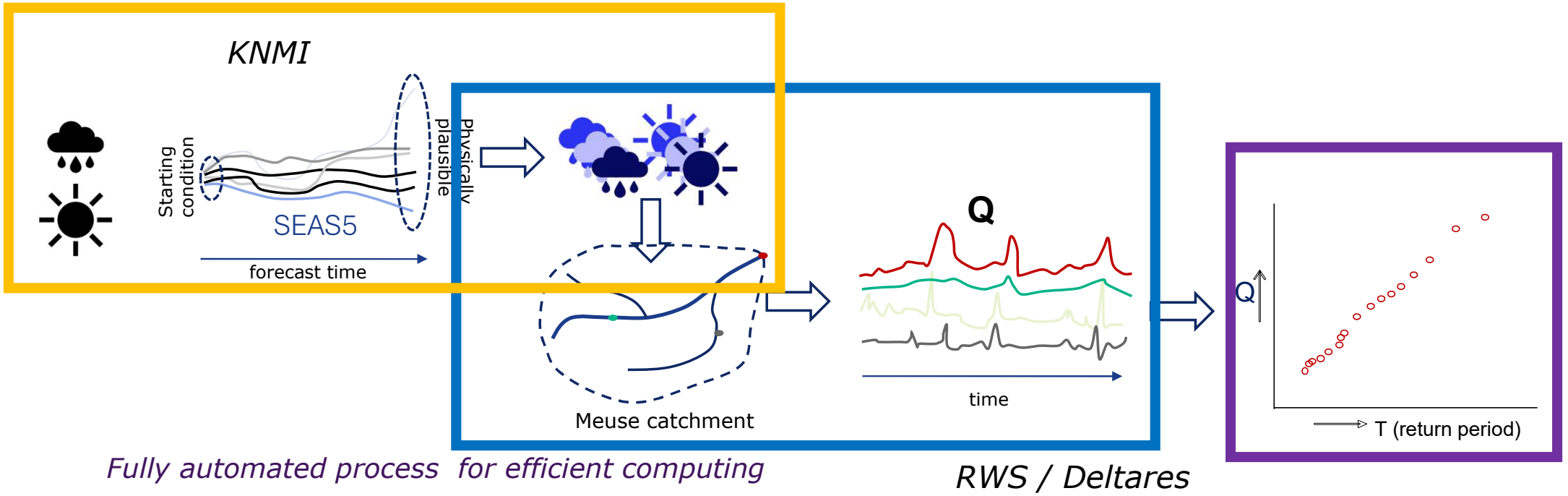
Co-financiers: Wallonie; Ministerium für Wirtschaft, Industrie, Klimaschutz und Energie des Landes Nordrhein-Westfalen

Partners: waterschap limburg; Ministerie van Infrastructuur en Waterstaat; LIÈGE université; TU Delft; RWTH AACHEN UNIVERSITY; INSTITUUT NATUUR- EN BOSONDERZOEK; WNF; kreis heinsberg; GEMEENTE WEERT

Objectives of the project

- Follow up of EMFloodresilience project
- Today: physically-based modelling chain to improve extreme discharge characterisation in the Meuse catchment (~10 000 years of SEAS5)
- Understand the extremes both in meteorological and hydrological sense
- Summer and winter events

The approach

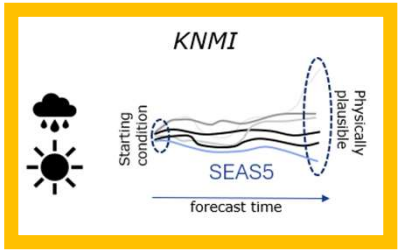


Fully automated process for efficient computing

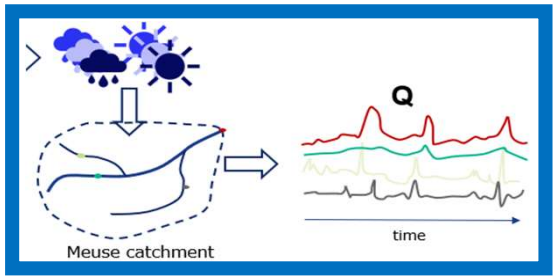
RWS / Deltares

Datasets from KNMI → **Hydrological and hydraulic model** → **Datasets of discharges across the whole Meuse catchment** → **Postprocessing**

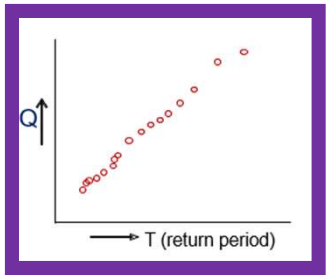
The approach – more detailed



- 306 blocks of ~ 40 years
- 36 km x 36 km, 6-hourly data
- 3 bias correction methods (3 x 306 block of ~ 40 years)
  - Sensitivity of the bias correction method

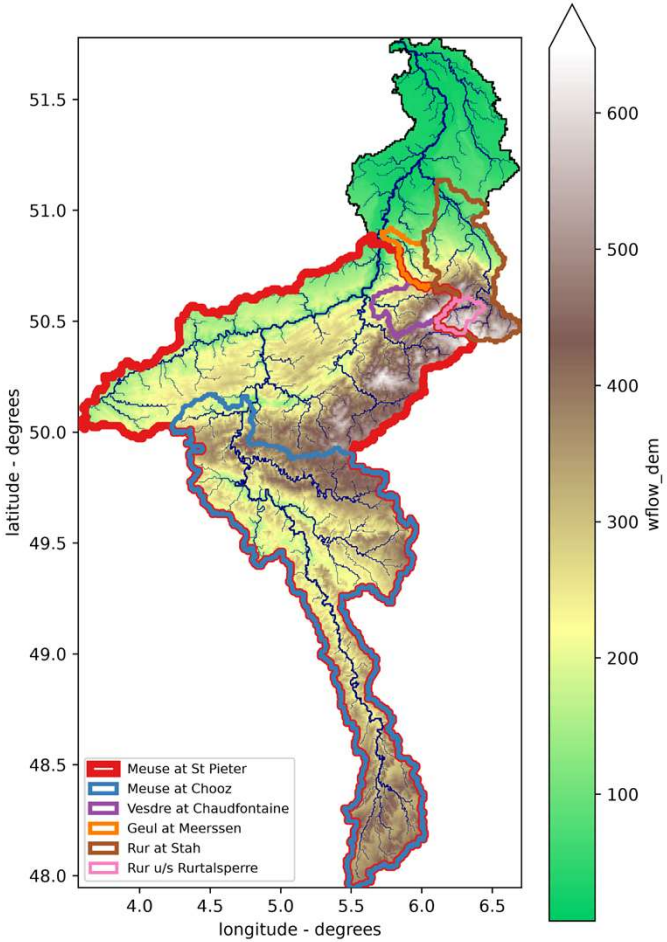


- Model calibration
- Climate data downscaled to 1 x 1 km, 6-hourly time step
- To prevent a cold start, initial conditions of the models based on a run from year 3 and 4 of the given runs



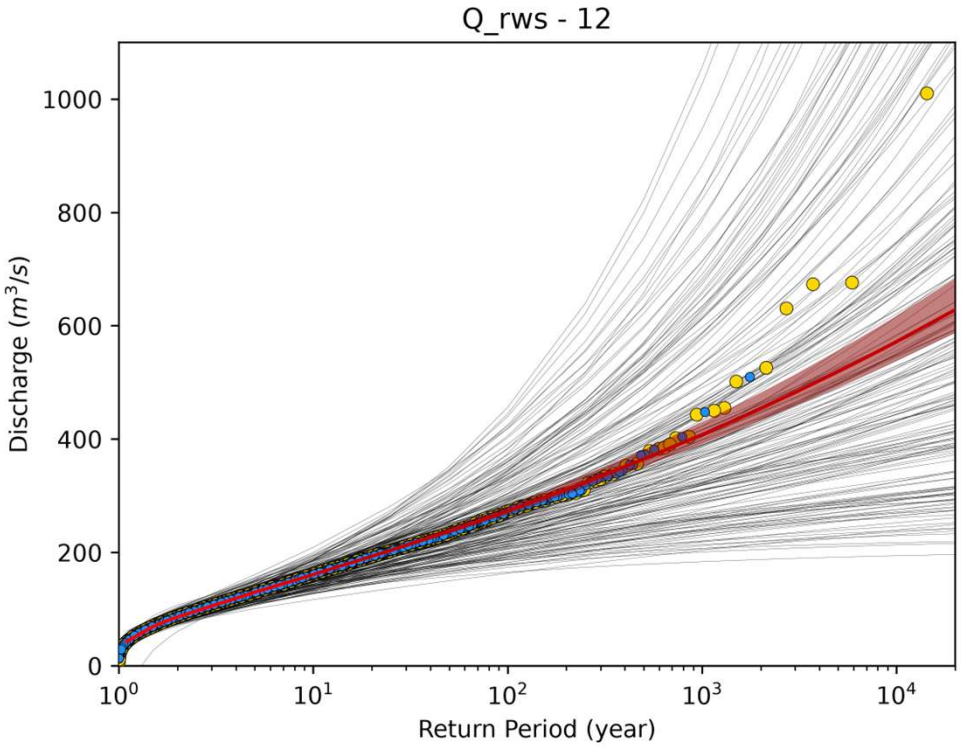
- Annual maxima from hydrological years (Oct-Sept)
- GEV fit
  - Parameter estimation with L-moments

Preliminary results - Focus



River	Location	Country	Catchment area (km^2)
Rur	Rurtalsperre	Germany	242
Geul	Meerssen	The Netherlands	338
Vesdre	Chaudfontaine	Belgium	683
Rur	Stah	Germany	2 152
Meuse	Chooz	France	10 120
Meuse	St Pieter	The Netherlands	21 233

Extreme value analysis
Vesdre at Chaudfontaine



Yellow: summer events
Blue: winter events

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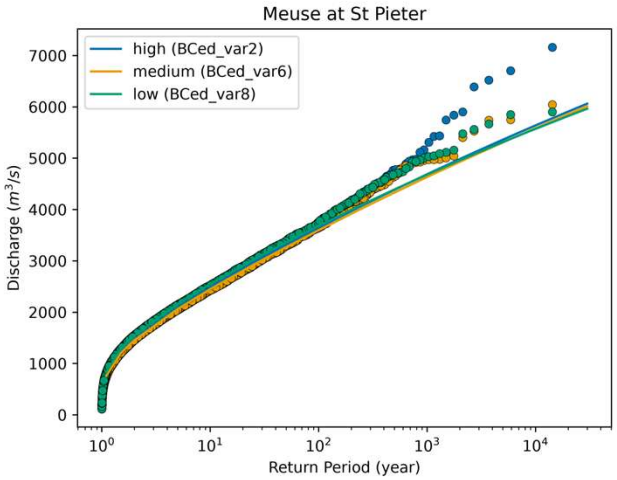
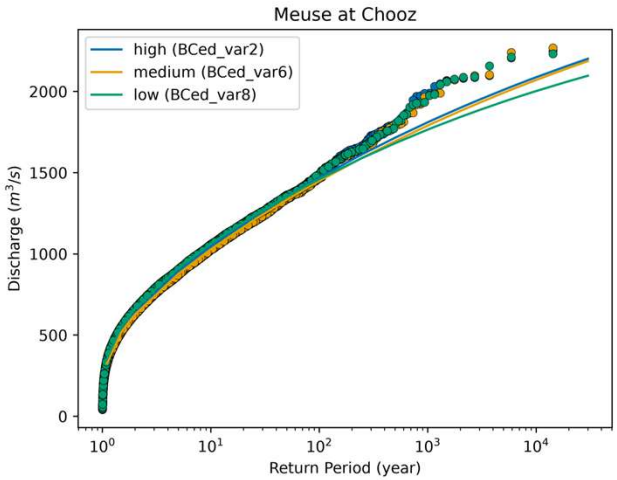
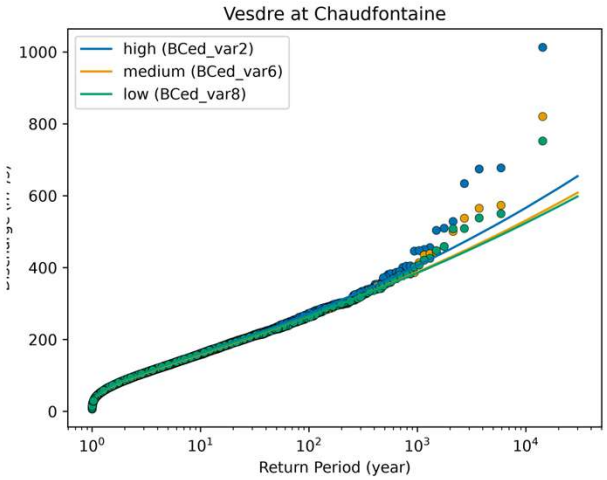
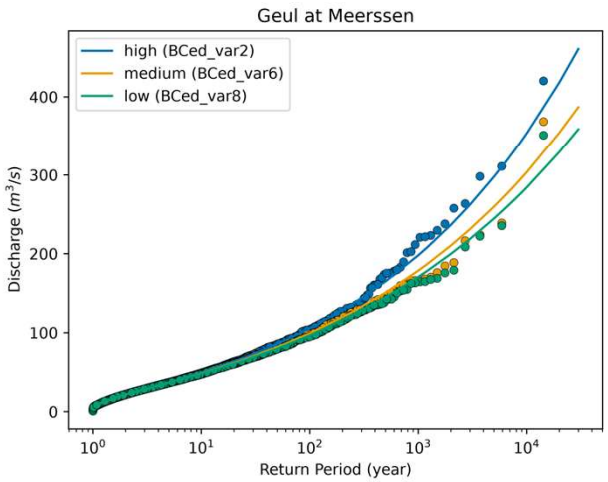
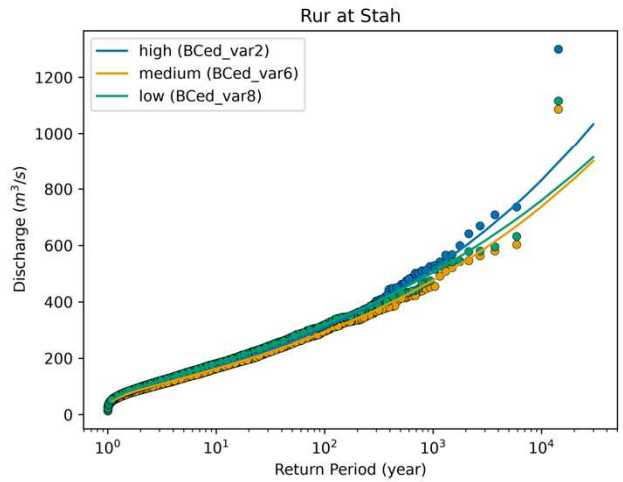
Extreme value analysis results

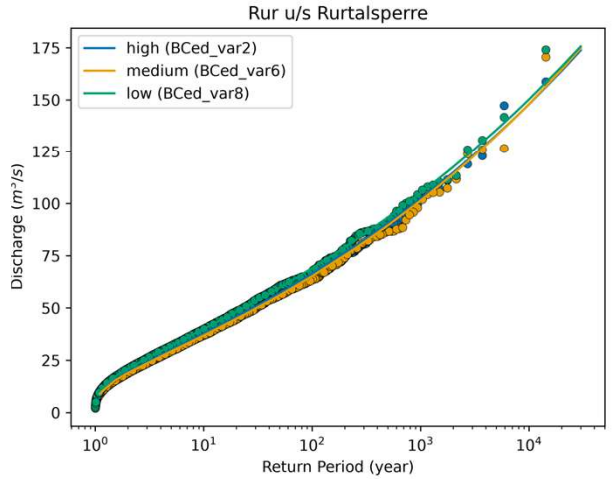






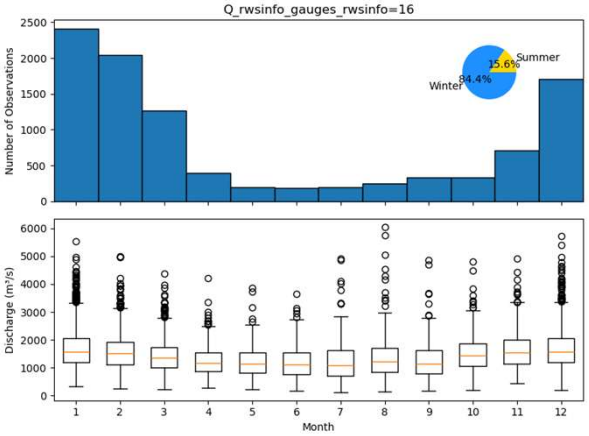




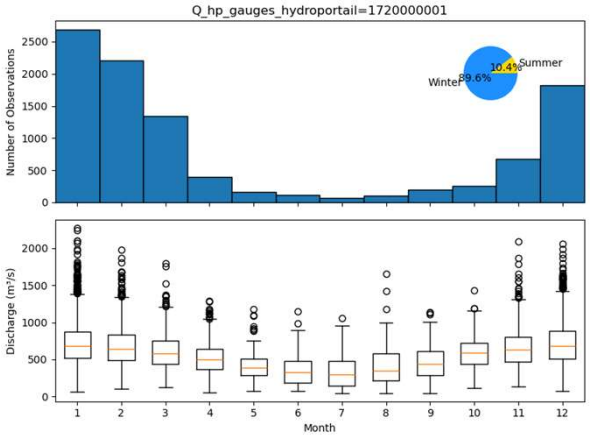


Seasonality

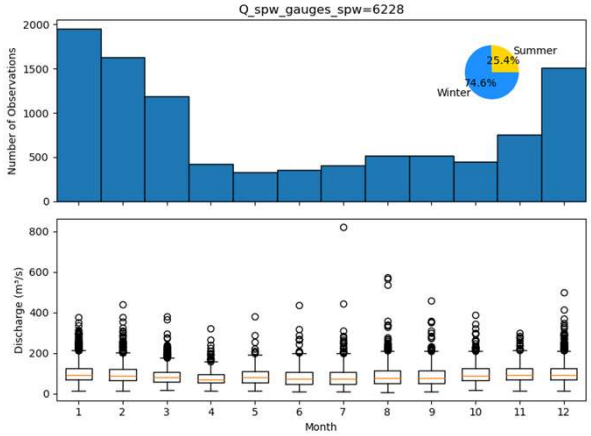
Meuse at St Pieter



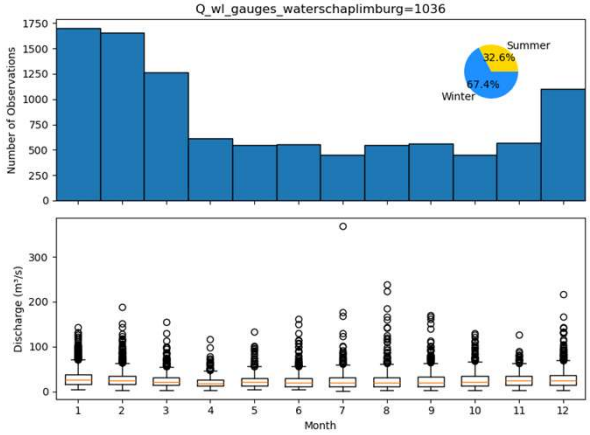
Meuse at Chooz



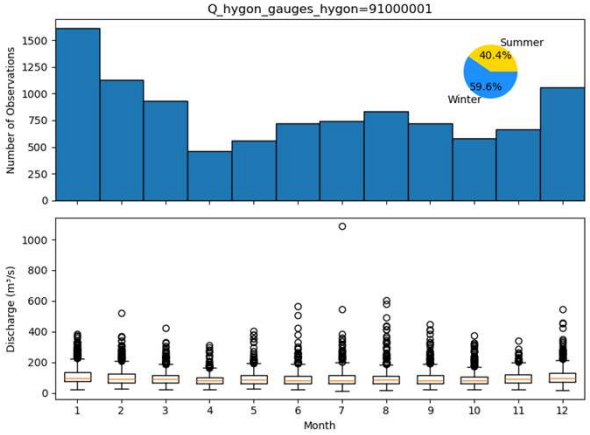
Vesdre at Chaudfontaine



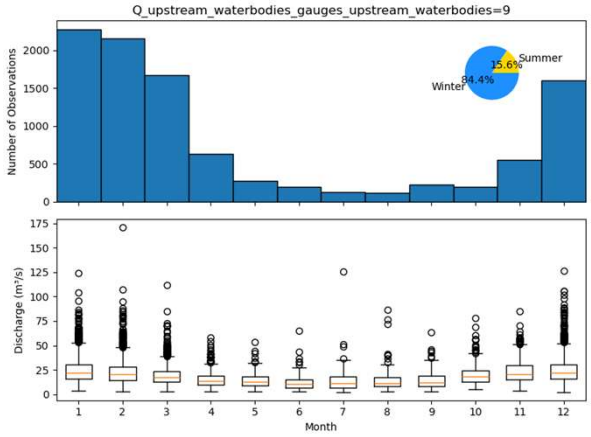
Geul at Meerssen



Rur at Stah



Rur at Rurtalsperre



Conclusion

- Bias correction impacts
  - The impact of the bias correction is more visible for BC_var2 but this impact varies across the stations
  - These differences become less pronounced with the current statiscal fit
- Shape parameter
  - Using the SEAS5 data help reduce some of the statistical uncertainty
- Summer vs winter
  - The proportion of summer events in the AM extreme event set can vary from about 9% to about 42% (across all bias corrections) --- more events than in previous project with EMFloodResilience (RACMO climate model)
  - Magnitude of the summer events larger than winter events for some locations
  - The importance of summer events in driving the tail of the distribution vary per location

Challenges

- Longer time series length reduces the statistical uncertainty.

- However it comes at the cost of:
  - coarse spatial and temporal resolution of SEAS5 data (6-hourly and 36 km x 36 km) (representation of orographic and convective processes)

- Model biases
  - Are summer precipitation extremes well represented in SEAS5?
  - Is the hydrological model able to meaningfully represent extreme (summer) events?

Opportunities

- Unique dataset of ~10000 years of meteorological forcing representing current climate conditions
- Reduced uncertainty for extreme value statistics
- Evaluate plausibility of events – physical processes
- Basin wide assessment – Meuse main river and smaller tributaries
- Derive shape parameter from the long time series to reduce uncertainty of the tail and combine with observations