Flood predictability from data

Comparison of FFA methods under diverse local conditions

- Simulation experiments for assessment of the effects of heterogeneity, sample size, and other local conditions.

  → Here: An observed mixed POT model (TMPS of SP1; Zwickau-Pöblitz, Mulde) is used to simulate 1000 samples of 100 and 5000 years each (Fig. 1).

- The simulation shows a good approximation of the true underlying model by the (seasonal) AMS with smaller uncertainty bands than the mixed POT model itself (Fig. 1 left).
- Only for very large samples (here 5000 years) the differences between the AMS and the mixed POT become significant (Fig. 1 right).
- The (seasonal) AMS shows great similarity with the POT model of the dominant flood type and the overall mixed model (Fig.2).
- In a next step the effect of different flood type configurations will be analyzed and generalized.

Fig. 1

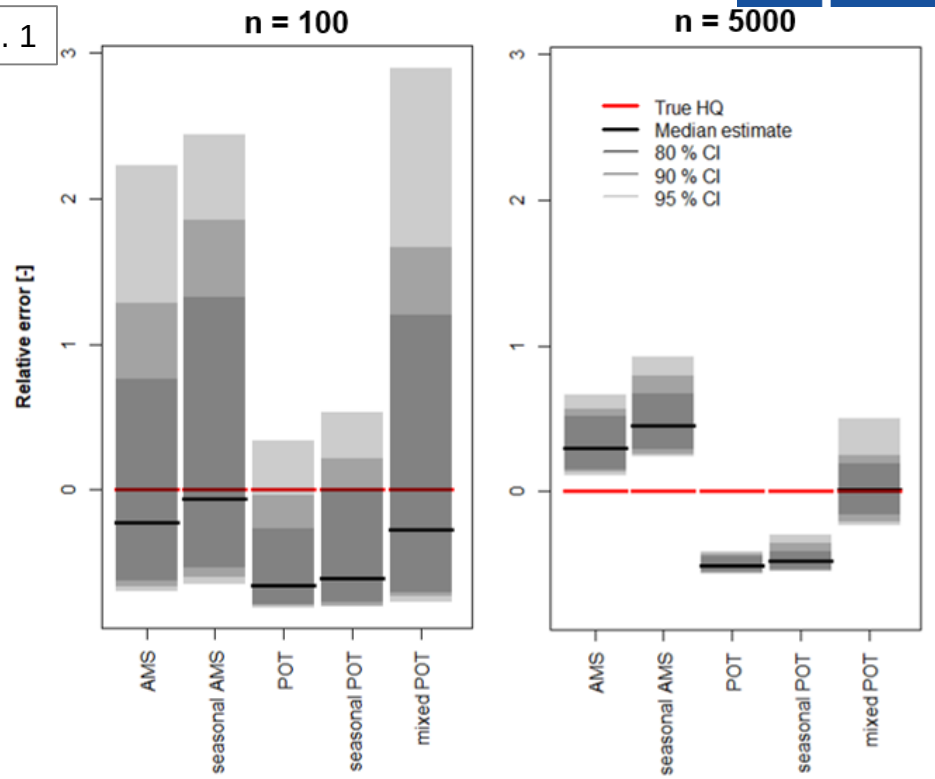
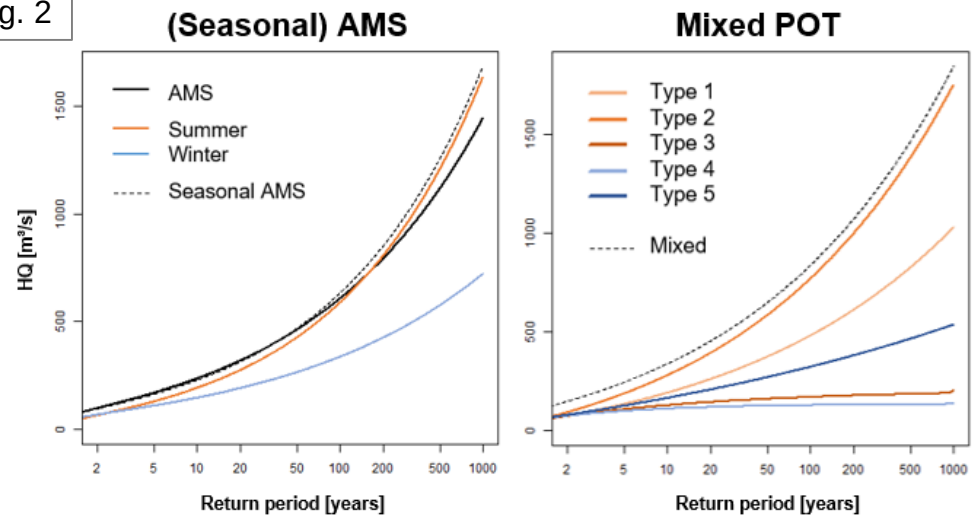


Fig. 2



Stochastic weather generation

Conditioning of a rainfall model on circulation pattern

- A alternating-renewal precipitation model has been developed based upon the principal of alternating and independent wet and dry spells.
- To improve the model's ability to model different precipitation types, especially in regards to extremes, a conditioning of the model on circulation pattern (CP) was undertaken using an objective fuzzy-rule based classification.
- Such classifications usually incorporate large scale pressure level data as input. Here, the approach was extended to also include variables such as temperature, wind, humidity and convective energy potential.
    - The addition of further variables led to a more varied and robust classification. Classes were more extreme (both wetter and drier), and differences between calibration and validation periods were negligible (Fig. 3).
    - Conditioning the rainfall model upon these classes allowed a better reproduction of extreme rainfall compared to other simpler classification approaches (Fig. 4).

Fig. 3

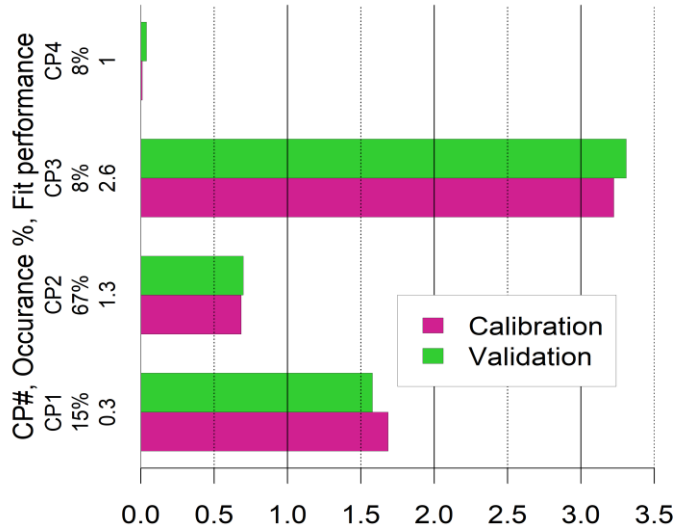
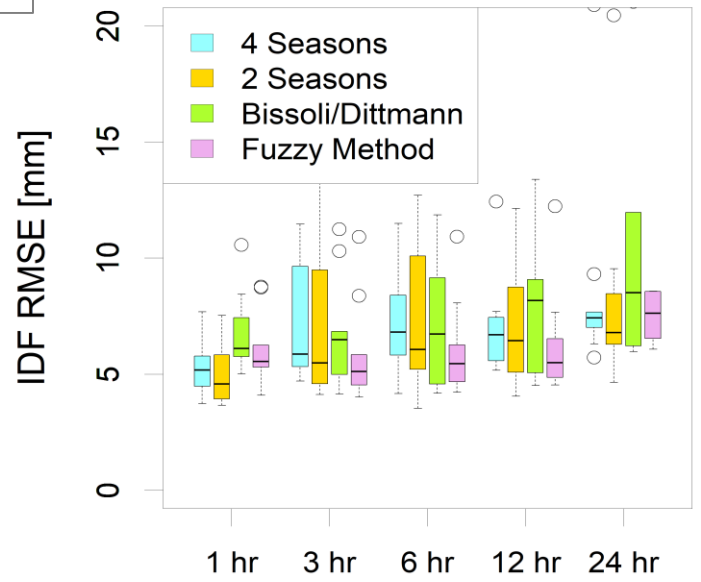


Fig. 4



Flood predictability from modelling

Validation of the weather generator using hydrological modelling

- A weather generator is used to drive hydrological models with a wide variety of rainfall and climate conditions to assess the flood predictability
- To validate the weather generator hydrological modelling is used.
  - The models are calibrated with 100 years stochastic point rainfall on the statistical measures flow duration curve, seasonality, summer and winter extreme value distributions.
  - The validation is done with 10 x 100 years synthetic rainfall on the annual flood frequency curves.

→ First results show, that the synthetic rainfall is well suited to drive the hydrological model in DFFA (Fig. 5).

Fig. 5