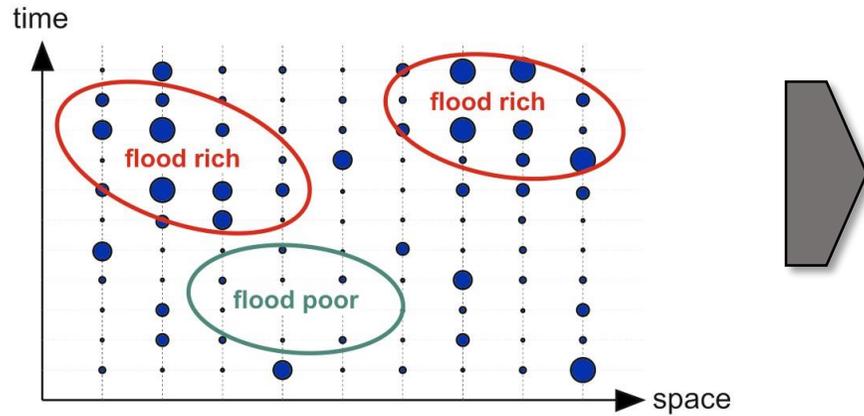
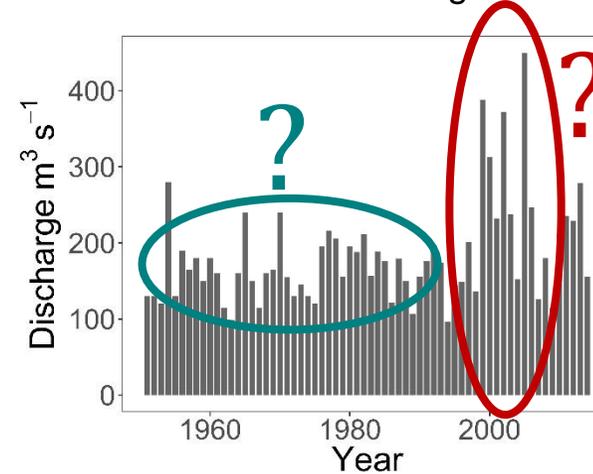


# Detecting flood probability changes

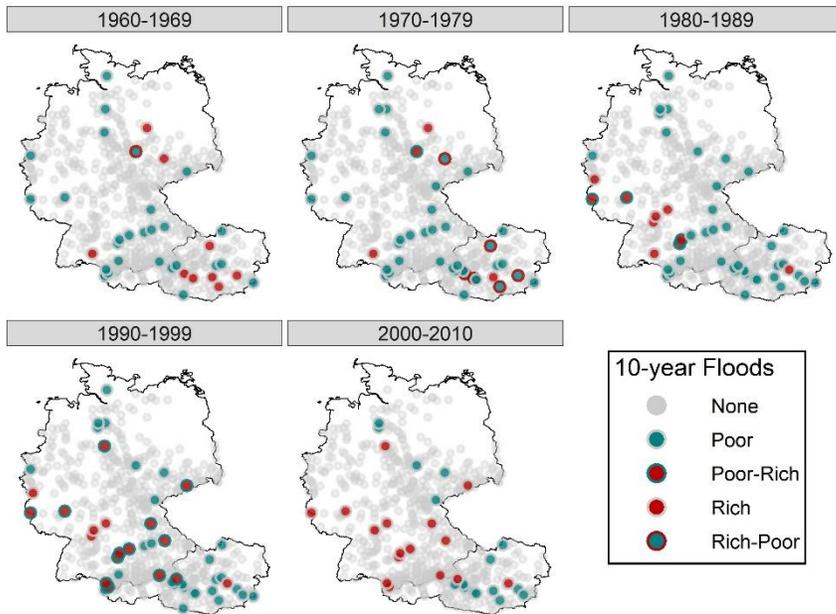
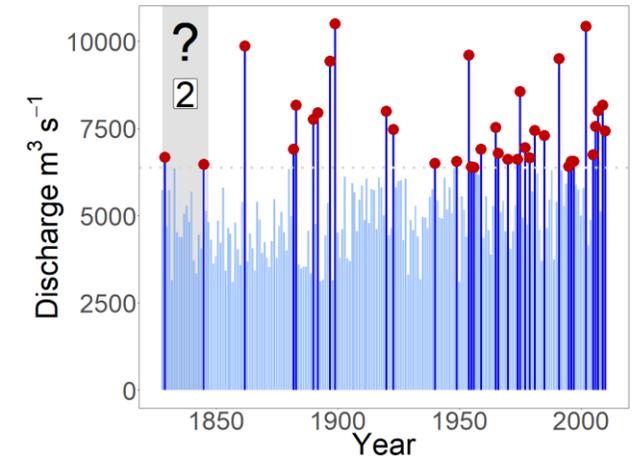
Schematic diagram



Data-based investigation



Detection with sliding window

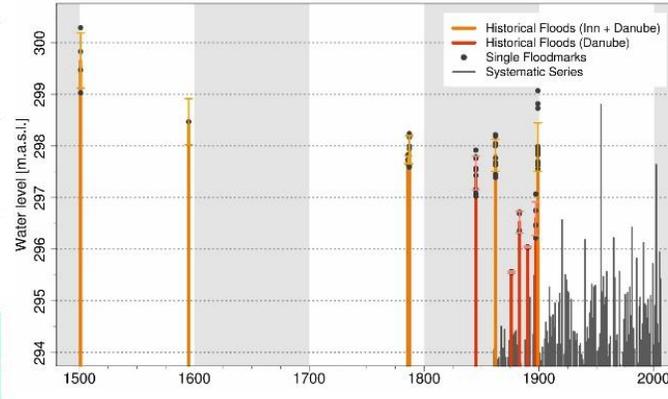
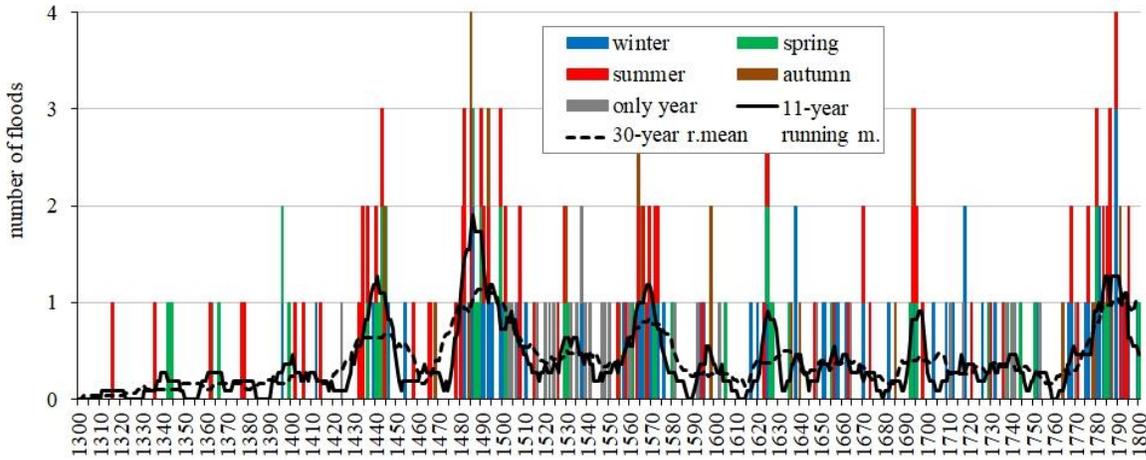


- Flood-rich (flood poor) periods refer to periods with unusually many (few) flood events and focus on the variability in the occurrence of flood events on different spatial and temporal scales, including decades.
- Using a time series of flood indicators and assuming threshold exceedances mark flood events, the statistical plausibility of occurrence patterns can be investigated employing a sliding window approach. This can be employed for time-continuous as well as time-discrete data and for different return periods.
- Applying the methodology to series of annual maximum peak discharge series from Austria and Germany shows a frequency of anomalies that is above what would be expected from the reference condition of no flood-rich and flood-poor periods. There appear to be regionally coherent patterns. The beginning of the observational period (1960) encompasses more flood-poor periods than flood-rich periods, in the end (2010) the situation is reversed.

Temporal flood-rich/flood-poor periods (local)

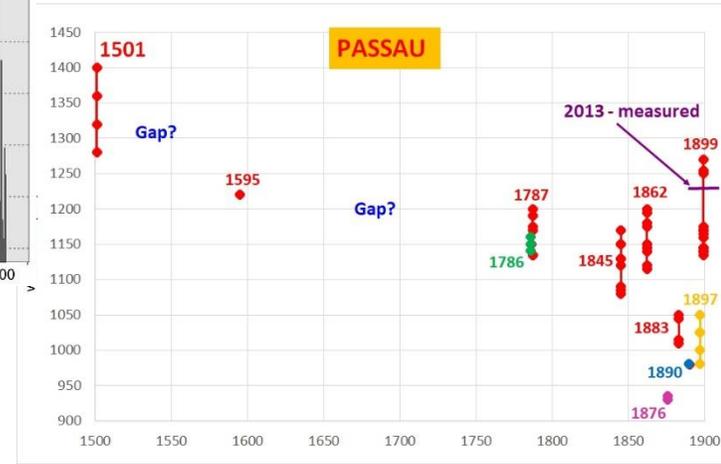
# Historical floods

## Documented floods & seasonality: Danube (Passau-Vienna/Bratislava)



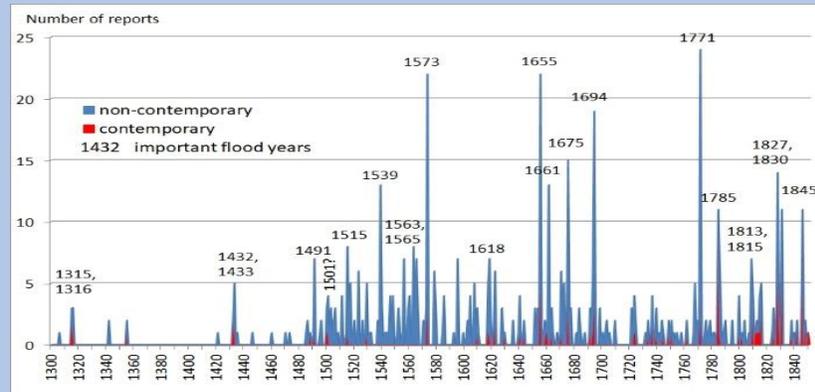
## Danube: Passau-Vienna

Passau floodmarks:  
waterlevel(discharge)  
Estimations of greatest historical floods

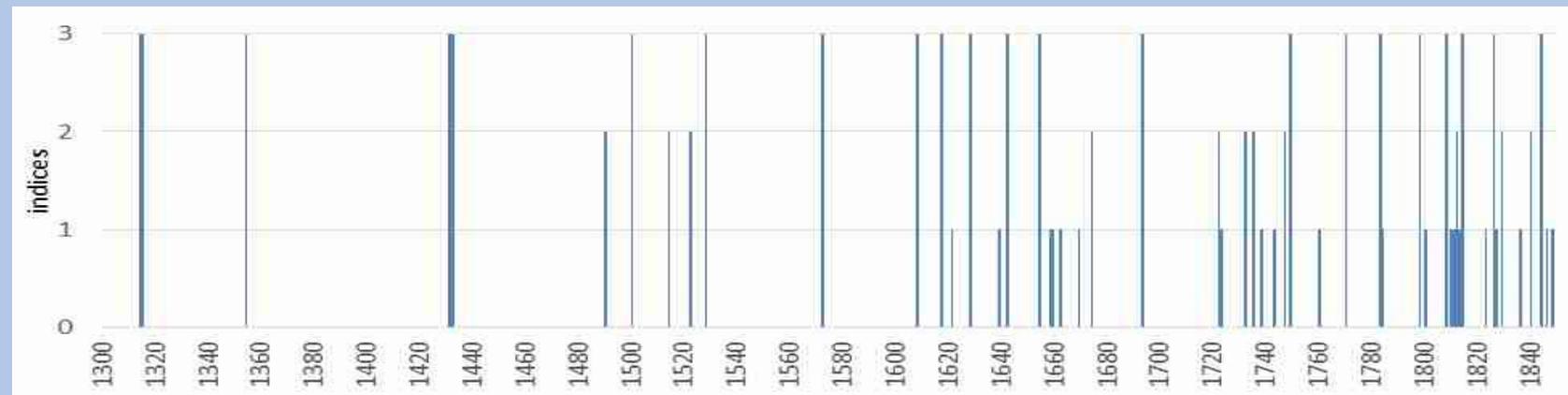


## Mulde

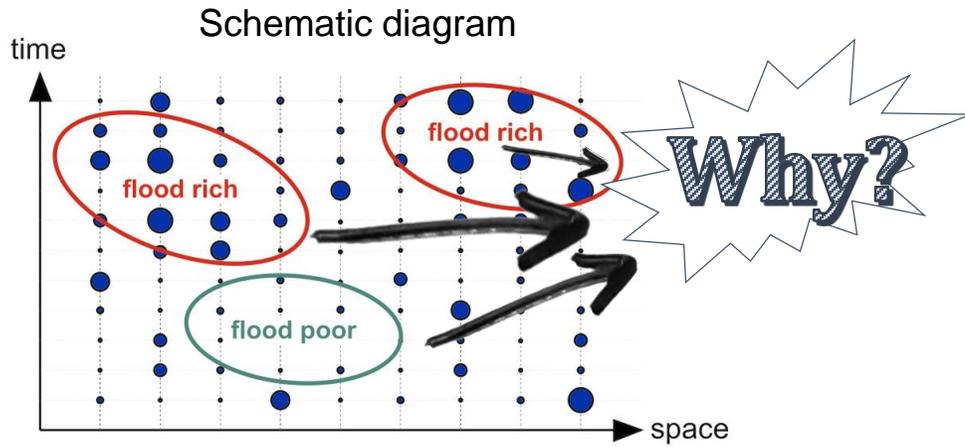
### Documented Mulde floods at Weikinn: Critical source evaluation



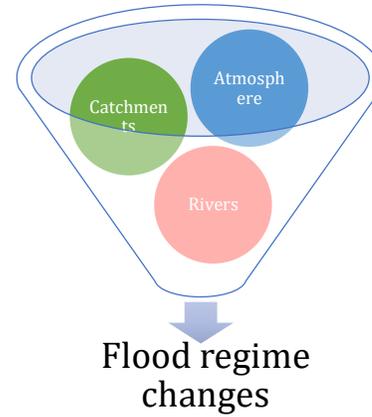
### 3-scaled magnitude classification of historical floods based on written sources: Mulde



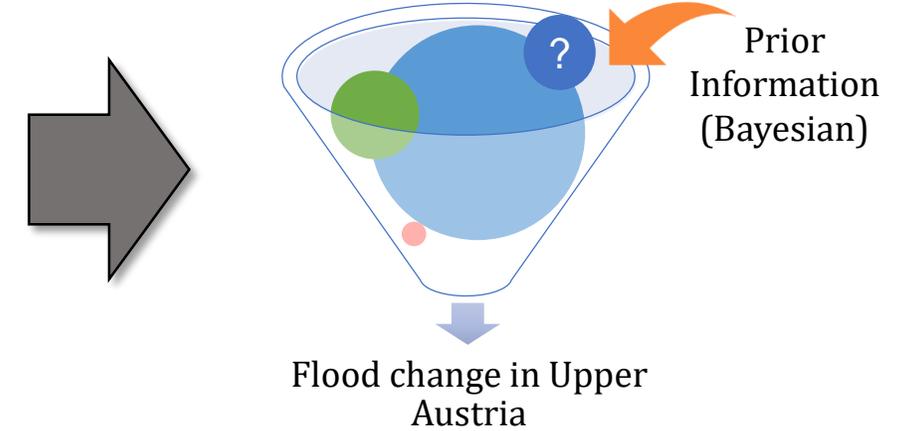
# Attributing flood probability changes



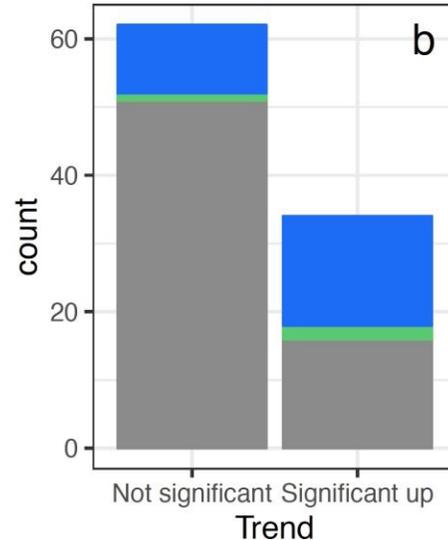
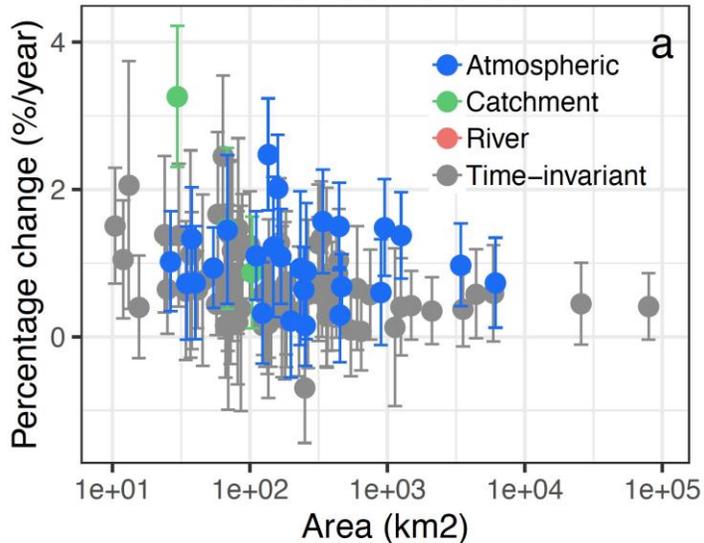
Drivers of flood change



Local attribution study in Upper Austria



## Attribution



- Despite trends in flood regimes are detected in numerous studies, the identification of their driving processes and causal mechanisms (i.e. flood change attribution) is still far from being properly addressed.
- A new framework based on regional fingerprint analysis is employed for attribution. The quantitative assessment of effects is framed in Bayesian terms to obtain distributions of the contributions of the drivers.
- Grouping potential drivers of flood regime changes in three groups, a local attribution study is done in Upper Austria, where multiple studies have reported statistically significant trends in flood magnitudes. <sup>1</sup>
- Results indicate that precipitation change is the main driver of flood change in the study region. Only in few (small catchments) the flood trends can be related to agricultural land-use intensification.