

REGIONAL FLOOD PROCESS TYPES

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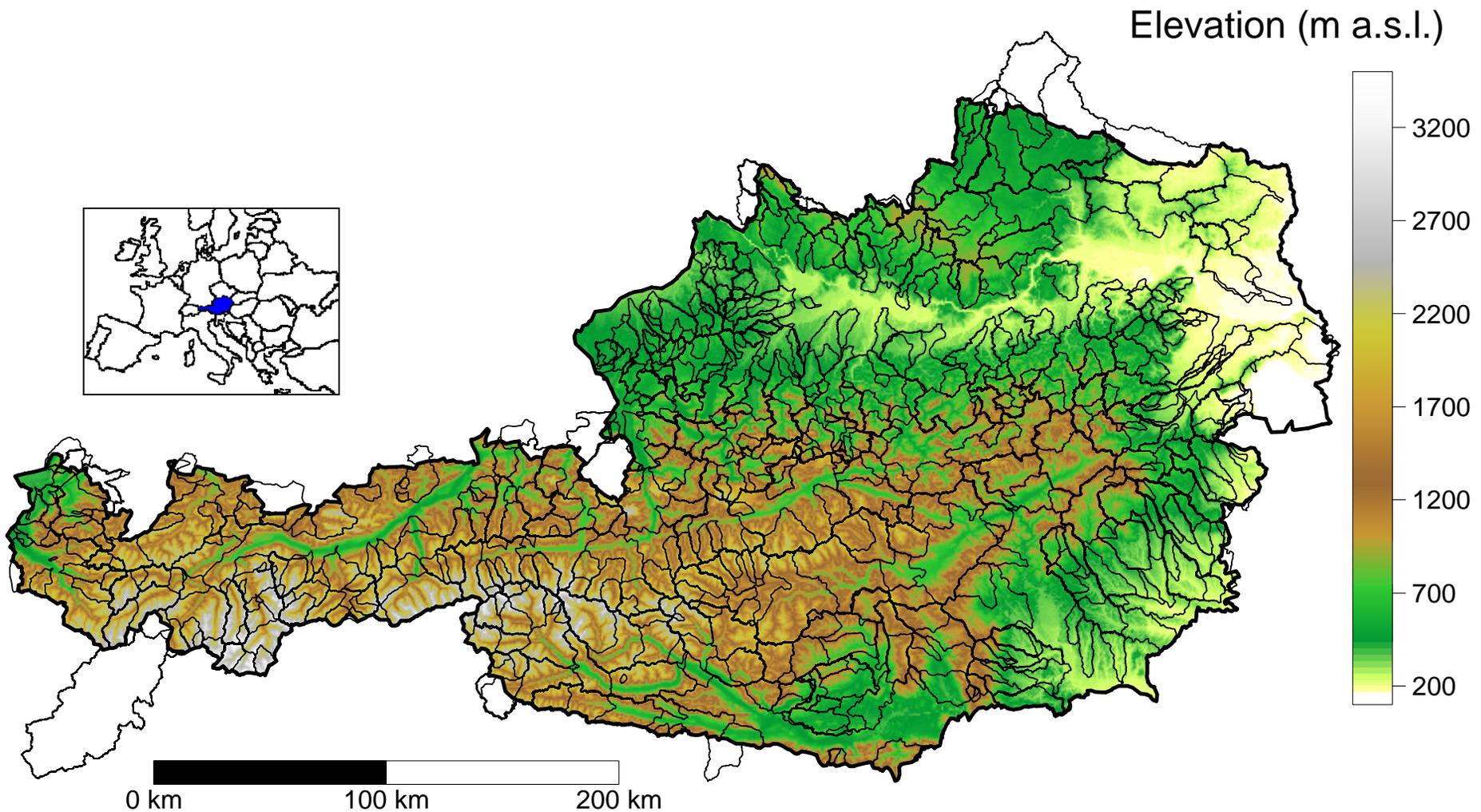
Motivation

- At-site extrapolation to large return periods
- Similarity measure for regionalisation
- Flood dynamics in flood forecasting

Objective

Flood process typology for “all” observed annual flood peaks in Austria

490 gauged catchments in Austria (10 - 5000 km²)
annual flood peaks 1971-97



Process types

- Long-rain floods
- Short-rain floods
- Flash floods
- Rain-on-snow floods
- Snow-melt floods

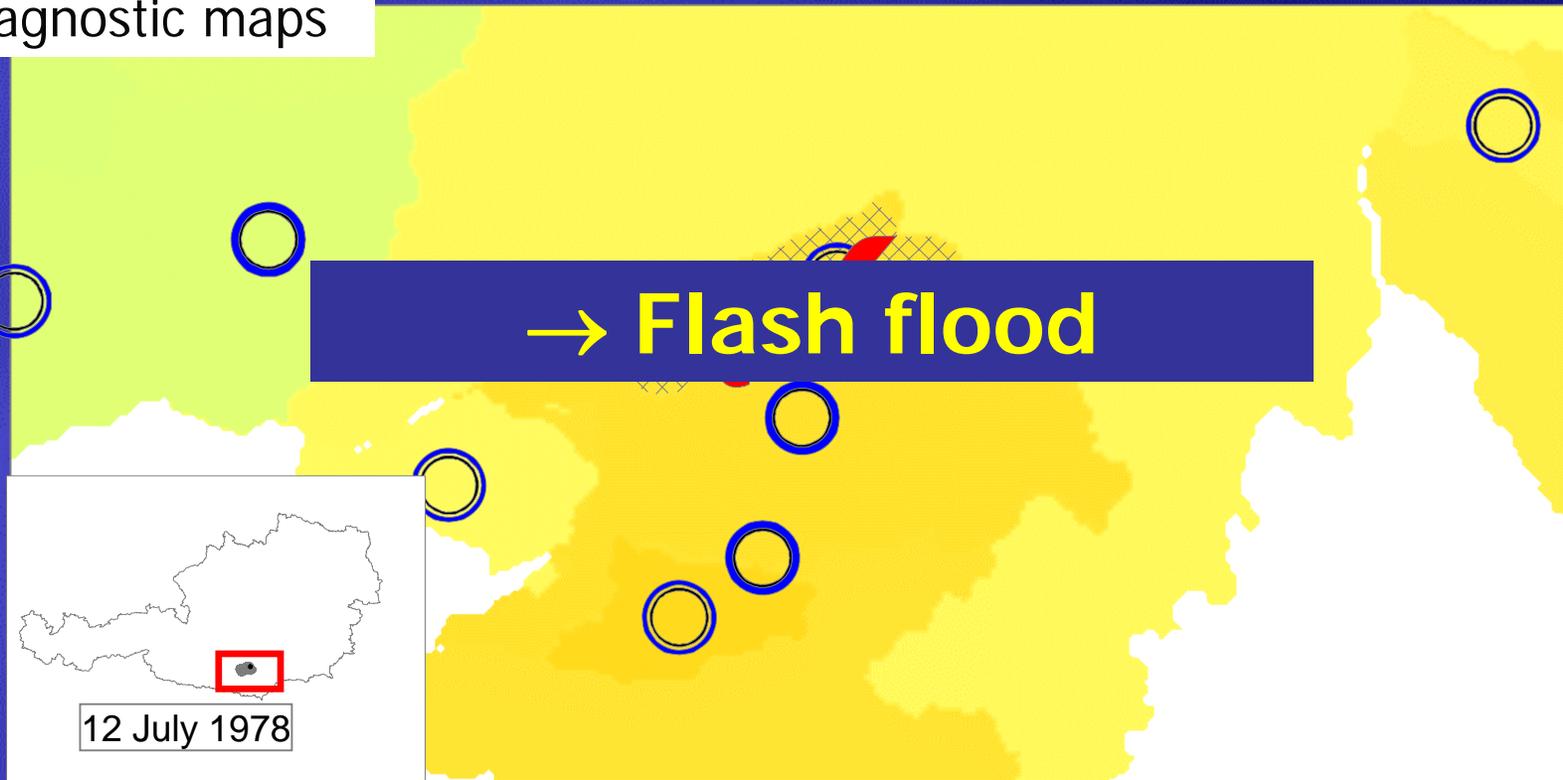
Process indicators

- Soil moisture state
(runoff generation index)
- Snow melt & snow water equivalent
- Rainfall duration & intensity
- Time of concentration (runoff dynamics)
- Spatial coherence

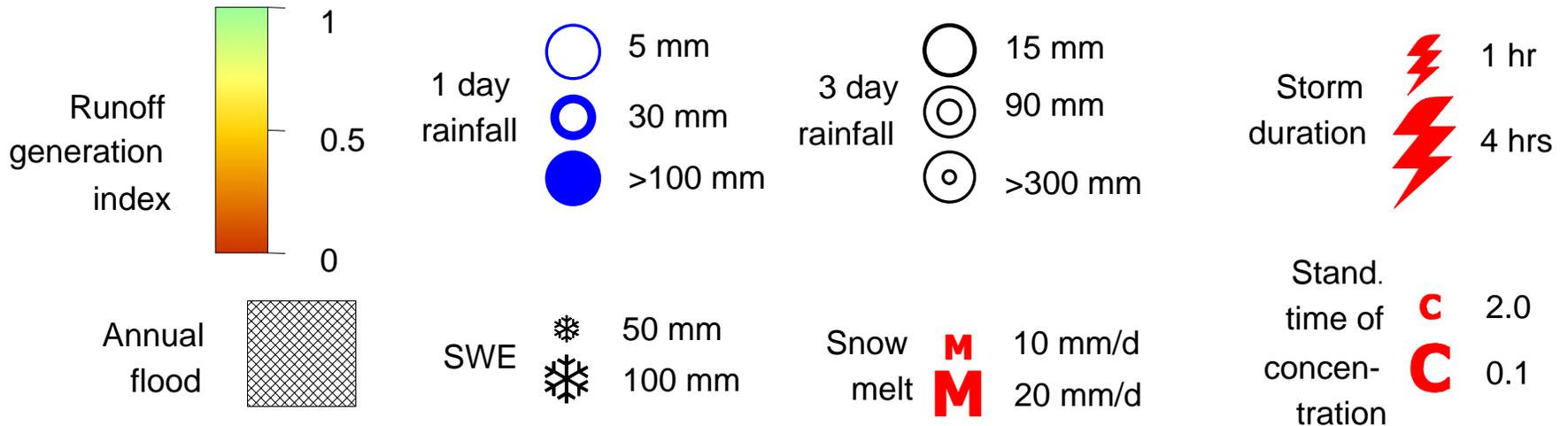


Diagnostic maps

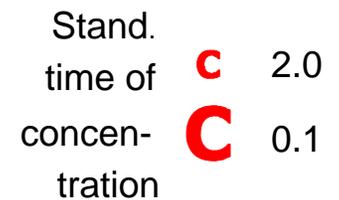
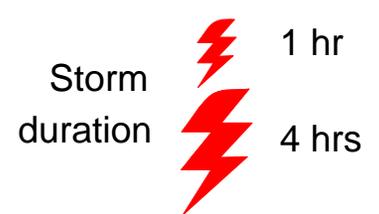
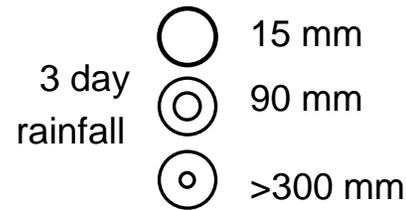
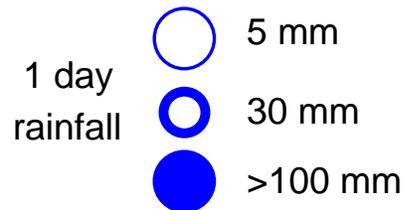
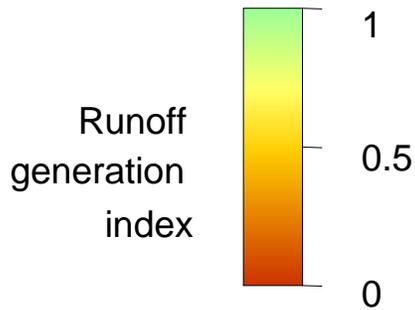
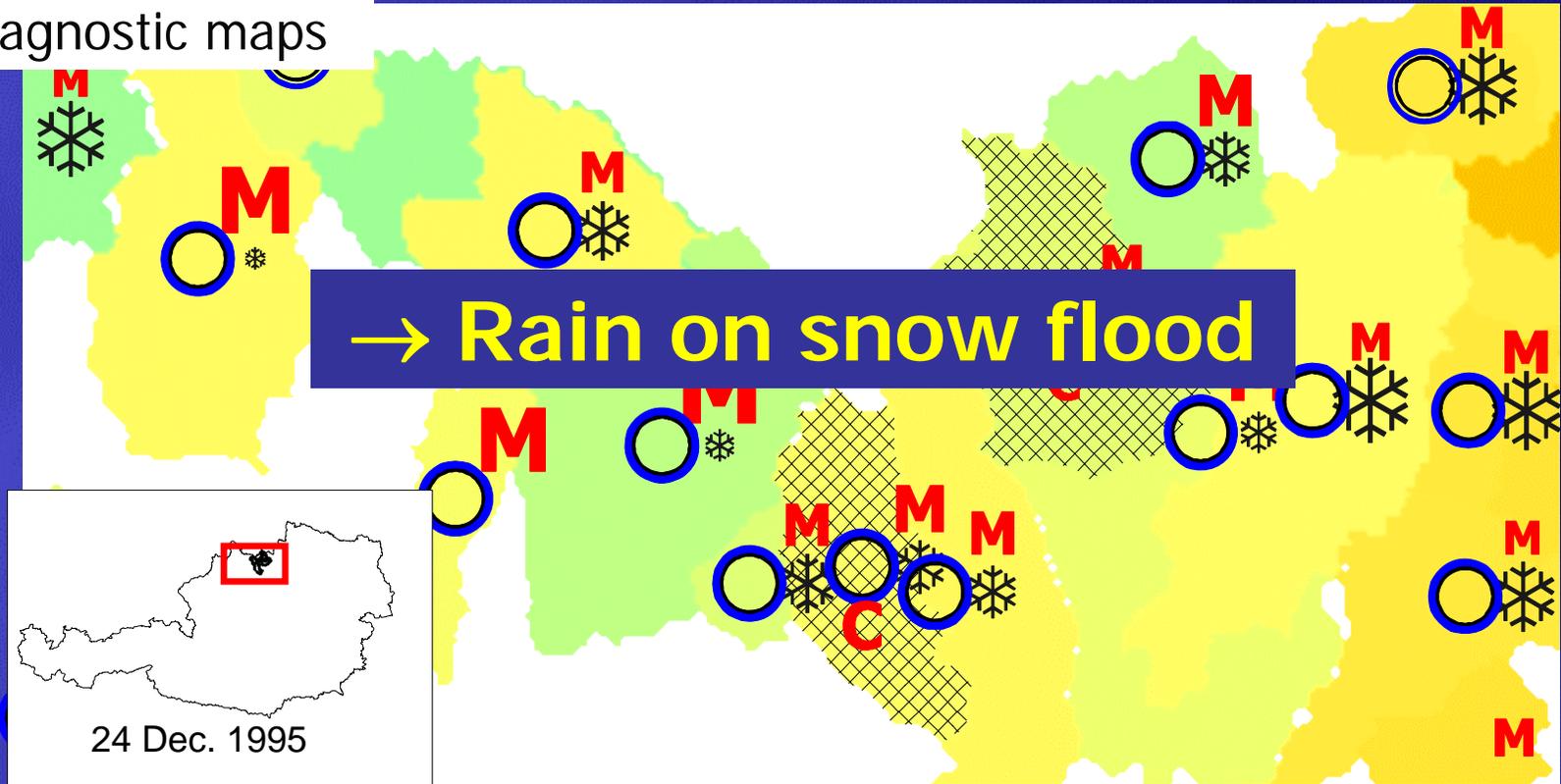
Diagnostic maps



12 July 1978

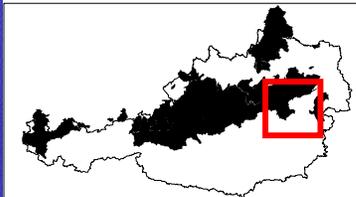


Diagnostic maps

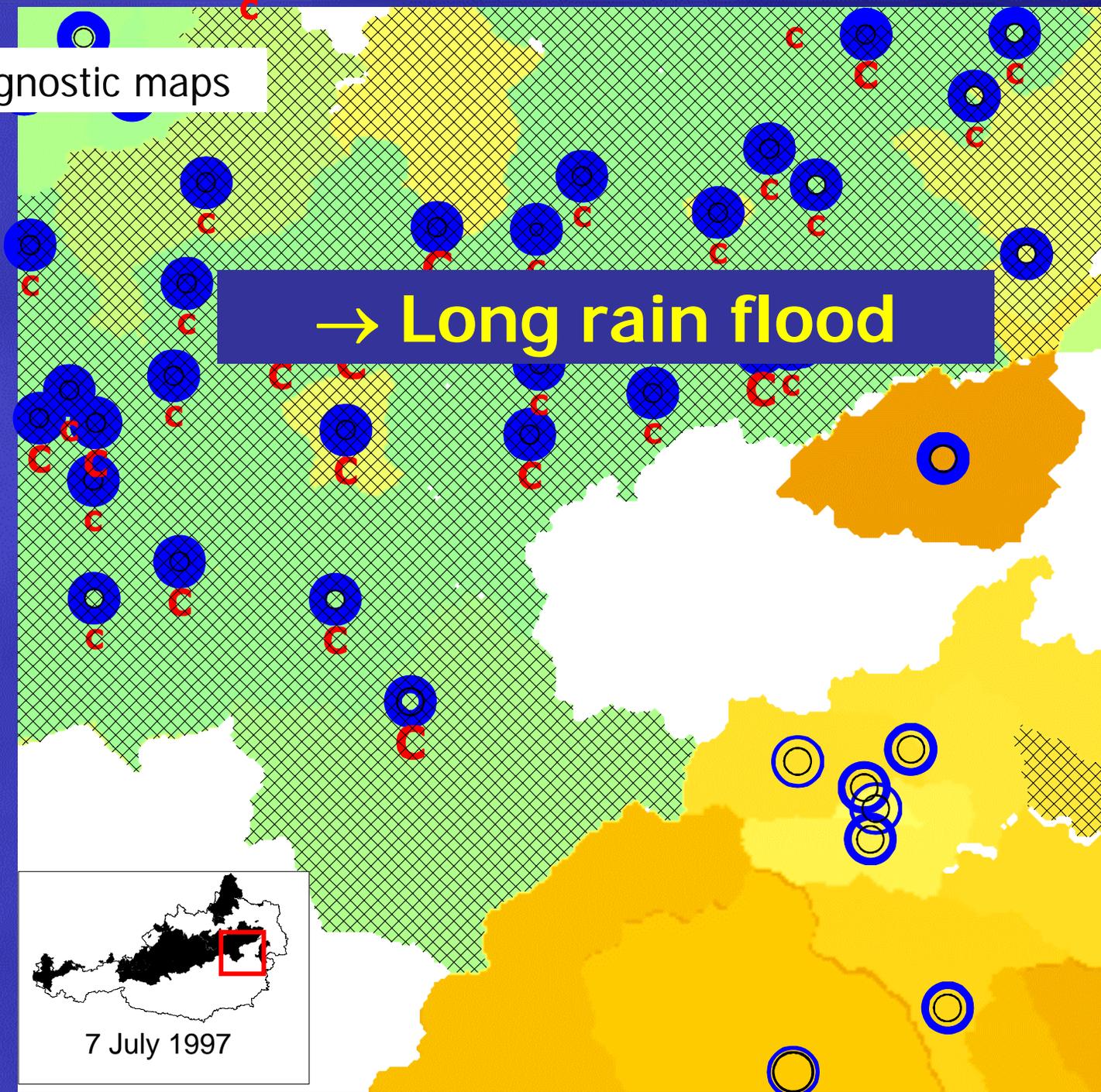


Diagnostic maps

→ Long rain flood

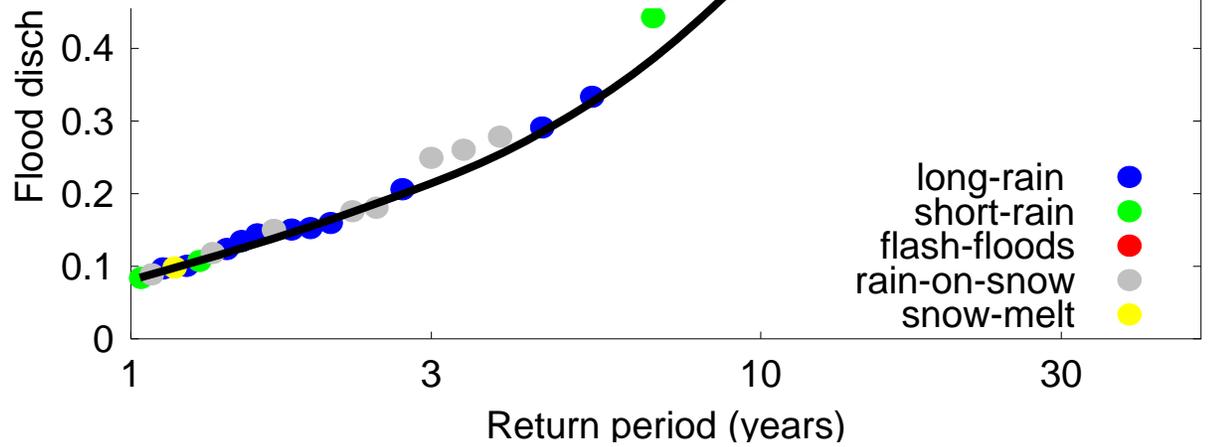
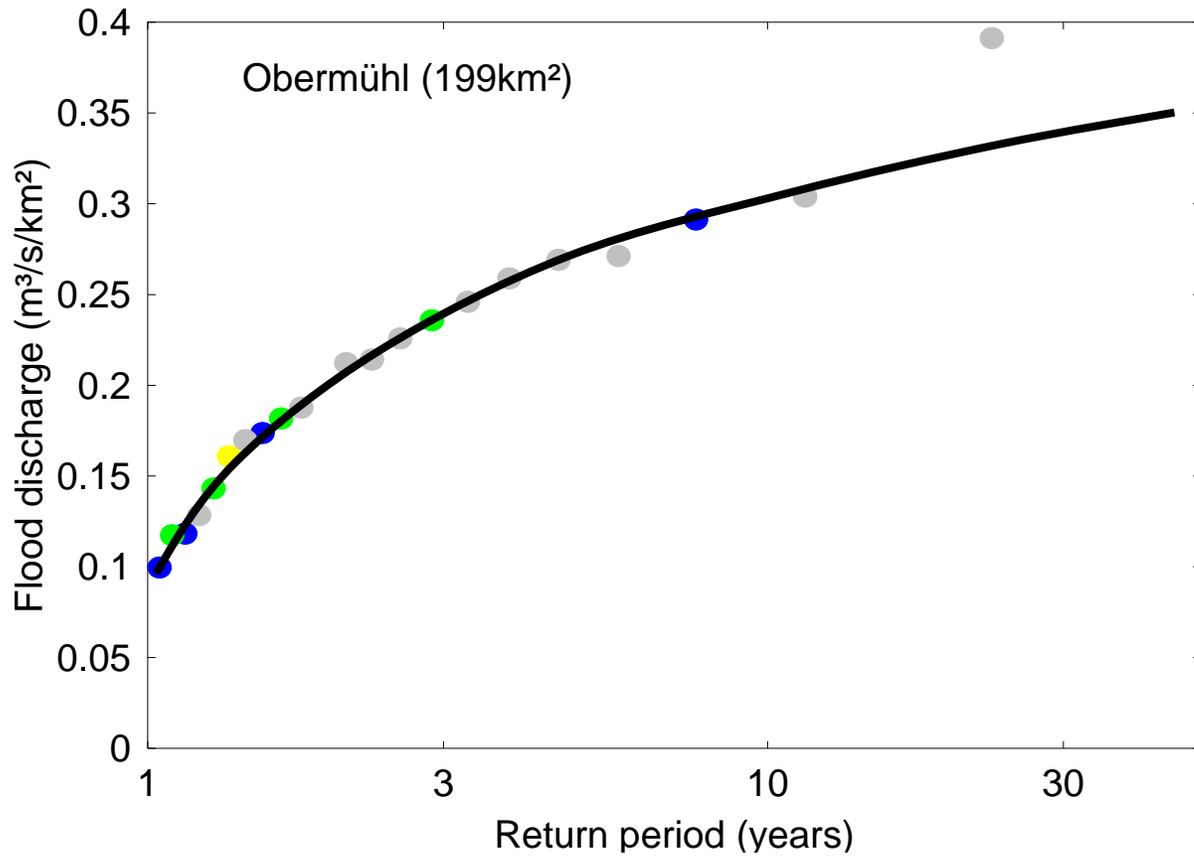


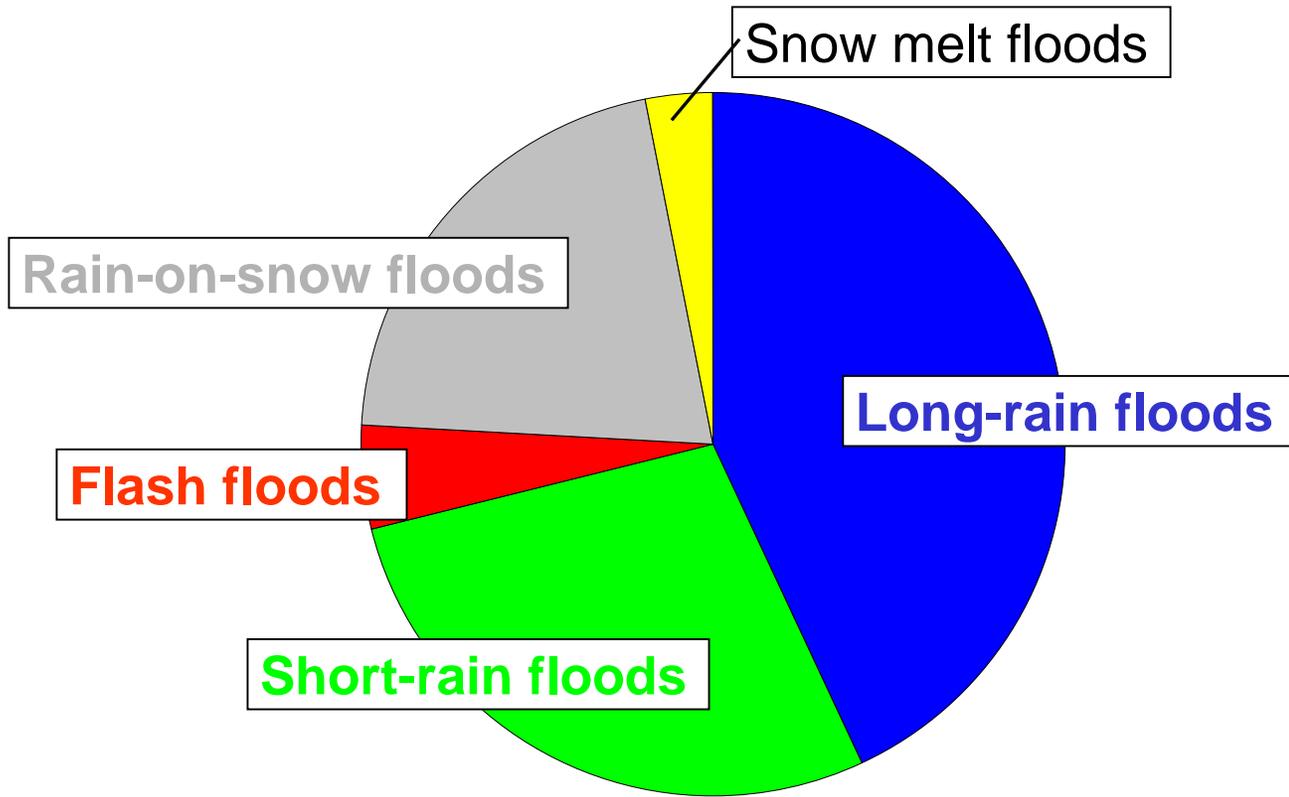
7 July 1997



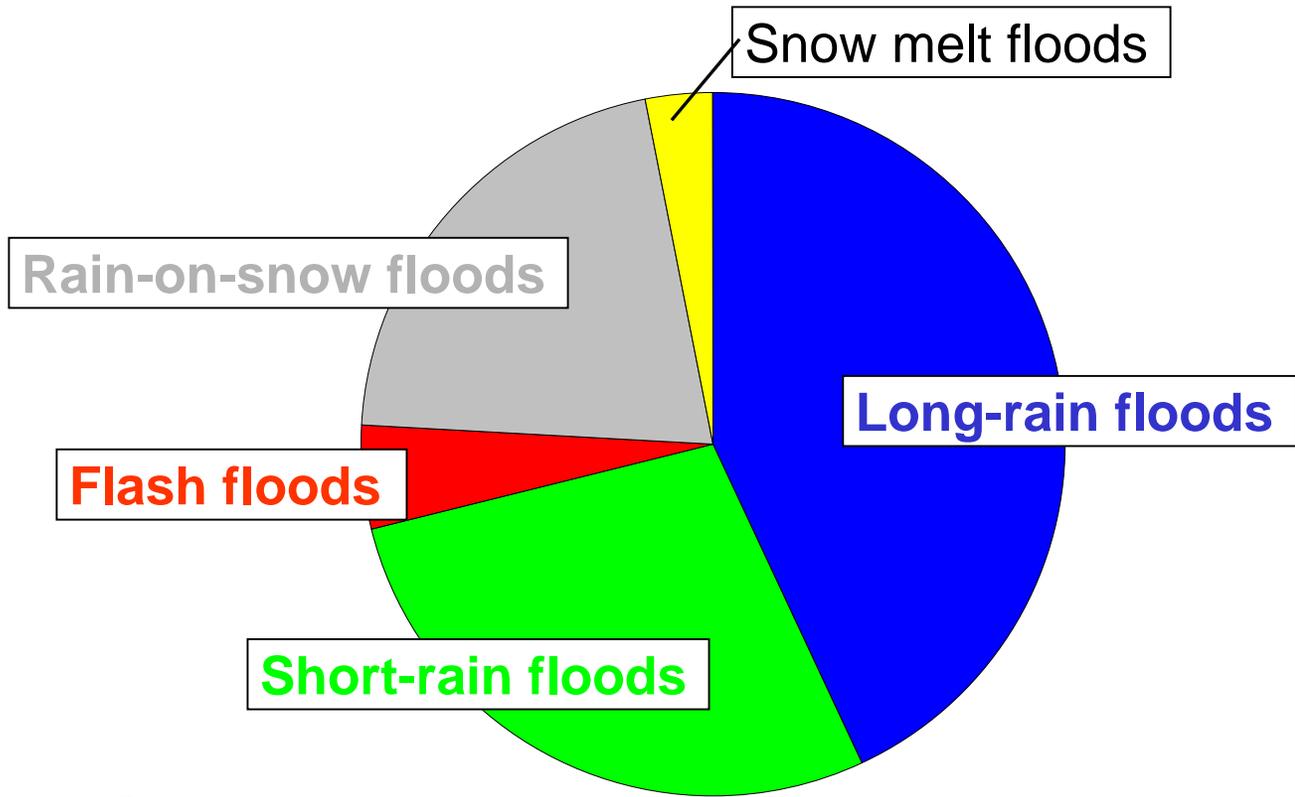
Manual classification of 11518 annual flood peaks in Austria.

Results ...

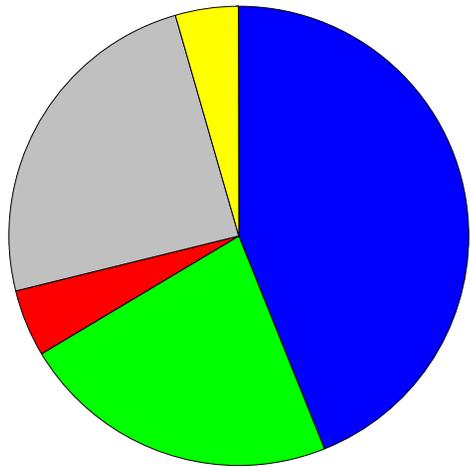




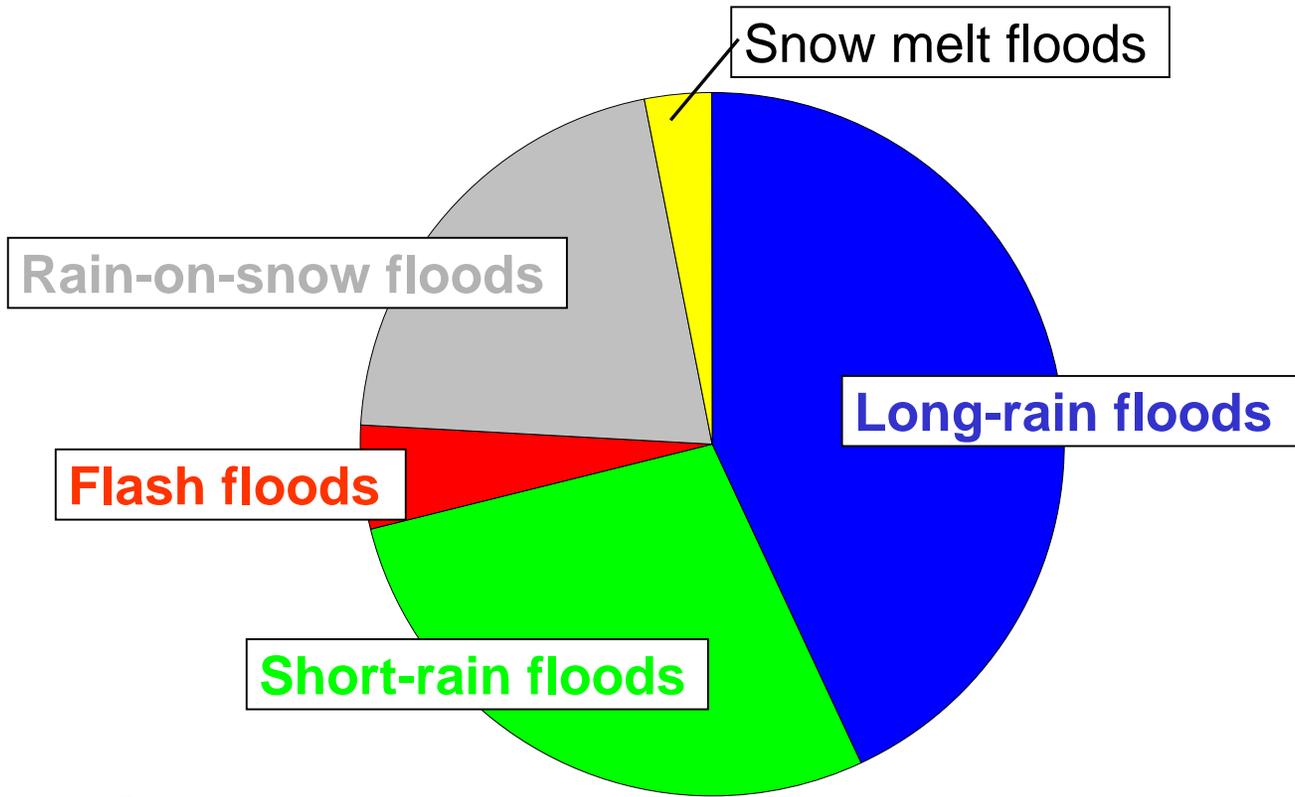
11518 annual flood peaks



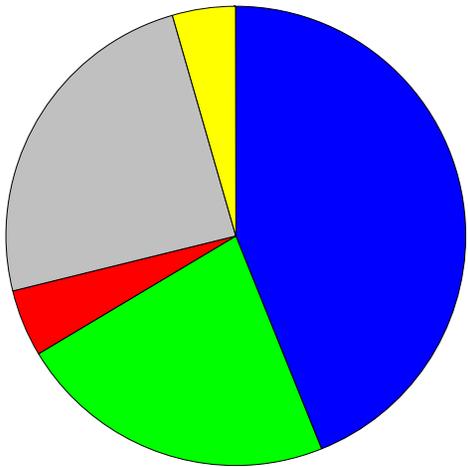
11518 annual flood peaks



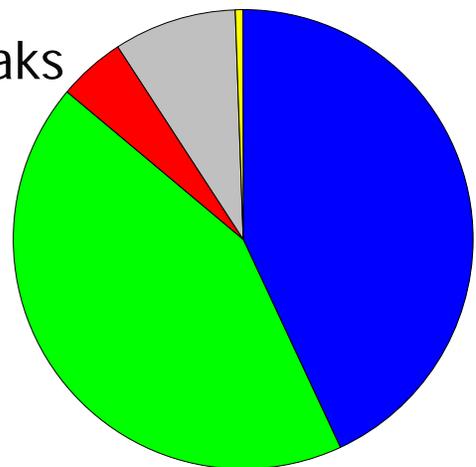
5712 peaks < Mean annual flood



11518 annual flood peaks

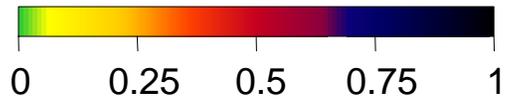


5712 peaks < Mean annual flood

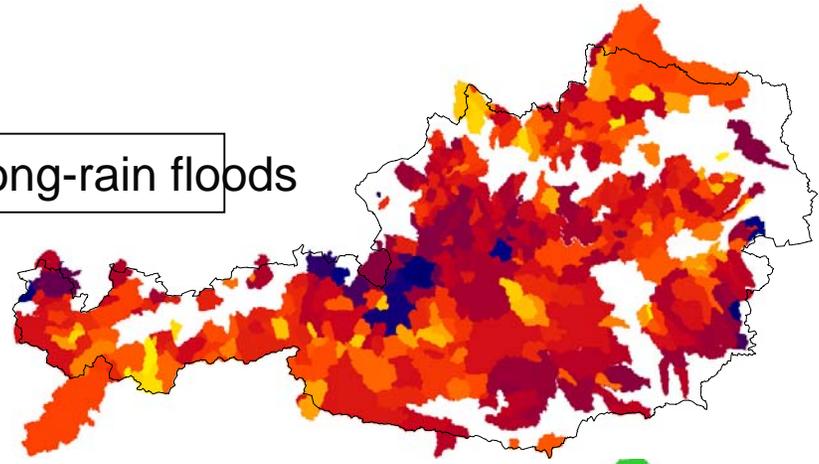


938 peaks > 10yr flood

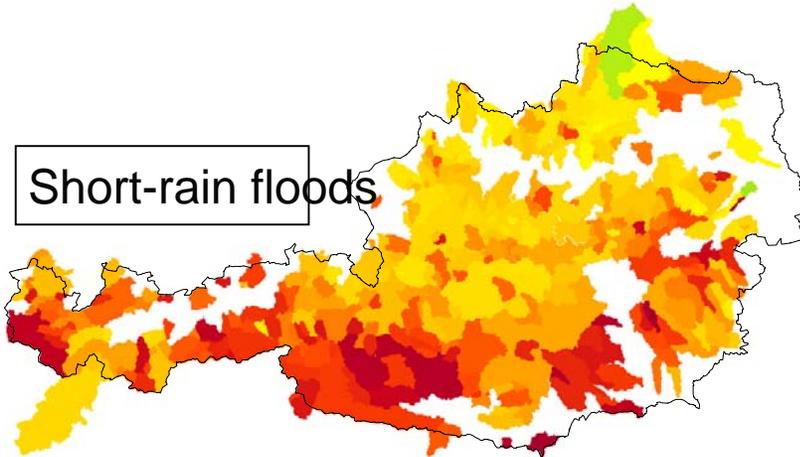
Spatial patterns of frequency of process type



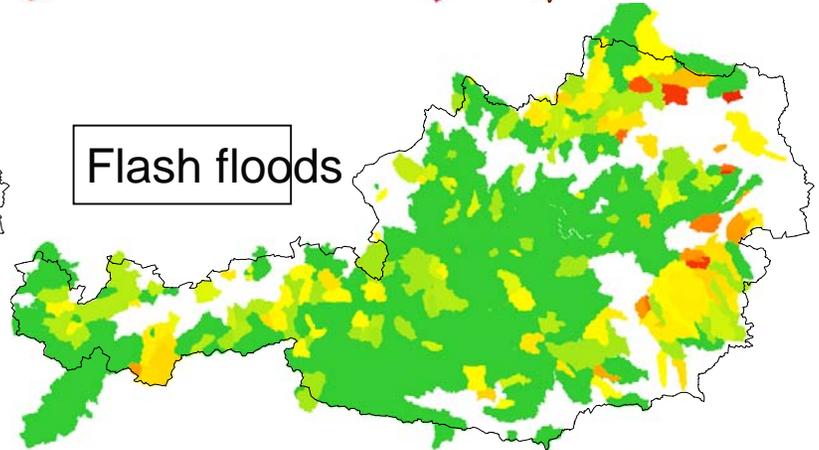
Long-rain floods



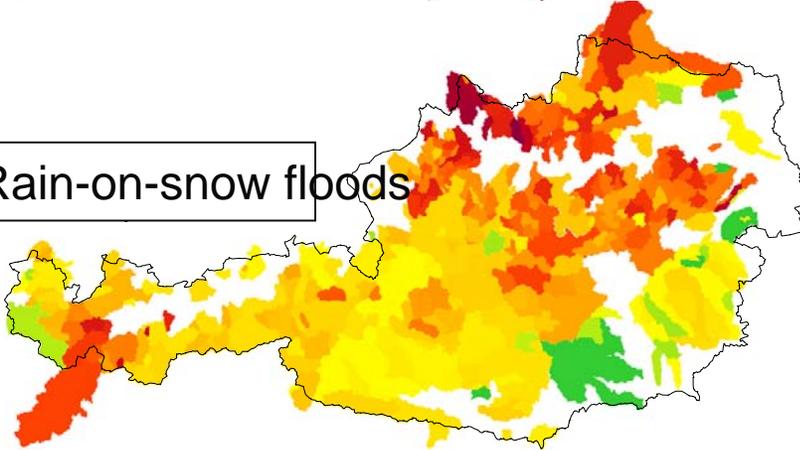
Short-rain floods



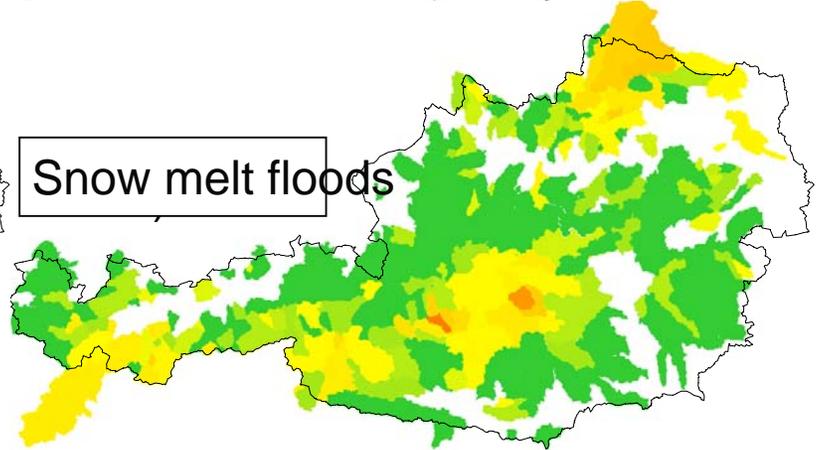
Flash floods



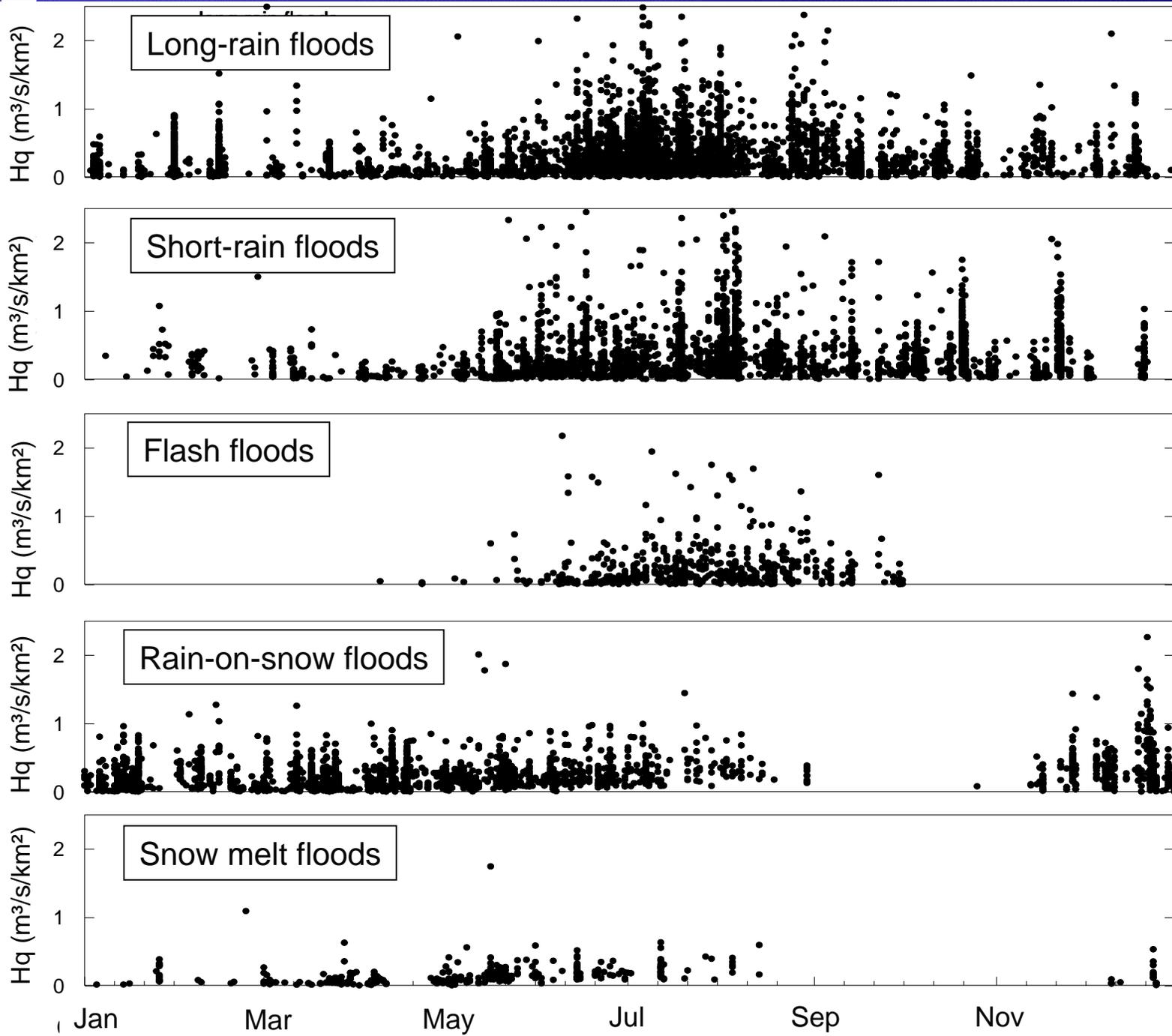
Rain-on-snow floods



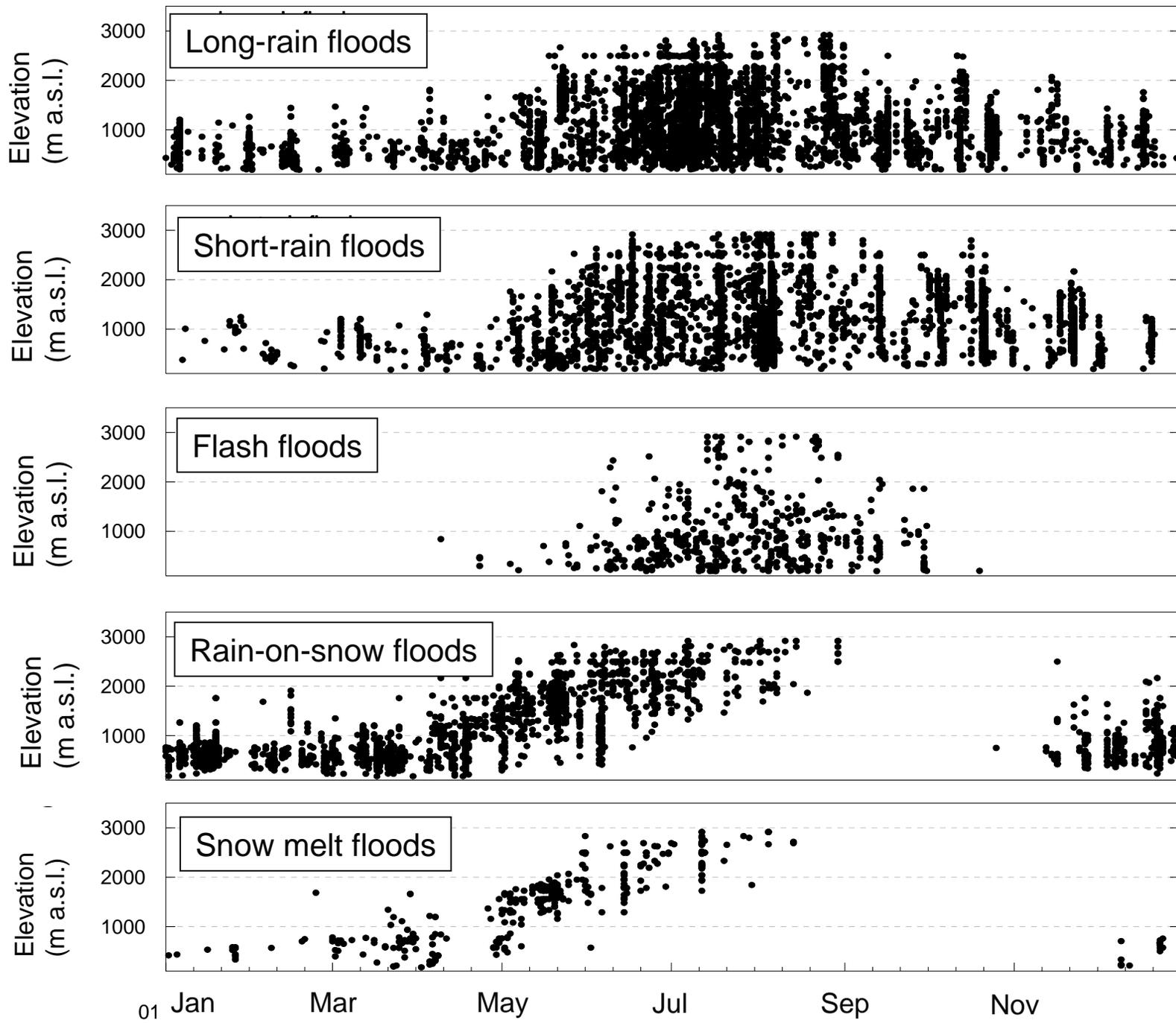
Snow melt floods



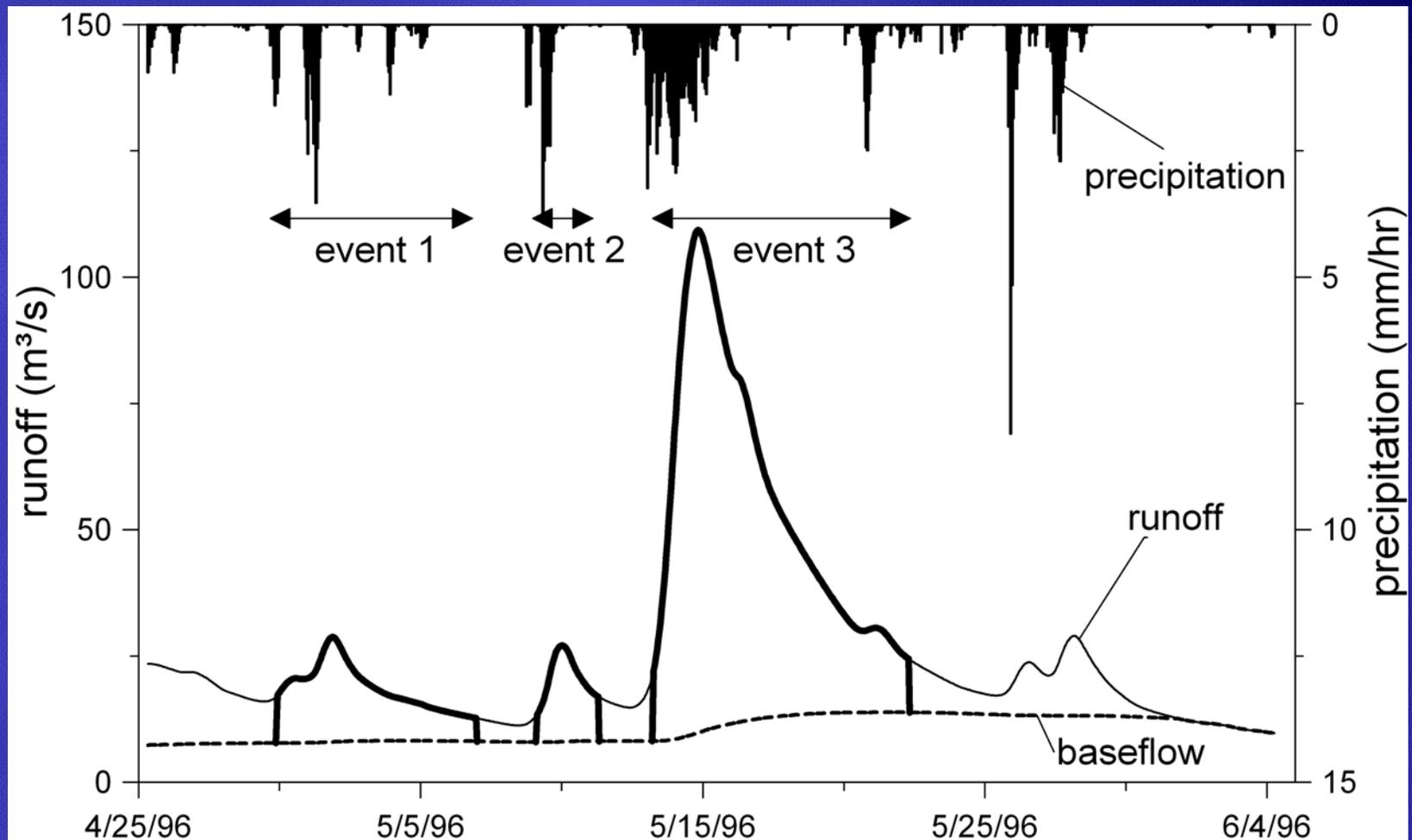
Flood peak vs. time of the year



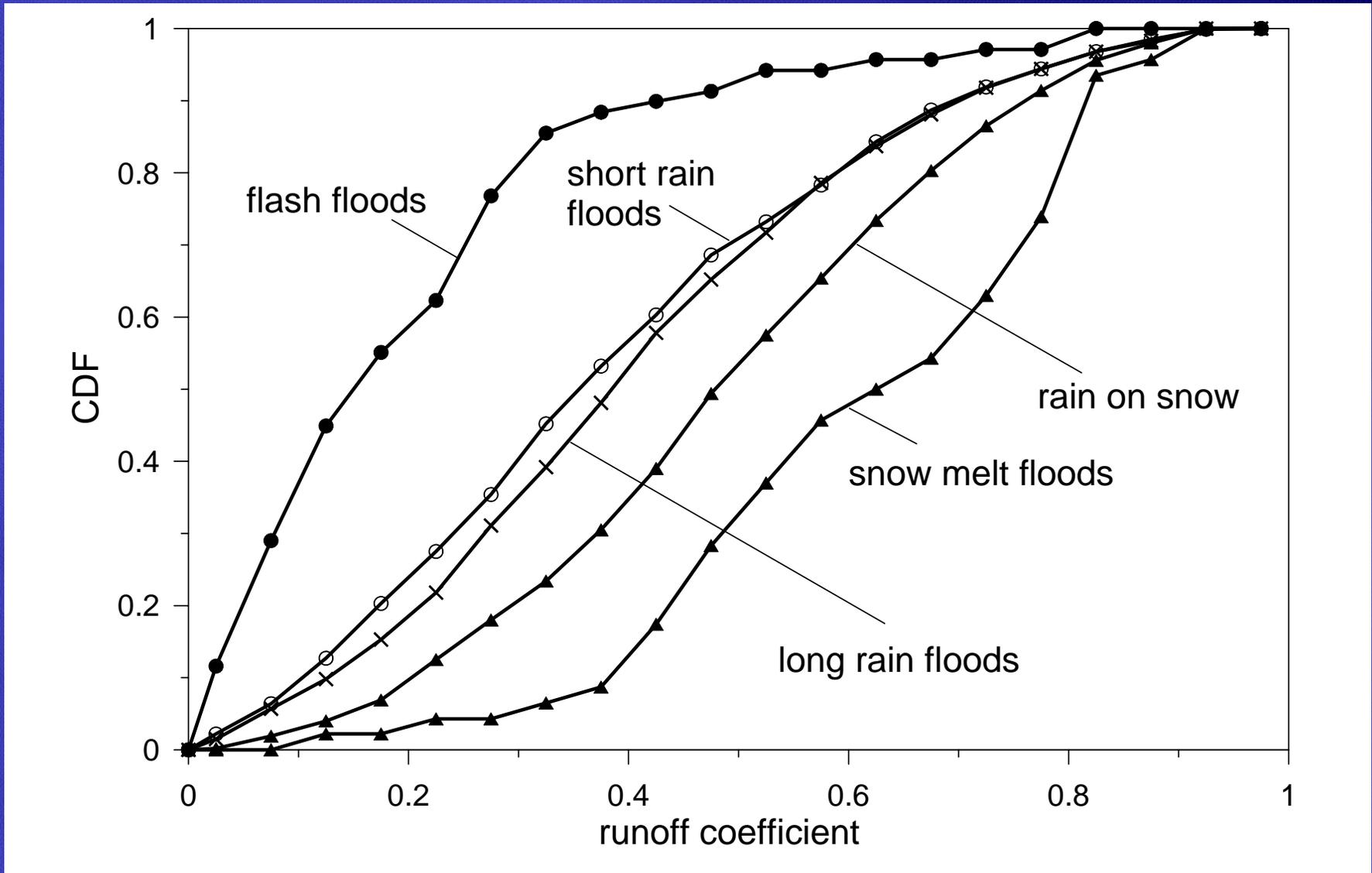
Catchment elevation vs. time of the year of flood



Analysis of runoff coefficients of 49753 rainfall runoff events in 345 Austrian catchments (1981-2000) based on hourly data.



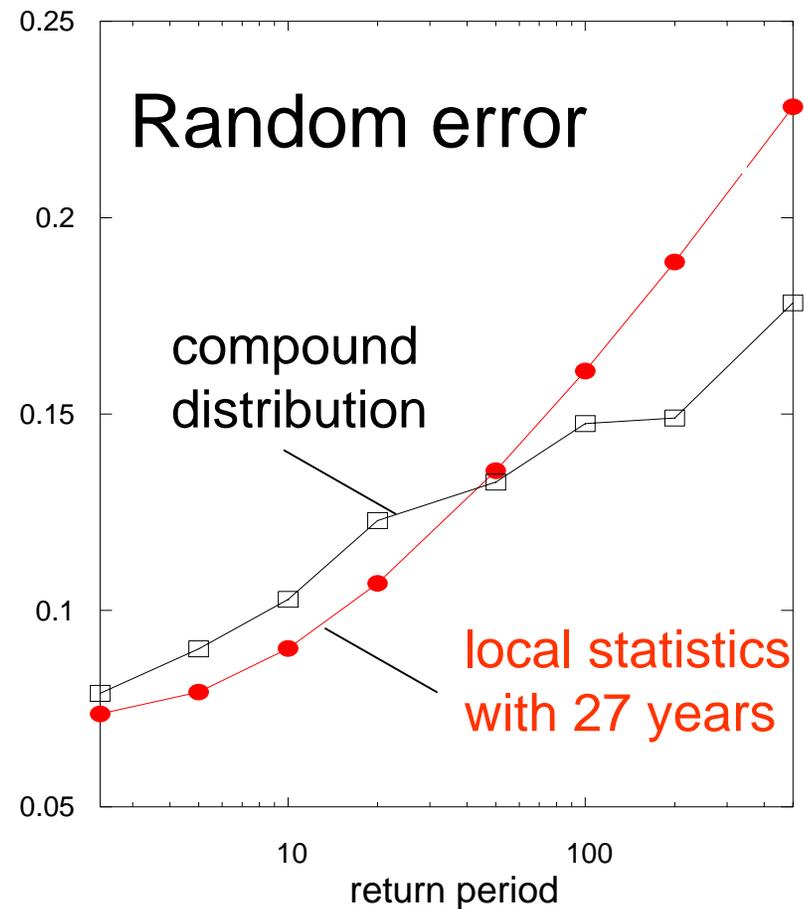
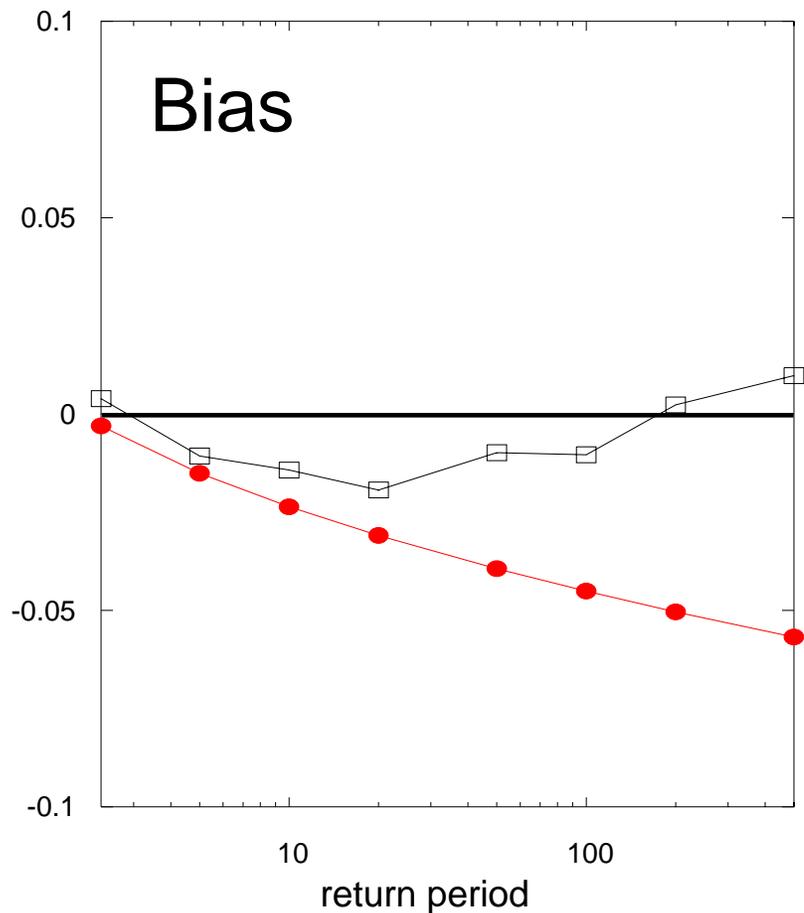
Classifying runoff coefficients acc. to flood type



Use process types to create compound flood frequency distribution

Local statistics for 144 catchments

Comparison to long series (>40 years of observation)



Conclusions:

- Plausible stratification of flood peaks
- Applicable to regional scale
- Process indicators from different data sources

→ More information on flood processes, better understanding

For Austria:

- Long-rain floods are most common type
- Flash floods are less frequent
- Extreme floods are never due to snow melt only

