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# Spatio-temporal Analysis of Seasonality in Hydroclimatic Extremes

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The timing of hydroclimatic extreme events is a key variable in understanding the main processes governing flood and drought events. In this work, regional similarities and differences in the seasonality of hydrological extremes and their associated dynamics are analysed using a unique discharge database encompassing over 5000 hydrometric stations across Europe.

The results show that the spatio-temporal seasonality features of hydroclimatic extremes evolve over multi-decadal scales, with regional differences due to nonlinearly modulating mechanisms.
For example, flood seasonality regimes evolve in a non-monotonic manner over certain parts of Europe, as a result from the spatio-temporal heterogeneity of the hydrologic sensitivity and consequent flood regime dynamics under climatic change.

Regions of spatially extended coherent behaviour in the time evolution of seasonality are identified, leading to a process-based clustering and bringing out “hot spots” of sustained coherent change. For instance, shifts in snow-melt related floods are observed in certain regions due to higher spring temperatures being reached gradually earlier.

The resulting spatio-temporal patterns of floods and droughts enable the formulation of better hypothesis on underlying mechanisms at play, most notably at larger scales.