

**28. November 2024, 16 ct - 18 Uhr**  
**Hörsaal Fahrenbergplatz, Friedrichstr. 39**

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### **Generation processes of streamflow and flood events – a tool for understanding hydrological changes and improving predictions**

A wide variety of processes controls characteristics of river flood events. Classifying flood events by their causative processes may assist in understanding the emergence of extremes and support the detection and interpretation of their changes. However, existing classification frameworks are tailored to specific locations and are only suitable for the events of certain magnitudes. By developing a novel automated event identification and classification framework based on dimensionless indicators of precipitation events and their interactions with catchment states, we are able to overcome these limitations.

Using the developed classification framework, we detect catchments where generation processes of extremes and frequent floods differ. By explicitly accounting for this disparity using process-enhanced statistical approaches, we are able to improve the accuracy of flood frequency estimates in such catchments. Furthermore, we show that we can use the information on different event generation processes for diagnosing limitations of conceptual hydrological models and forecasting tools paving the way to their improvement. Finally, we show observational evidences of considerable changes in the frequency of different processes in Europe in the past decades that are likely to manifest in the shifts in the dominant processes by the end of the century under high emission scenario.

Our ongoing work on socio-economic impacts of floods generated by different processes indicates that these possible shifts might have dire consequences for the flood preparedness in Europe.