EGU24-19865, updated on 20 May 2024
https://doi.org/10.5194/egusphere-egu24-19865
EGU General Assembly 2024

What contradictory signals in flood trends can tell us about drivers of hydrological change

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Flood trends are commonly assessed based on instantaneous peak flows on an hourly timescale, as these are most relevant for flood management. However, when hourly data are missing, it has been suggested to perform flood statistics on daily flood values instead, assuming a scaling relationship that depends on the shape of the flood hydrograph and applies over the entire observation period (e.g. Bartens & Haberlandt, 2021).

In an Austria-wide assessment, recent flood trends show diverging spatial patterns that contradict such a stationarity assumption. Interestingly, an aggravation of the flood situation is mainly observed for the peak flow (IPF), while the high values of the mean daily discharge (MDF) show much smaller and, importantly, less significant trends.

Rather than applying flood statistics corrections (e.g. Beylich et al. 2021), the aim of this contribution is to use flood divergence at different timescales as a mean of inferring likely drivers of flood trends. To this end, we combine several established and innovative indicators, such as a trend divergence index (peak versus daily flood scale), a seasonal trend index (to infer information about flood generation processes), and a seasonal shift index (to infer changes in the relevance of these processes). We show the extent to which these indices can inform us about likely drivers of change, i.e. climate-related vs. anthropogenic changes in the catchment. We discuss how these indicators perform in the light of existing flood scale indices, such as the flood timescale (Gaál et al., 2012) and the peak-volume ratio (Bartens & Haberlandt, 2021). The results suggest that the conflicting space-time patterns contain a wealth of information that is highly informative about changes in flood controls under global change.

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