EGU24-11499, updated on 07 Dec 2024
https://doi.org/10.5194/egusphere-egu24-11499
EGU General Assembly 2024

The role of meteorological drivers and initial hydrologic conditions on streamflow drought-to-flood transition events

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Extreme hydrometeorological events such as streamflow droughts and floods may have severe impacts on infrastructure, agriculture, water supply, and hydropower generation, as well as social and political systems. Even though such impacts can be enhanced if the two types of events occur consecutively, the occurrence and drivers of drought-to-flood transitions are not well understood. Here, we ask: 'How do the properties of drought-to-flood transitions change with different meteorological drivers and initial hydrologic conditions?' To address this question, we configure the PCR-GlobWB hydrological model in a suite of near-natural gauged catchments, included in the quasi-global large sample dataset CARAVAN, that comprise different hydroclimatic conditions and physiographic characteristics. We run numerical experiments to understand the sensitivity of consecutive drought-to-flood properties (e.g., duration, extension, intensity, etc.) to different driver scenarios. Additionally, we perform, for each catchment, a flux-mapping analysis to explore whether different combinations of drivers can lead to a similar catchment response through different combinations of fluxes. Finally, we define clusters of catchments with similar drivers and sensitivities of consecutive hydrological extremes to the different stress tests. Ongoing analyses suggest that the drivers of drought-to-flood transitions vary substantially across catchments.