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Influence of rainfall event characteristics on the subsurface stormflow response: a multi-site analysis

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In many natural landscapes, subsurface stormflow (SSF) is a runoff-producing mechanism which can substantially contribute to the storm hydrograph of a stream. Despite its importance, its complex and highly dynamic nature have hindered its conceptualization and integration in most hydrological models. The lack of general rules to describe SSF is partly linked to the fact that SSF studies are often conducted at only one specific site or analyze only a handful of storm events. In the quest to gain a better understanding of the processes governing SSF, multiple SSF-capturing trenches have been excavated on intensely instrumented hillslopes characterized by different land uses, geology, soils and climates. The trenches are 10-15 m wide and 2-3 m deep and are vertically divided into an upper and lower flow-capture zone, which allows to study SSF at different depths. At the sites, SSF was continuously recorded over a period of ca. 1.5 year, during which numerous rainfall events occurred. This study analyses how the different rainfall event characteristics (e.g. total rainfall, intensity, etc.) influence the SSF response and to what degree the relationships between rainfall and SSF event characteristics are affected by the initial subsurface conditions (i.e. initial trenchflow and initial water content).