



Spatiotemporal changes in the hydrological state of temporary streams in a pre-alpine headwater catchment

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Temporary streams are common in headwater catchments and serve as important ecological and hydrological links between these catchments and downstream perennial rivers. However, our understanding of temporary streams in headwater catchments is limited due to a lack of high spatiotemporal resolution data of the three main hydrological states of these streams: dry streambed, standing water and flowing water. In this study, we used a custom designed multi-sensor monitoring system to collect high spatiotemporal resolution state data of the temporary streams in the 0.12 km² upper Studibach catchment, a pre-alpine headwater catchment in Alptal, Switzerland. The monitoring system was installed at 30 locations in the stream network. The state data was used to determine: (1) the temporary stream regime for every monitoring location based on the permanence of each hydrological state, (2) the state change thresholds (antecedent soil moisture, precipitation amount and intensity, and discharge at the outlet) for every monitoring location, and (3) the state change patterns in the stream network during precipitation events. The temporary stream regimes, and the state change thresholds and patterns were compared to topographic, land cover and channel characteristics to determine if these factors can explain the variability in temporary stream dynamics. The results show that there are four different landscape areas with distinctive temporary stream dynamics in the catchment, and that a steep forested section with coarse streambed material often disconnects the flowing parts of the upper and lower stream network.