



## **How old is overland flow? – Isotopic and hydrochemical evidence of considerable pre-event water contribution from a forested catchment**

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This study tests the hypothesis that a rapidly responding hydrograph consists mainly of event water where saturation excess overland flow prevails by applying a combined hydrometric, hydrochemical and isotope approach. The application of hydrograph separation identified overland flow as the dominant stormflow contributing source with a minimum contribution of 58 %. Overland flow was further found to be a mixture of event and pre-event water. While the chemical and isotopic compositions of the source components allow us to infer sources of base flow and overland flow, their within-event dynamics provide implications for the stormflow generating mechanism. The Si dynamics of stormflow indicate that precipitation contributes a large part to the initial rise of the hydrograph. However, while the relatively prompt increase of Si concentration in stream and overland flow waters points at a pre-event water source as a large contributor to the discharge throughout the rest of the event, the  $\delta^2\text{H}$  dynamics indicate that this pre-event water source is not base flow until overland flow ends. This implies that overland flow is generated by a combination of saturation excess and return flow. The final, conclusive identification of event and pre-event water sources will depend on a close look at within-event atmospheric conditions. However, this is the first documentation of such subsurface waters and flowpaths contributing to overland flow. Further work is necessary to collect other supporting field evidence for these subsurface pathways. Our data also suggest considering a differentiation of various pre-event water sources in hydrograph separation studies.