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Hydrological analysis of runoff formation in a small forested mountain catchment using $\delta^2\text{H}$ and $\delta^{18}\text{O}$ ratios

Lisa Rommel and Thomas Wöhling

Technische Universität Dresden, Institute for Hydrology and Meteorology, Department of Hydrology, Germany

The identification of origin, flow paths and transit times of water in catchments is an important component for process-based model development for runoff prediction. Hydrological studies offer, combined with isotope data, the possibility to quantify interactions between different compartments in catchments. In the context of this work it is examined to what extent event sampling of precipitation, streamflow, soil water and groundwater and the evaluation of their isotopic ratios $\delta^2\text{H}$ and $\delta^{18}\text{O}$ enable complex hydrological process investigations in the small forested mountain catchment of the river Große Ohe in the Bavarian Forest National Park. Within this study process analyses are carried out on small scales, e.g. runoff formation on hill slopes and on catchment scale as integrative process analysis. The water samples were collected during a small flood event and analysed for the isotope ratios $\delta^2\text{H}$ and $\delta^{18}\text{O}$ using a Picarro. A hydrograph separation was carried out through a comprehensive evaluation of the concentration profiles during the event. In combination with further hydrological and soil hydrological observations possible areas of origin and retention times of the water were determined. A strongly delayed reaction of the groundwater was observed which suggests that groundwater is not contributing to stream flow during a flood event, but a possible mobilization of pre-event water in the riparian zone can be observed as a response to precipitation events. The knowledge gained hereby is the basis for further process analysis and model development.