



## **Runoff response of an alpine catchment: analysis and comparison across different scales**

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Hydrological processes were analysed across different scales (0.07 km<sup>2</sup> to 150 km<sup>2</sup>) in the upper reach of the Saalach river in the Austrian Alps. More than 200 rainfall runoff events between 1997-2002 were examined in order to understand how hydrological processes are related across scales. The Saalach catchment (gauge at 12° 44.14' E, 47° 21.94' N; WGS84) is a nested catchment covering different scales, from the micro-scale (Limberg, 0.07 km<sup>2</sup>), to the small-catchment scale (Rammern, 15.5 km<sup>2</sup>), and the meso-scale (gauge Viehhofen, 150 km<sup>2</sup>). At these three scales two different event types could clearly be identified, depending on rainfall characteristics and initial baseflow level: (1) a unimodal event type with a quick rising and falling hydrograph, responding to short duration rainfall, and (2) a bimodal event type with a double peak hydrograph at the micro-scale and substantially increased flow values at the superordinate basins Rammern and Viehhofen, responding to long duration rainfall events. In all cases where a bimodal event is identified at the micro-scale, the hydrographs at the larger scales exhibit significantly attenuated recession behavior, quantified by recession constants. At all scales, the bimodal events are associated with considerably higher runoff volumes than the unimodal events. Detailed investigations at the headwater Limberg were performed with geophysical, tracer- and hydrochemical methods and led to the conclusion that the higher amount of runoff of bimodal events is due to the mobilization of subsurface flow processes. The link between the scales means that the runoff behavior of the headwater may be used as an indicator of the runoff behavior of much larger areas.