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Hydrological trends in a small research basin

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Hydrological research basins (HRB) are characterized by a dense monitoring network and help to answer different questions depending on their size. The HRB Pöllau (58.3 km^2) is located in the Eastern alpine foothills and was established in 1978 with the aim to conduct in-detail studies on various hydrological processes. A number of reasons supported the selection of the Pöllau sub-basin for the establishment of an HRB: (i) the confining arched mountain ridge allows a clear delineation of the catchment, (ii) the loamy soils are characterized by low storage capacities minimizing the influence of subsurface flow on catchment hydrology, and (iii) the climate of the catchment with heavy storm events in the summer and relatively dry winters is representative for the Eastern alpine foothills.

Monitoring started with the first operating rain gauge in 1979. Over the course of years, the monitoring network was expanded and continuously updated. Currently, it comprises six rain gauges (five tipping gauges and one scale), a central meteorological station (wind speed and direction, air and soil temperature, radiation and evaporation) also monitoring precipitation (equipped with a tipping gauge, a scale, and a distrometer), and two discharge gauges. While the currently operating discharge gauges have been recording since 1980, additional data are available from five discharge gauges that were in operation for a limited period between 1980 and 2009.

The identification of hydrological and climatological trends was conducted by applying statistical methods to the available data. Prior to the analysis, the data was validated with respect to data gaps, the sensor and climate specific plausibility, and the data variability. Results show an increasing trend with respect to annual precipitation sums since 1980. This result is in accordance with the literature that reports increasing annual precipitation sums since the 1970's. A similar trend was found with respect to heavy storm events (min. 17 mm h^{-1}). While also these results are confirmed by the literature, it is to be noted that extreme values imply large uncertainties hampering the identification of trends. This complication is mostly due to their rare occurrence at a small spatial scale. The analysis of the mean annual temperature for the Pöllau HRB shows a decreasing trend. While this observation is not confirmed by literature (a general increase of 1.5 C^o has been reported for Austria since the 1970's) it is to be noted that while the precipitation data sets cover more than 35 years, temperature was not recorded before 1993. A time series of 25 years is to be considered relatively short with respect to climatological trends and the length of the available data series might thus affect results.