



The terroir of prealpine headwaters - spatial patterns of water chemistry

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Out of all hydrological systems, headwaters and especially mountainous catchments are still poorly investigated. For these complex and variable systems long-term detailed data are sparse and even when they exist, internal data are lacking. In our study we investigated a mountainous catchment and tried to quantify internal catchment variability by collecting water samples at numerous locations and analysing their chemical composition. The goal was to investigate whether spatial patterns can be detected. We then tried to link these patterns to the physical properties of the respective sub catchments and studied whether the observed patterns remained stable in time. Here we present first results from this new data set collected in the Swiss pre-alpine Alptal catchment (35 km south-east of Zürich, 4.3 km², 1100-1600 m.a.s.l., slope 20deg up to 60deg, P >2000 mm y-1). Three snapshot campaigns during low flow, with each comprising more than 100 sampling points, were performed. The water samples were analysed for the major water composition (D, ^{18}O , AT, NO_3 , SO_4 , Na, Ca, Mg, DOC & SiO_2). Additional for every sample location it's local and upslope catchment characteristics (topographic indices, such as area, slope, flow length, TWI (Topographic Wetness Index) and altitude as well as land use, soil depth and geology) were derived. To identify patterns the data was analyzed with a combination of principal component and cluster analyses. First results showed that the collected water samples actually do contain information about the structure and represented the local physical system with differences between different sub catchments as well as between smaller hydrological units. One surprising outcome was that the chemical signal from springs near the water divide could be detected even at the catchment outlet. Overall the results showed that the snapshot sampling approach is a valuable tool for assessing hydrological organisation.