



Quantifying Alpine groundwater recharge from regional isotopic lapse rates

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Alpine environments are important water resources for low lying areas and for hydropower production. These water resources experience growing human pressure while being particularly sensitive to climate warming. In this context, new methods for regional-scale water resources quantification are of prime interest for sustainable management. Water balance estimation in mountainous areas is, however, notoriously difficult due to the high heterogeneity of rain- and snowfall and of related hydrological processes.

In this presentation, we discuss how new quantitative insights can be gained from the analysis of routinely analyzed stable water isotopes in groundwater, rainfall and streamflow in Switzerland. Isotopic lapse rates of deuterium and oxygene-18 are known to contain information about the catchment feeding the sampled ground water and in particular about the mean elevation. We analyze Swiss groundwater and rainfall lapse rates to infer new insights into elevation gradients of groundwater recharge. The used data includes stable water isotope data available from the national and international isotope observation networks along with the data from a national pilot study including 1102 observations from 50 groundwater wells for the period 2007-2013. The obtained results are compared to elevation gradients obtained from a regional analysis of river discharge.

The analyzed region shows a wide range of hydroclimatic regimes, strongly influenced by elevational air temperature gradients. Accordingly, the obtained results allow new insights into potential groundwater recharge modifications in a warming climate.