17 Poster Presentation

Insights and limitations of stable isotopes in groundwater research: a case study from the eastern side of the Untersberg, Salzburg

Benjamin Bichler[1], Markus Reischer[1], Christoph Spötl[1], Giorgio Höfer-Öllinger[2], Stefan Wyhlidal[3]

[1] Institute of Geology, University of Innsbruck
[2] Geoconsult ZT GmbH, Wals bei Salzburg
[3] AIT Austrian Institute of Technology GmbH, Tulln

In the Salzburg Basin fluvial sediments form a porous aquifer which is regarded as coherent and unconfined. The Untersberg consists mainly of carbonate rocks forming a large karst aquifer. Tracer tests have shown that large parts of the Untersberg are drained to the Fürstenbrunn spring, the main karst spring of this massif. A deep karst has previously been postulated below the spring assuming that karst water infiltrates directly into the porous aquifer.
Between 01.02.2012 and 26.03.2013, 60 sites (springs, streams and monitoring wells) were sampled monthly. In addition to temperature, electrical conductivity and discharge stable isotopes ($\delta^{18}O$, $\delta^{2}H$) were measured on these samples. Precipitation was collected in rain gouges and snow profiles were sampled as well.
The isotopic composition of precipitation in the Untersberg area shows an altitude gradient of -0.14 ‰/ 100 m. This provides the basis for assessing the mean altitude of the springs' catchments. A mean residence time of ca. 0.4 yr was obtained for water emerging at the Fürstenbrunn spring using an exponential model.
The isotope data confirm the infiltration of the Berchtesgadener Ache into the porous aquifer at St. Leonhard. In this area, monitoring wells and the nearby Berchtesgadener Ache show the same mean $\delta^{18}O$ values and a very similar pattern throughout the year. Further towards the basin, rain is the main source of recharge. Secondly, water from the Untersberg (Rosittenbach, Fürstenbrunn spring) infiltrates - partly artificially - into the porous aquifer. A distinction between these waters from the Untersberg is not possible because of their similar $\delta^{18}O$ values. Consequently the hypothesis of an additional infiltration via a deep karst aquifer cannot be tested using stable isotope data, because this source would have an isotopic composition indistinguishable from that of the Fürstenbrunn spring.

The data of this study show, however, that large fluctuations of the groundwater body do also occur in winter when the discharge from the karst system is very low. This leads to the conclusion that precipitation in the Salzburg Basin is more important for recharging the porous aquifer than was previously assumed. Furthermore, neither temperature nor electrical conductivity showed evidence of infiltration of cold and low-mineralized waters into this aquifer.