average flow velocities of 1.4-4.5 mm per day near the front for the period 2006-2011. Two cores were drilled on the lower part of the rock glacier during late summer of 2010. Core I is 40 m long and penetrated the active layer (0-2.8 m), the frozen core extend from 2.8 to 24 m. Below the frozen core coarse debris with small amounts of fine-grained sediment is present to a depth of 28 m, followed by lodgement till. The average ice content is 43 vol%. At core II, which was drilled close to the front, the active layer is 4.5 m thick, underlain by the frozen core down to a depth of 18.5 m. The ice-content is lower compared to core I averaging 22 vol%.
From the frozen cores samples were taken at an interval of approximately 10 cm for geochemical analyses, isotope studies, palynology and radiocarbon dating. Temperature loggers were installed in the borehole of core II to record the temperature within the bore hole. Inclinometers were installed to obtain information on the movement of the rock glacier. Borehole measurements, geochemical and palynological data and radiocarbon ages provide important information on the formation and dynamics of this active rock glacier.

Isotopic and chemical evidence on the transition unsaturated - saturated zone: From the lysimeter to groundwater body scale, Wagna, Leibnitzer Feld

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Isotopic behaviour, hydrochemical exchange and transport velocities in the unsaturated zone and at the transition unsaturated and saturated zone is still relatively unknown in many groundwater bodies. At the lysimeter station Wagna (Leibnitzer Feld, Styria, Austria) a dense depth-profile (n=24) over the transition unsaturated and saturated zone was sampled 6 month after an unusual wet summer. On all samples oxygen and hydrogen isotopes as well as major ions were analysed. Tritium was measured at the top and the bottom of the saturated zone. The heavier isotopes and the smaller ion-concentration in the water of the unsaturated zone approach the surface of the saturated zone with a gradient. This gradient continues in a steep form over the depth of the saturated zone. The tritium content on top of the saturated zone is significantly higher than at the bottom of the zone (11 and 9.7 TU). All the major ions are less concentrated in the unsaturated zone with the exception of nitrate. The summer precipitation seem to have arrived quicker than normal at the saturated zone in the depth from 2.3 m and mix with the thin aquifer of about 2 meter. Isotope data of 14 monitoring sites in the groundwater body around the lysimeter allow to unravel the timing and the equal importance of the summer precipitation for the groundwater recharge in unconfined aquifers in humid climates.

Where does Nitrogen, Sulphur and Lead go in a forested Alpine watershed? The relation of “water age” and the retention of N-, S-, O, DIC, Sr and Pb by a multi-isotope approach, Zöbelboden, Reichraming.

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In a pilot study precipitation, soil, rock and spring waters were collected in a small catchment at the front of the Northern Calcareous Alps to test the application of isotope analyses to estimate the mean transfer time, the amount of nutriens, contaminants and their transfer to the groundwater. The hydrochemistry and the isotopic composition of nitrate, sulphate, strontium, lead and the water molecule itself has been analysed in five laboratories.
The transfer-time of precipitation through soil and groundwater was estimated by oxygen-18, tritium and 3H/3He measurements.
Comparison of strontium isotope measurements in precipitation, spring waters and dolomite bedrock in a relatively pristine and remote area at the front-range of the Northern Calcareous Alps in Austria with literature data indicate that 87Sr/86Sr-isotope ratios in precipitation (0.7092) support at least a more radiogenic, far transported source in addition to a possible recycling of local dolomite and limestone dust (0.7080-0.7083). Spring waters show similar ratios (0.7083-0.7084) confirming Sr-isotopes are good indicators for groundwater contact with specific host rocks.
The monthly precipitation samples show 18O-rich sulphate ions, whereas the soil sulphates change in a direction