GROUNDWATER HYDROCHEMISTRY IN METAMORPHIC ROCKS AND QUATERNARY DEPOSITS OF HIGH-ALPINE SLOPES (UPPER KAUNER VALLEY, (AUSTRIA)

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This contribution presents results from geological studies and hydrochemical investigations of spring and tunnel inflow waters in metamorphic rocks of a high-alpine area. The slopes around the Gepatsch reservoir in the Upper Kauner Valley (Austria) consist mainly of paragneiss with intercalations of orthogneiss and amphibolite belonging to the Ötztal-Stubai Basement Complex. The fracture surfaces of these folded and jointed bedrocks are typically coated with Fe-(hydr-)oxides and chlorites, but also with carbonates. Sulphides occur dominantly as accessory minerals but also locally as small veins. The bedrock is mostly covered by different Quaternary deposits consisting of reworked fragments of metamorphic rock types. A characteristic feature of the study area is the occurrence of several deep-seated, well-investigated rockslides.

Detailed field surveys and subsurface investigations (tunnels, drillings, and numerous in-situ tests) indicate that the groundwater preferentially flows within zones of highly weathered bedrock, brittle fracture zones, deep-seated rockslides, and in permeable Quaternary deposits. Some of the spring and tunnel inflow waters are characterised by remarkably high amounts of total dissolved solids (up to more than 1000 mg/l). The pH of these waters is predominantly neutral to slightly alkaline. $\delta^{18}O$ and $\delta^{2}H$ values indicate no fractionation or evaporation processes and Tritium and $\delta^{18}O$ data indicate a rather young groundwater age. Ca and Mg are the major cations and SO_4 and HCO_3 are the dominant anions. Electric conductivity of the water increases with increasing Ca, Mg and SO_4 concentrations. Low $\delta^{34}S$ values indicate that sulphate dissolved in the spring waters originates from the oxidation of sulphides. The dissolution of carbonate fracture fillings and the oxidation of widespread pyrite are regarded as the main processes that lead to the observed groundwater chemistry.

Furthermore, the gravitational rock disintegration processes (which here mainly affect the paragneiss and generate fresh fracture surfaces to substantial depths within the aquifers) are supposed to favour the chemical processes leading to groundwater characterised by high amounts of total dissolved solids.