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The Fischa-Dagnitz spring, Southern Vienna Basin: a multi tracer time series study re-assessing earlier conceptual assumptions.

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The gravel aquifer of the Southern Vienna Basin is a very important backup drinking water resource for the city of Vienna. A discharge location, the Fischa-Dagnitz spring in the Southern Vienna Basin, Austria, was re-investigated in 2011, five years after the gas exchange tracer test published in (Stolp et al., 2010), and sampled for stable isotopes $^{18}O/^{2}H$, tritium, ^{3}He, SF_6 and ^{85}Kr (Gerber et al., 2012). Additionally, new tritium time series data (Davis et al., 1967), previously not considered in Stolp et al. (2010), were included. These show a higher and earlier tritium peak of >300 TU in 1965 in the discharge of the Fischa-Dagnitz spring as compared to 221 TU in 1972 considered in Stolp et al. (2010). The new ^{3}He, SF_6 and ^{85}Kr gas tracer data from 2011 confirm the earlier finding for ^{3}He of Stolp et al. (2010) and indicate a more recent equilibration with the atmosphere than the water bound tracers ^{18}O, ^{2}H and tritium.

A new modelling attempt using the Lumpy code (Suckow, 2012) confirmed the discrepancy between the tritium data and the gaseous tracers ^{3}He, SF_6 and ^{85}Kr. No steady-state combination of local recharge (represented by an exponential model) and Schwarza river infiltration flowing through the gravel aquifer (represented by a parallel dispersion model) can equally well explain both the tritium time series and the gas tracer results.

A revised conceptual model proposes that a pinching of the aquifer at unconformities in the gravel body or a fault zone known in the gravel body forces groundwater along the flow path closer to the surface and exposes it to the atmosphere. This would tend to reset the "dating" clock for the gaseous tracers ^{3}He, SF_6 and ^{85}Kr, which can equilibrate quickly with the atmosphere, but not for tritium, which marks the transport behaviour of the water itself. These findings are of importance also for other multi-tracer assessments of groundwater movement in phreatic aquifer systems.

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