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Estimations of subsurface recharge from a karstic formation into a contaminated aquifer system

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A large set of environmental tracer methods (^{3}H/^{3}He, ^{85}Kr, SF_6, CFC's, $^4He_{rad}$, NGT's, δ^{18}O, δ^2H) was used to build up and constrain a flow model for a heterogeneous aquifer system of a town in Switzerland. Groundwater in the area is affected by chlorinated hydrocarbon contamination originating from the local industries. Knowledge about the flow dynamics of the groundwater is the basis for the construction of a numerical flow and transport model which allows conclusions about the future behaviour of the contaminants. Estimated groundwater residence times increase from one year near the recharge areas in the North of the town to over 50 years in the river plane in the South. Despite of the hydrogeological heterogeneities and the non atmospheric subsurface tritium sources, ^{85}Kr and ^{3}H/^{3}He- Piston flow ages correspond very well. Depleted noble gas temperatures suggest that a significant amount of water recharged at higher elevations with a lower mean annual temperature is present in the southern part of the aquifer. It is assumed that this water is related to the karstic system of the nearby mountains. In general, the stable isotopes also indicate the proposed karstic inflow. Nevertheless, some contradiction in spatial extension and the amount of inflowing water raise the question about reliability and applicability of both methods. Therefore, efforts are made to better constrain the amount and extension of the mountain block recharge with the help of other parameters like groundwater residence times, mean annual air temperatures or hydrogeological considerations.