GEFÖRDERT VOM
Bundesministerium für Bildung und Forschung
FONA Forschung für Nachhaltigkeit
LURCH Grundwasser nachhaltig bewirtschaften

An isotopic look at river bank filtration and its use for sustainable management of groundwater resources near rivers

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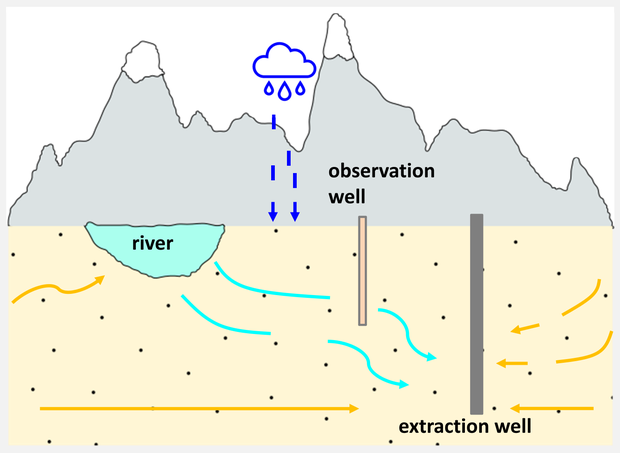
Objectives

River bank filtration is a natural and cost-effective method for sustainable management of groundwater resources near rivers. The question of supply with drinking water as well as raw water (agriculture, geothermal use) poses a continuously growing challenge for the water resources management in the future. Even in alpine regions, where water supply is mainly based on spring water, river bank filtration from narrow limited porous aquifers is a necessary supplement for the increasing periods of drought. Within the scope of the BMBF-Lurch IsoGW project, one of these supply systems (Ofterschwang site in the Upper Allgäu) was selected as a pilot site. In order to investigate over a period of more than 2 years, the variability of hydrological processes stable and radiogenic water isotopes will be used to characterise and quantify the groundwater recharge components, flow velocities, and mixing balances. The site specification and initial results of these investigations are presented.

River bank filtration (RBF)

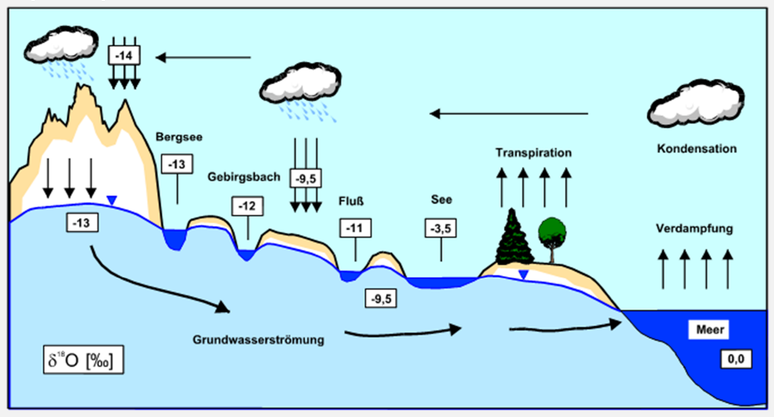
- RBF is a popular method for groundwater management in Germany



Sketch:
Surface water infiltrates from the river bank into the underground sediments towards the extraction well where it mixes with an unknown portion of groundwater. Precipitation and/or snowmelt also take part in the groundwater recharge

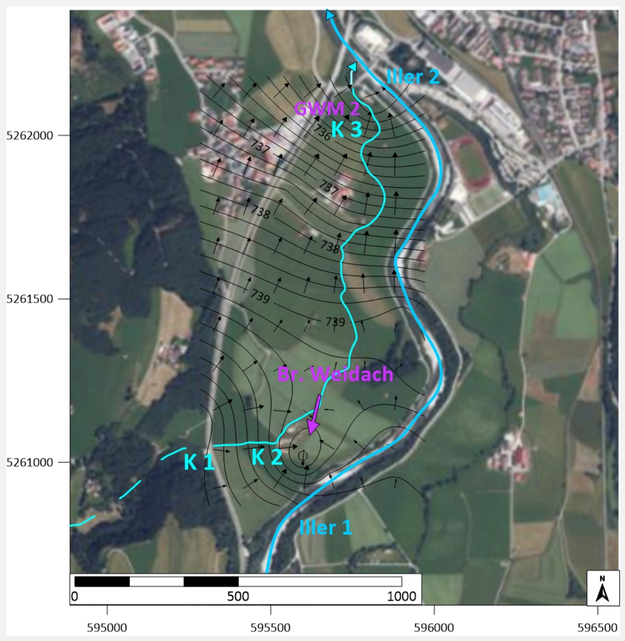
$\delta^{18}O$ and $\delta^{2}H$

- As water evaporates from the ocean, it takes its journey inland
- The higher and the further the water vapour travels, the higher the depletion of the isotopes in precipitation

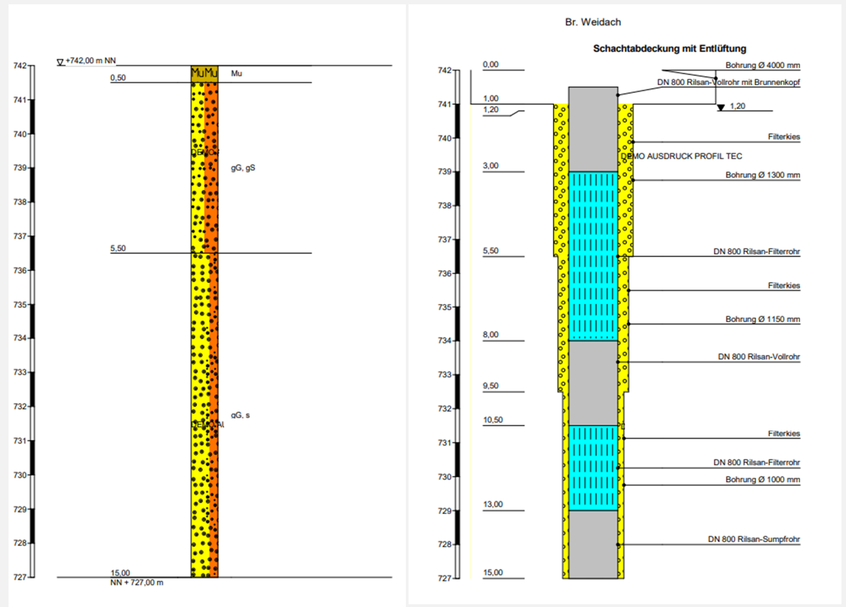


Stabile isotopes are used to..
→ distinguish groundwater from river water in a mixing system
→ determine the flow velocity between the river and the well

Ofterschwang (Upper Allgäu)

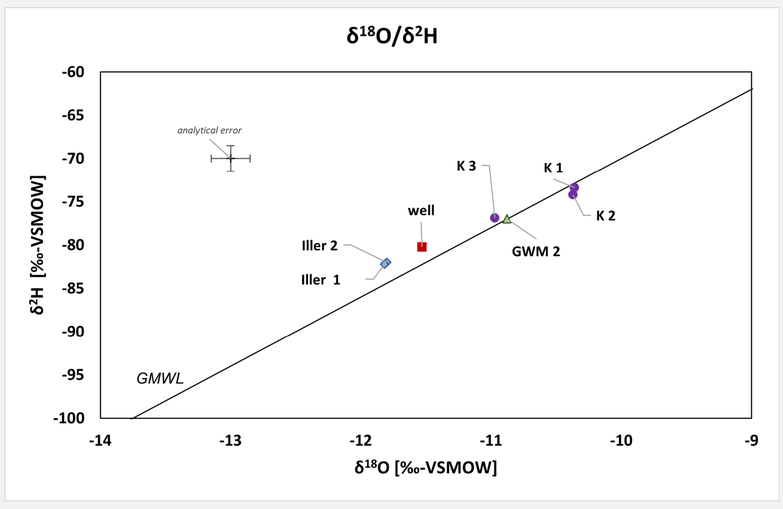


- Ofterschwang is located in a narrow, glazial over-deepened valley in the Upper Allgäu surrounded by the foothills of the Alps
- The Iller River flows from the Alps towards the North, where it infiltrates into the porous aquifer (upper groundwater storrey)
- The Krebsbach (K) coming from the West is a tributary to the Iller river and makes its way past the well towards the North
- Infiltration of the Iller River will be determined throughout short-term and long-term isotopic measurements



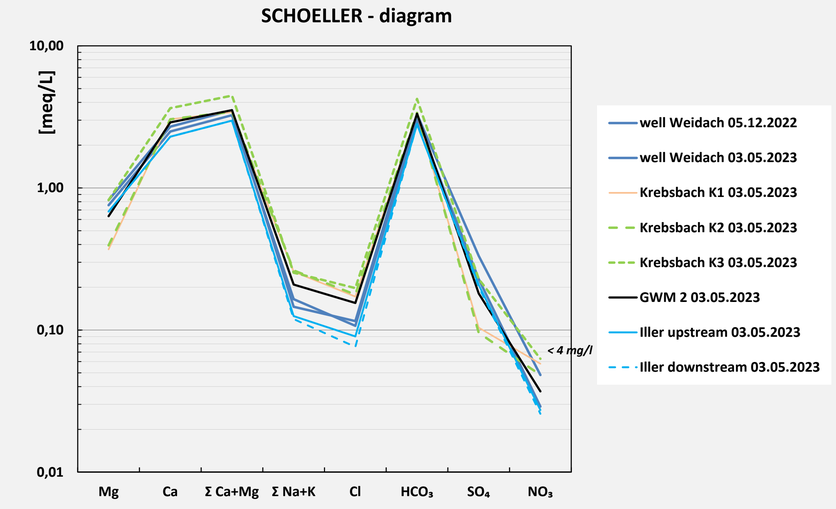
Well structure and geological profile, which shows a domination of gravel and sand

Initial results



Initial results from the isotopic sampling (03.05.2023, after a long wet period in late spring)

- The Iller River as expected shows an identical isotopic signature at its upper reach and downstream
- The isotopic signature Krebsbach is variable as it flows towards the North, but different from the River
- The isotopic values of the well are close to the river, which leads to the assumption of river bank infiltration.



- The overall water chemistry can be identified as an alkaline earth water, rich in hydrocarbonate, low in nitrate (< 4 mg/l) and shows no clear differentiation

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