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Combined Use of $^3H/^3He$ Apparent Age and On-Site Helium Analysis to Identify Groundwater Flow Dynamics and Transport Of PCE

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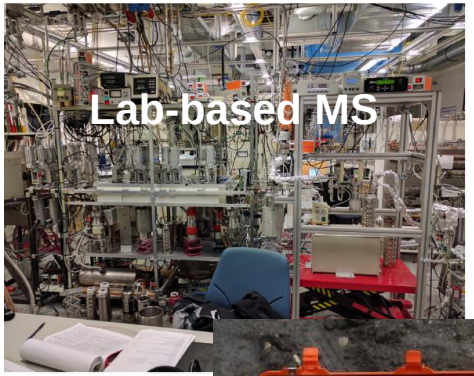
Introduction

- **Tritium (^{3}H) is a suitable tracer** for younger groundwater.
- **Radiogenic ^{4}He is a by-product of the ^{3}H/^{3}He method** and used as an **additional indicator for groundwater age.**
- **New developments in portable field-operated GE-MIMS system** provides a unique opportunity to measure dissolved gas concentrations, such as ^{4}He, in groundwater systems
- **^{4}He** accumulation rates are often **obtained from ^{3}H/^{3}He** ages.

→ We aimed to **determine the relationship** between field-measured ^{4}He concentrations analyzed with a GE-MIMS system and lab-based apparent ^{3}H/^{3}He ages.



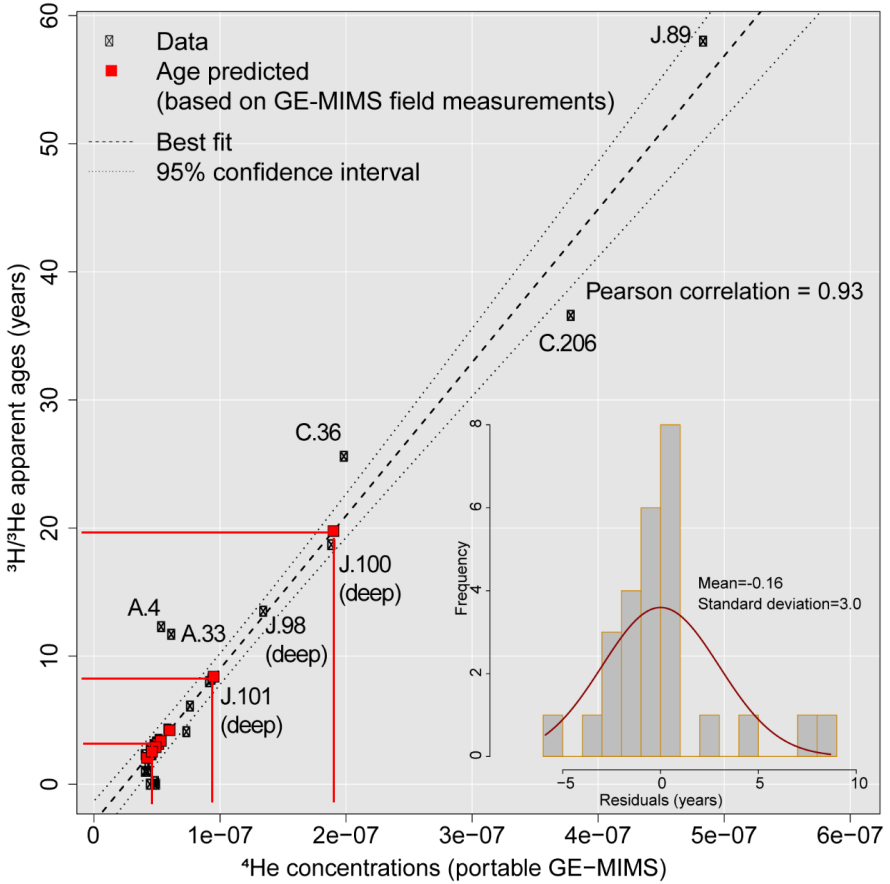
Relationship between $^3H/^3He$ apparent ages and GE-MIMS measurements

Study Area:
Drinking water supply site combined with artificial infiltration (~95.000 m^3/d)

Relationship:

- Linear relationship between field-measured ^4He concentrations collected with the GE-MIMS system and the estimated laboratory $^3H/^3He$ apparent ages.

- Apparent ages can be predicted for sampling locations where only ^4He concentration from the GE-MIMS measurements are available.



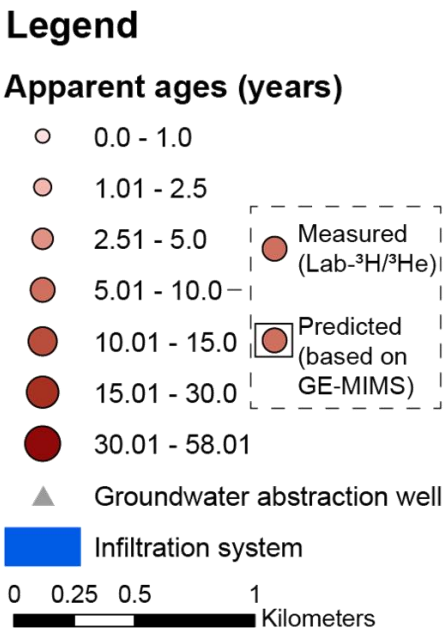
Spatial Distribution Apparent Ages

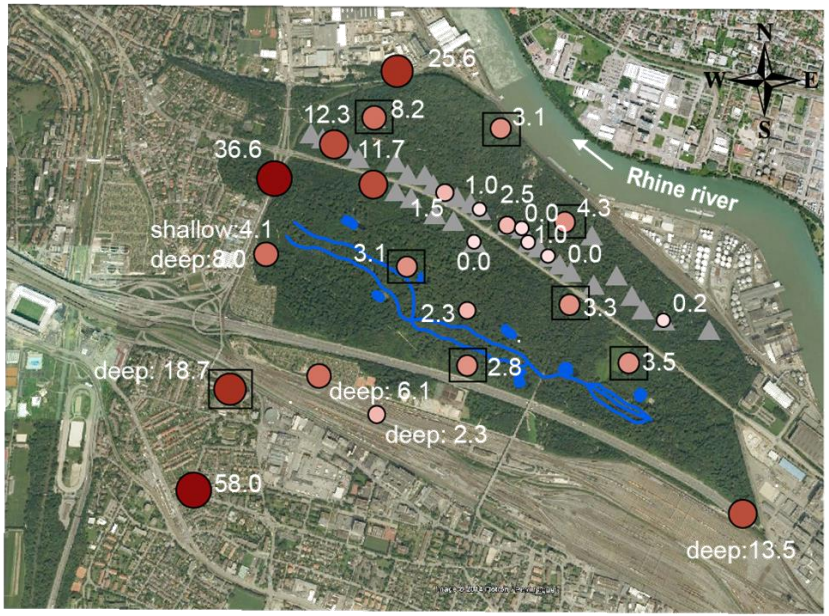
Relatively young water → close to the artificial infiltration system.

Oldest water → in the south and at western edge.

Multilevel wells → increasing trend with increasing depth.

Pumping wells → older ages at wells located at the western edge.





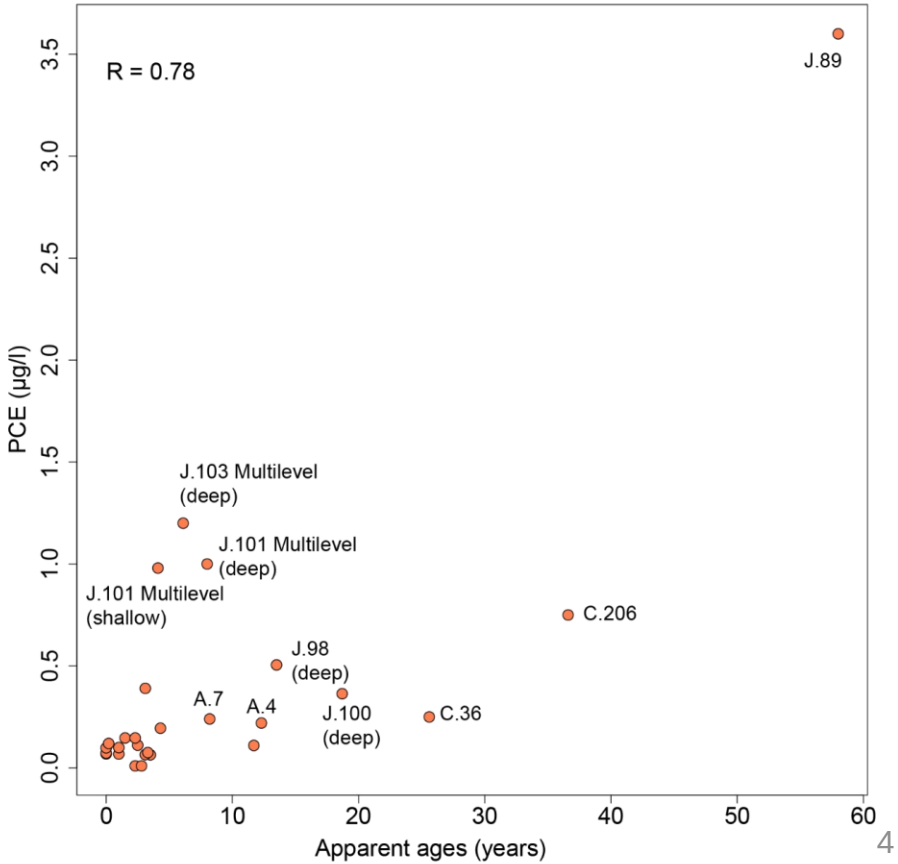
Apparent Ages and PCE

Highest concentration PCE → oldest groundwater.

PCE concentration decreases with decreasing age.

Most multilevel wells with deeper sampling depths indicate higher concentrations of PCE.

Pumping wells in the western part of the pumping well gallery (e.g. A.4 and A.7) show higher concentrations of PCE.



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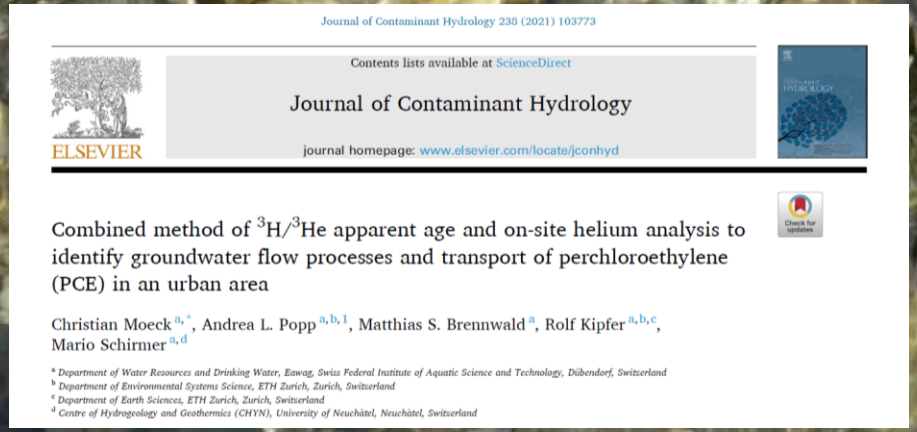
Thank you for your attention



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Combined method of $^{3}H/^{3}He$ apparent age and on-site helium analysis to identify groundwater flow processes and transport of perchloroethylene (PCE) in an urban area

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