Groundwater Recharge in the Human Environment: Chemical Indicators

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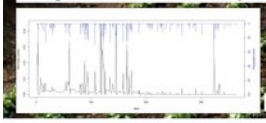
Objectives

Human development of the land shows a marked influence on groundwater recharge and the local water cycle as a whole. For water resources and water quality related concerns, it is important to understand where groundwater recharge is coming from and how it changes in storage over time. Here we address two common landscape types: urban and agricultural.

The urban water cycle is altered by:
- Damming and canalization of surface water bodies
- Subsurface infrastructure
- Impervious surfaces

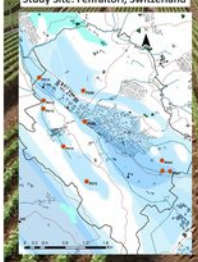
Agricultural water cycles are altered by:
- Irrigation
- Drainage canals
- Changes in soil

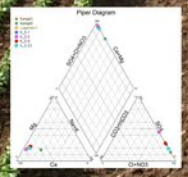
Here, the beginning of an investigation into the use of chemical indicators for recharge is presented. In the long term, estimates using indicators will be compared to estimates from a multitude of recharge calculation methods to verify conclusions.



Graphic: Daily rainfall (blue) compared with groundwater recharge (black)

Study Site: Fehraltorf, Switzerland

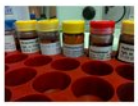




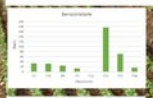
Micropollutants as Indicators

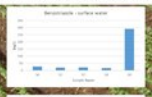
Following an altered water cycle, groundwater recharge in urban and agricultural areas includes natural and artificial sources, such as:

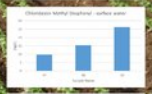
- Rainfall
- Stream infiltration
- Irrigated fields and gardens
- Sewers and water mains leakages
- Impervious surface runoff



Micropollutants are a powerful tool for identifying and quantifying such sources in the groundwater. Different classes of micropollutants are used in distinct land use types, and often also show distinct behaviors during rainy and dry conditions. These characteristics can be used to differentiate sources and quantify their input.







Pair	r
CMD - TER	0.84
DIC - VAL	0.81
CMD - BENZO	-0.74
CMD - DIC	-0.22

Next Steps

A time series of micropollutant concentrations is needed to properly quantify dynamics. More compounds which strengthen the information gained from those currently measured must be included in future campaigns. Compounds which capture other suspected sources of recharge will also be considered.

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