

## Time-scale of pesticide metabolite impacts on groundwater

### Context and objectives

Pesticide metabolites have been widely detected in groundwater across the Swiss Plateau. While some of the pesticides leading to high metabolite concentrations have been banned, metabolite concentrations tend to decrease only slowly or remain stable. For water utilities, it is crucial to know the expected temporal evolution of metabolite concentrations in order to plan the operation of pumping wells and possible investments in water treatment. The aim of this project is to investigate processes that control the temporal evolution of metabolite concentrations at pumping wells as a basis for prediction. The project will focus on a glacio-fluvial aquifers where metabolites of several pesticides have been detected and the history of pesticide application is well known. A monitoring station of the Swiss Groundwater Monitoring Network (NAQUA) is located at the site and a long data series of metabolite concentrations in groundwater is available.

### Methodology

A wide range of field and computational methods will be used. Concentrations of pesticides and metabolites will be determined in soils with a known application history and compared with historical data to investigate whether soil acts as a long-term reservoir for input to groundwater. Laboratory column studies will be used to assess whether there is a delay in movement to groundwater. Groundwater concentration time series and groundwater age data will be used to evaluate how long substances are expected to remain in groundwater. An existing numerical groundwater model can be used to investigate how the various factors influence the temporal dynamics of pesticide metabolites in a pumping well and to provide recommendations for predicting metabolite concentrations.

### Supervision and collaboration

The project will be supervised by Daniel Hunkeler. The project will be carried out in collaboration with the local farmers, the water works and the federal office of the environment operating the monitoring station.

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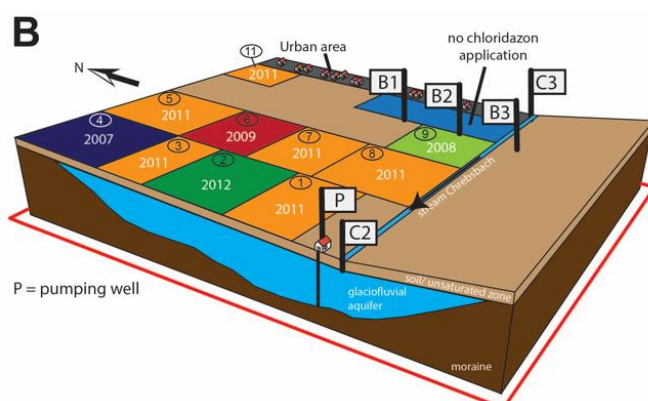


Figure 1: Schematic view of the field site with “historical” application of pesticides.