



Universität
Basel

Research Project

Integrated simulation of surface water-groundwater systems driven by advanced tracer and inversion methods

Project funded by own resources

Project title Integrated simulation of surface water-groundwater systems driven by advanced tracer and inversion methods

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Organisation / Research unit

Departement Umweltwissenschaften / Hydrogeologie (Schilling)

Project start 01.07.2022

Probable end 30.06.2026

Status Active

In this PhD project, the aim is the investigation of the transport behavior of different solutes and microbes in groundwater and surface water on a wellfield scale, with the goal to improve the quantification of river-aquifer interactions with tracers and the delineation of groundwater wellhead protection zones. To this end, recent methodological developments of three separate domains will be combined: Online microbial and solute tracer monitoring (i.e., analytics), integrated hydrological flow and transport simulations (i.e., numerical flow modelling), and fully-automated model calibration (i.e., mathematical inversion). Through the combination of these recent developments, it will finally become possible to delineate protection zones for drinking water supply wells that robustly reflect the pathways and travel times of both microbial pathogens and contaminants. The current protection zone delineation approaches for drinking water wells are exclusively based on solutes and never on microbial tracers, although it is well understood that microbes travel faster than solutes and protection zones should primarily protect against microbial contamination. An important part of the project will focus on the implementation of a modified colloid filtration theory approach for microbial transport simulations in the integrated surface-subsurface hydrological model HydroGeoSphere. The project is conducted in close collaboration with Université Laval (Prof. R. Therrien), Université de Neuchâtel (Prof. P. Brunner & Prof. D. Hunkeler) and Eawag (Prof. R. Kipfer).

Keywords microbes, tracers, groundwater, surface water-groundwater interactions, modelling

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Specify cooperation partners

ID	Kreditinhaber	Kooperationspartner	Institution	Laufzeit - von	Laufzeit - bis
4658641	Schilling, Oliver	Therrien, René, Prof.	Université Laval	01.07.2022	30.06.2026
4658642	Schilling, Oliver	Brunner, Philip, Prof.	Université de Neuchâtel	01.07.2022	30.06.2026
4658643	Schilling, Oliver	Hunkeler, Daniel, Prof.	Université de Neuchâtel	01.07.2022	30.06.2026
4658644	Schilling, Oliver	Kipfer, Rolf, Prof.	Eawag	01.07.2022	30.06.2026