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Versuchseinrichtung zur Grundwasser- und Altlastensanierung · *VEGAS*
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Research project for:
B.Sc., M.Sc.
BAU, UMW, WASTE

Numerical Modelling of PFAS Desorption and Transport Based on Laboratory Experimental Data

Per- and polyfluoroalkyl substances (PFAS) are used in several industrial branches as well as in fire-fighting foam because of their hydrophobic and lipophobic properties. In the Upper Rhine Valley, Germany, more than 1000 ha of predominantly agricultural land has been contaminated with PFAS. The immobilization of PFAS in the topsoil is currently discussed as a possible management option to avoid further transport into aquifers and transfer to plants.

In this project, we develop an experimental and analytical test-strategy to evaluate PFAS immobilization. Among them, Lysimeter experiments under variably-saturated conditions are conducted. Additionally, a numerical model using Hydrus-1D is set up to simulate the solute transport characteristics (sorption) for several PFAS. Sorption parameters are calibrated based on experimental data.
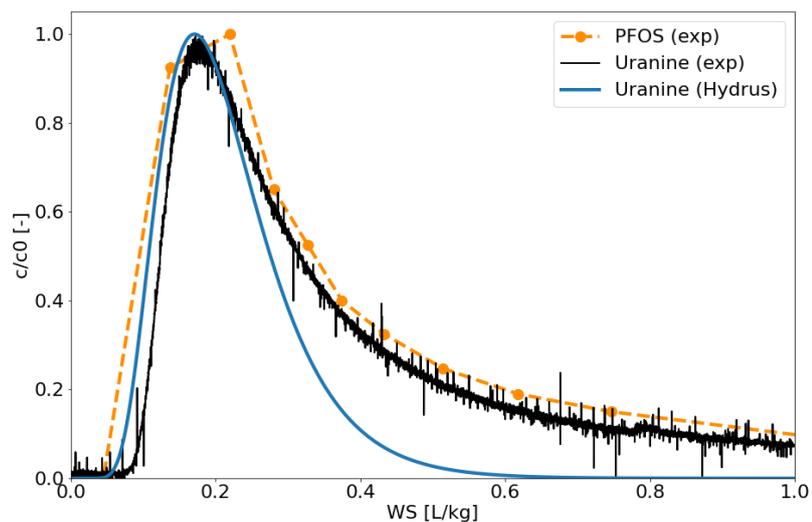

Figure 1: Lysimeter

Figure 2: Simulation (Hydrus-1D) and fit to experimental data

A thesis in this area at VEGAS involves the following aspects:
- get familiar with the topic "PFAS" (sorption/desorption mechanisms, biotransformation, precursors…)
- gain practice with variably-saturated solute transport models (Hydrus-1D; relevant variables) and use the models (calibration, process understanding, evaluation of effects of boundary conditions and management scenarios)
- analyse, visualize and evaluate data (from experiments and model outputs).
- work in an interdisciplinary supportive team with close ties between the real world, lab experiments, data derived from actual experiments, and quantitative process understanding

Previous knowledge and skills in the following would be useful:
- Multiphase flow and transport
- Programming languages (e.g., Python) and data handling and the desire to learn

The start date can be negotiated. If interested, please do not hesitate to contact us for more information.

We are looking forward to your interest!

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