



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

Universität Stuttgart  
**Institut für Wasser- und  
Umweltsystemmodellierung**

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## Quantifying the Effects of PFAS-Immobilisation-Strategies

Perfluoroalkyl substances (PFAS) are used in several industrial branches as well as in fire-fighting foam because of their hydrophobic and lipophobic properties. In the region Rastatt/Baden-Baden in the Upper Rhine Valley, Germany, approximately 800 ha of predominantly agricultural land has been contaminated with per- and polyfluoroalkyl substances (PFASs). This is one of the most important cases of groundwater and soil contamination in Germany. We are actively working on providing solutions to decrease PFAS loading rates to the groundwater.

In this project, we develop a test-strategy to evaluate different immobilization strategies for PFAS contaminated soils. The treated soil is tested on different scales (batch experiments of  $\approx 1\text{L}$ , column experiments of  $\approx 5\text{L}$ , lysimeters of  $\approx 200\text{L}$ ) and under different saturation conditions (saturated and variably saturated). Additionally, a numerical model using HYDRUS-1D is set up to simulate the solute transport characteristics (sorption) for several PFAS substances in the column and lysimeter experiments.

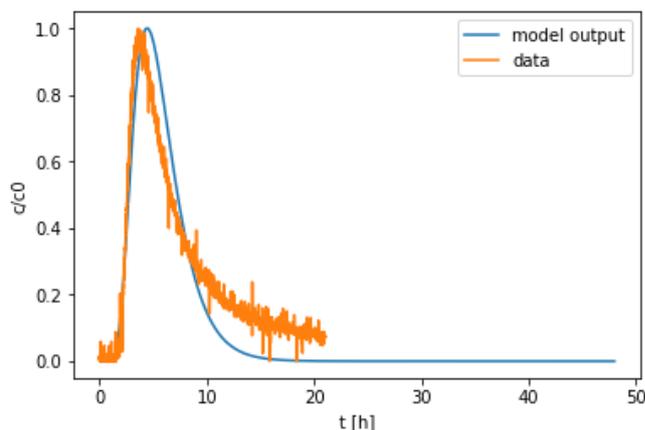


Figure 1:  
Example of analytical and experimental data



Figure 2:  
Example of experimental setup (lysimeter)

**Possible thesis topics include:**

- Quantify leaching rates of various PFAS compounds under various conditions / with various immobilisation agents
- Evaluating the effect of immobilisation strategies on regional water quality (concentrations at supply wells)
- Evaluate leaching rates through construction material containing agricultural soil

**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 work with the models (calibration, process understanding, evaluation of effects of boundary conditions and management scenarios)
- analyze, visualize and evaluate data (from experiments and model outputs). Skills in data handling (e.g., Python) and the desire to learn do help
- work in an interdisciplinary supportive team with close ties between the real world, lab experiments, data derived from actual experiments, and quantitative process understanding

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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