Chair for Hydrology and River Basin Management
TUM School of Engineering and Design
Technical University Munich

Master thesis/Study Project – Environmental Engineering

Master Thesis Workload: 30 ECTS, 900 hours

Study Project Workload: 12 ECTS, 360 hours

Interaction between hydropeaking and aquifer heterogeneity in a laboratory scale model

Groundwater flow and solute transport is controlled by the hydraulic conductivity and the boundary conditions of the system. An example of transient boundaries is hydropeaking, river fluctuations due to the operation of hydropower plants. Recently, flow-through laboratory experiments and their numerical interpretation were used to study the effect of hydropeaking on solute transport of a contaminant plume moving across a homogeneous aquifer. However, natural aquifers are often heterogeneous and the hydraulic conductivity represents a big source of uncertainty. The objective of this work is to extend the numerical model to a heterogeneous aquifer within a stochastic framework. While the numerical model is available, the student should perform several simulations with different hydraulic conductivity fields and degrees of heterogeneity.

Tasks:

- Generate heterogeneous hydraulic conductivity fields adapted to the laboratory experiment scale.
- Check the effect of numerical dispersion on the results.
- Run groundwater flow and transport simulations with different hydraulic conductivity fields and degrees of heterogeneity.
- Post-process the results and analyze them within a stochastic framework.

Requirements:

- Good knowledge of groundwater modeling (MODFLOW)
- Good knowledge in programming (e.g., MATLAB, Python)
- Independent, conscientious and responsible way of working

Start:

From January 2023

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