



LABORATORY OF COUPLED PROCESS MODELLING

Main objectives and activities of the laboratory

The workgroup is a team of modellers focused on solution of coupled (multiphysics) and geochemical problems, i.e. problems influenced or controlled by several physical and chemical phenomena simultaneously. We are able to analyse a problem, solve its subproblems and interpret the simulation results in relation to measured data and overall problem understanding. We are experienced in modelling and also in building of information systems for data collection and management in the field of environmental problems and in statistical processing of such data.

Professional focus of the laboratory

- transport of solutes in groundwater coupled with geochemical reactions and heat transfer,
- transport of nanoparticles in porous medium coupled with their aggregation,
- transport experiment interpretation, model parameter identification,
- research of computational methods for coupled problems,
- development of problem oriented information systems.

Specific equipment

We have a laboratory equipped for column transport-reaction experiments in small scale and tools for computer simulation of water flow in porous medium, transport, and chemical reactions – e.g. FEFLOW, GWB, MODFLOW, MATLAB, RStudio, Python, Visual Studio, SageMath, Pentaho, and our own SW.

Offered technologies and expertise

Collection and processing of environmental monitoring data (esp. groundwater), adaptability for various types of problems, semi-automatized loading of archive data to a database system, advanced statistical methods for data processing, groundwater and geochemical models (design, realization, other authors' model validation), development of applications for data management (databases, warehouses), visualization (geographic information systems, 3D models, web map applications), modelling and advanced assessment of environmental risks (multi-criterial analyses), early warning systems, decision support systems, object models of various natural phenomena, multidisciplinary cooperation in frames of a small team of experts e.g. for simulation tool development.

