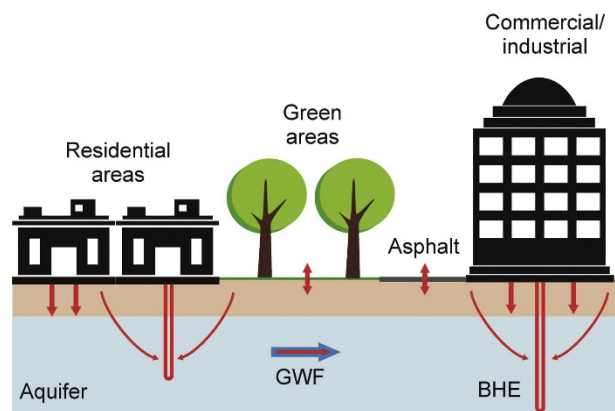
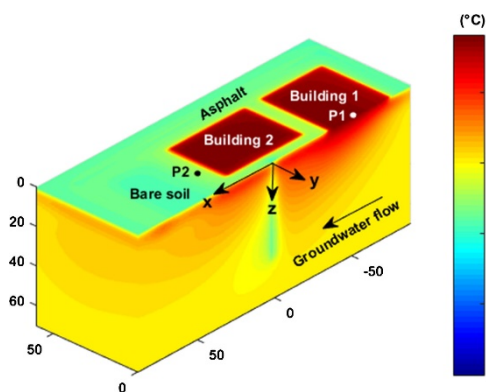


Investigation of shallow geothermal systems performance under different scenarios: A benchmark study on analytical and numerical models

About

Ground source heat pump systems are standard applications of low-enthalpy geothermal energy utilization. For supply of greater energy demands, large-scale systems with multiple borehole heat exchangers (BHEs) are applied to access substantial volumes of the shallow ground. The system is operated by circulating a heat carrier fluid in the BHEs, which exchanges heat with the ground and feeds an indoor heat pump. The performance of geothermal systems is closely affected by the geological and hydro(geo)logical conditions of the subsurface. The existence of subsurface heterogeneity, groundwater flow and different land uses are among the items that should be considered in short-term and long-term simulations of geothermal systems. The purpose of this project is to set up different plausible scenarios (in terms of boundary conditions, space- and time resolution, layered and non-layered heterogeneity, groundwater flow and mechanical dispersion, short-term vs. long-term response) that can occur and use existing analytical and numerical models to simulate for a comparative study.



Tasks

- Literature review on the previous works
- Design and preparation of possible scenarios with different complexities
- Set up numerical and current-existing analytical models for the considered scenarios
- Comparison of the results and making a critical discussion

Requirements

- Good knowledge in hydrogeology and basic mathematical skills
- Enthusiasm for working with computational softwares (FEFLOW/COMSOL)
- Interested in programming and dealing with analytical models

Supervisors

Hesam Soltan Mohammadi (hesam.soltan-mohammadi@geo.uni-halle.de)

Prof. Dr. Peter Bayer (peter.bayer@geo.uni-halle.de)