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Rock Garden test site – hydraulics in porous fractured media

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Understanding of subsurface flow and transport is of major interest supporting optimal design for several societal relevant technologies, such as waste disposals, geothermal or groundwater production facilities. To advance measurement and modeling techniques and refine them for practical applications, we further developed the fractured aquifer test site Rock Garden at the Martin Luther University Halle. The Rock Garden test site is situated beneath the courtyard of the Faculty of Natural Sciences III and is 60 m x 60 m in size. Fractured Rotliegend series of conglomerates, sand- and siltstones are investigated at the site by 6 drillings. A central borehole (B3) is 40 m in depth and developed as an open borehole between 15 m - 40 m below surface. Five boreholes are developed as groundwater observation wells of about 20 m depth and are equipped with filter screens between 10 m - 20 m below surface. Natural groundwater levels are on average about 3 m below surface and vary about 0.5 m around this value. The average gradient varies as a function of time between 0.3 % and 0.5 %, direction east northeast. A first pumping test in B3 unraveled hydraulic connection to all of the five surrounding boreholes. The effective transmissivities are of the order of 10^{-5} m²/s and storativities are of the order of 10^{-4} . To understand hydraulically active fractures or fracture zones and their connection to the rock matrix at the Rock Garden site, a first flowmeter experiment was performed in well B3. Under natural conditions no flowmeter signals have been detected suggesting vertical ambient flow to be smaller than 7 cm/min. Under pumping conditions, the flowmeter signals suggest diffuse horizontal inflow from conglomerate lenses (about 80 % of the total inflow) and discrete horizontal inflow from fractures in clay and siltstones (about 20 % of the total inflow). To characterize these fractured and porous zones in detail, we plan performing hydraulic and tracer tomography at the Rock Garden test site in the near future.