RUHR-UNIVERSITÄT BOCHUM

RUB

INVITATION TO THE PHD-COLLOQUIUM OF THE FACULTY OF GEOSCIENCE

Date: 16th January 2024 at **15:00**
Room: UFO 01/07
Zoom: 613 9100 7070, passcode: 081163
Moderator: Roman Fritz

15:10 to 15:30 Ozioma Uwakwe
– Experimental investigation of scale formation in fractured rocks representative of near deep geothermal reservoirs

15:35 to 15:55 Melanie Vogel
– Raising awareness among consumer groups in Germany for soils and soil protection - results of an empirical study

16:00 to 16:20 Fahim Mumand
– Two-well dipole test for aquifer characterization

All interested parties are kindly invited to attend in the colloquium.

Join on Zoom via the QR-Code:

LIST OF ABSTRACTS

Ozioma Uwakwe

Scaling is a process when minerals dissolved in fluid precipitate from the liquid due to changes in pressure, temperature pH, and ion concentration. Scaling in geothermal wells often leads to reduction in the porosity and permeability of rocks. This study evaluates the possible effects of scale formation in the reservoir through dissolution and precipitation processes in a fractured reservoir rocks exposed to hydrothermal fluids. Evaluation of the scaling effects is carried out by flow-through experiments, physiochemical monitoring, petrographic analysis and geochemical analysis. Four artificially fractured Devonian carbonates rocks were used in the flow-through experiments at near geothermal conditions. During the experiments, diagenetic changes in the rocks and chemical changes in the fluid were monitored. The results show that hydrothermal alteration generates secondary precipitates like calcite and aragonite. This study when compared with other high temperature-pressure experiments suggests that calcium carbonate scaling could lead to clogging problems in geothermal wells.

Melanie Vogel

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Fahim Mumand

Heat and cold storage in the subsurface as well as geothermal energy provision intrinsically involve cyclic pumping operations, often in fields of several boreholes. We investigated the pressure and flow rate fields resulting from the simultaneous periodic operations in two boreholes. The interference in pressure experienced by a third monitoring borehole can be assessed by an analytical solution when assuming radial flow from the pumping wells. The solution is simply gained by superposition relying on the known solution for periodic pumping in a single well. An injectivity analysis, i.e., relating spectral characteristics of flow rate and pressure in a pumping well requires numerical solution even for simplifying assumptions. We compare our analytical and numerical results to observations from field tests conducted in four boreholes located close to the northwestern banks of an artificial freshwater reservoir, called the Kemnader See, at the southern city-limits of Bochum, Germany. The derived solutions allow us to assess, for example, how pumping periods and phase shifts affect hydraulic penetration of the exerted perturbations and whether simultaneous pumping operations can improve the yield of a producing well. Solving and investigating the hydraulic problem constitute the necessary first step towards a thermal performance analysis.