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Petrophysical core characterization at supercritical geothermal conditions

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There is a growing scientific interest in the exploitation of supercritical geothermal reservoirs to increase the efficiency of geothermal power plants. The utilisation of geothermal energy requires in any case the detailed knowledge of the reservoir. In reservoir engineering, the characterisation of the geothermal system by electrical resistivity tomography (ERT) is a common geophysical exploration and monitoring strategy. For a realistic interpretation of the field measurements it is necessary to know both, the physical properties of the rock and those of the interacting fluid at defined temperature and pressure conditions.

While there have been made great effort in determine the physical and chemical properties of water above its critical point ($T_{critical}$ = 374.21˚C and $p_{critical}$ = 221.2 bar), the influence of fluid-rock interactions on petrophysical properties in supercritical aqueous systems is nearly unknown. At supercritical conditions the viscosity of the fluid is low, which enhances the mass transfer and diffusion-controlled chemical reactions. This may have considerable effects on the porosity and hydraulic properties of a rock.

To investigate high-enthalpy fluid-rock systems, in the framework of the EU-funded project IMAGE we have built a new percolation set-up, which allows for the measurement of electrical resistivity and permeability of rock samples at controlled supercritical conditions of aqueous fluids (pore pressure = 400 bar and a temperature = 400˚C). First results will be presented.