



Experimental Study of Thermal Effects on Hydro-Mechanical Properties of a Saturated Sandstone

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During water injection into a geothermal reservoir, mechanical and transport properties may vary due to changes in pressure and temperature. In order to establish a fundamental microscopic basis of macroscopic mechanical behavior, experimental determination of constitutive laws is of major importance. This paper presents the results of an experimental study of thermal effects on the hydro-mechanical behavior of a saturated sandstone. For this study, cylindrical rock specimens of low porosity (9-11 %) Flechtinger sandstone were used. Samples of water-saturated sandstone were submitted to confining pressure cycles during which pore-fluid volume changes were measured. Confining pressure varied between 2 to 50 MPa at a rate of 0.1 MPa/min. Pore pressure was maintained constant at 1 MPa at drained condition. Parallel to the pressure cycles temperature was increased step-wise from 30 °C to 140 °C. The thermo-mechanical behavior of rock influences both hydraulic and poroelastic properties such as porosity, drained bulk compressibility and Biot coefficient. The results show that Biot coefficient and porosity decrease with increasing temperature. In contrast, drained bulk compressibility is not temperature dependent.