Slip behavior induced by pore pressure of rock crack under subcritical / supercritical geothermal reservoir conditions

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Abstract

This thesis presents an analysis of injection-induced slip characteristics and changes in permeability after the shear slip under the subcritical and / or supercritical condition. In addition, the probability of the use of the geothermal reservoir which is under the high pressure and high temperature, like the supercritical condition, is referred on the end.

In recent years, a new concept of Engineered / Enhanced Geothermal Systems (EGS) where reservoirs are created in ductile basement has been proposed. Whereas the present type of EGS has a number of disadvantages including: low recovery rate of injected water and unclear possibility of induced earthquake, this new geothermal system is presumed that it potentially has an ability to overcome these disadvantages and supply geothermal resources stably due to the condition under the high pressure and high temperature. To assess the potential of the new geothermal system, the Japan Beyond Brittle Project (JBBP) has also been initiated, and fundamental examinations have been conducted on mechanical and hydraulic characteristics of the new type of reservoir. However, characteristics of a rock fracture on the geothermal reservoir under the subcritical / supercritical condition is still incompletely understood. For this reason, the experiment of shear slip has been conducted on this study, and two types of shear slip are confirmed.

In conclusion, this study has demonstrated that the induced earthquake which gives damages to our lives does not occur under subcritical / supercritical conditions, and assumed that the new geothermal system is able to work sufficiently because the decrease in permeability after the shear slip on 500 ℃ is 48 % which is not the significant change.