Geophysical Research Abstracts
Vol. 14, EGU2012-354, 2012
EGU General Assembly 2012

Estimation of the failure probability during EGS stimulation based on borehole data

C. Meller, Th. Kohl, and E. Gaucher
Germany (carola.meller@kit.edu)

In recent times the search for alternative sources of energy has been fostered by the scarcity of fossil fuels. With its ability to permanently provide electricity or heat with little emission of CO_2, geothermal energy will have an important share in the energy mix of the future. Within Europe, scientists identified many locations with conditions suitable for Enhanced Geothermal System (EGS) projects. In order to provide sufficiently high reservoir permeability, EGS require borehole stimulations prior to installation of power plants (Gérard et al, 2006). Induced seismicity during water injection into reservoirs EGS systems is a factor that currently cannot be predicted nor controlled. Often, people living near EGS projects are frightened by smaller earthquakes occurring during stimulation or injection. As this fear can lead to widespread disapproval of geothermal power plants, it is appreciable to find a way to estimate the probability of fractures to shear when injecting water with a distinct pressure into a geothermal reservoir. This provides knowledge, which enables to predict the mechanical behavior of a reservoir in response to a change in pore pressure conditions.

In the present study an approach for estimation of the shearing probability based on statistical analyses of fracture distribution, orientation and clusters, together with their geological properties is proposed. Based on geophysical logs of five wells in Soultz-sous-Forêts, France, and with the help of statistical tools, the Mohr criterion, geological and mineralogical properties of the host rock and the fracture fillings, correlations between the wells are analyzed. This is achieved with the self-written MATLAB-code Fracdens, which enables us to statistically analyze the log files in different ways. With the application of a pore pressure change, the evolution of the critical pressure on the fractures can be determined. A special focus is on the clay fillings of the fractures and how they reduce the frictional strength of the reservoir rock and thus determine or influence its mechanical behavior.