Geophysical Research Abstracts
Vol. 20, EGU2018-8887, 2018
EGU General Assembly 2018

Evaluating the potential of induced seismicity during reservoir operations in EGS

Mauro Cacace (1), Guido Blöcher (2), Antoine Jacquey (2), Arno Zang (2), Oliver Heidbach (2), Hannes Hofmann (2), Christian Kluge (2), Maren Brehme (2), Thomas Reinsch (2), and Günter Zimmermann (2)

(1) GeoForschungsZentrum GFZ Potsdam, Potsdam, Germany (cacace@gfz-potsdam.de), (2) GeoForschungsZentrum GFZ Potsdam, Potsdam, Germany

Stimulation treatments and/or reservoir operations can significantly alter the in-situ stress state and can induce variations in the mechanical state of existing fault zones. Such changes in fault's slip and dilation can ultimately lead to a reactivation of fault zones and the related movements might promote the occurrence of seismic events. In this study, we carry out an evaluation of the potential for induced seismicity arising from hydraulic stimulation of low to middle enthalpy porous reservoirs, by taking the geothermal operational facility of Groß Schönebeck as our natural study case. The stability analysis is based on results from THM coupled simulations obtained under either Terzaghi's effective stress concept or under the more complete Biot's effective stress concept. In particular, in this study we focus in describing and quantifying: (i) the in-situ stress state, (ii) a waterfrac stimulation treatment, and, (iii) a projected 30 years production and injection at the in-situ geothermal test-site Groß Schönebeck. The in-situ stress state indicates no potential for fault reactivation. During the waterfrac stimulation treatment, micro-seismic events were recorded in the field. Our current evaluation shows an increase of slip and dilation tendency during the treatment, though of magnitudes below the failure level as based on Mohr-Coulomb friction concepts. Even during the projected production and injection period, despite increased in thermal stress, the values for slip and dilation tendency are constrained below the threshold for fault reactivation. The above results are then used to inspire a second set of simulations aiming at investigating additional aspects that can be considered responsible for the field observations. These include uncertainties in the in-situ stress state, the role of pre-existing fault zones, the adopted criterion for fault reactivation, and a 3D rock failure criterion based on true triaxial measurements.