EGU21-6601
https://doi.org/10.5194/egusphere-egu21-6601
EGU General Assembly 2021

Numerical investigation of fracture aperture heterogeneity on performance of geothermal reservoir in EGS

Dejian Zhou[1], Alexandru Tatomir[1,2], and Martin Sauter[1]
[1]University of Goettingen, Geoscience Center, Applied Geology, Goettingen, Germany (dejian.zhou@geo.uni-goettingen.de)
[2]Dept. of Earth Sciences, Geocentrum, Uppsala University, Sweden

In the attempt to reduce the CO2 emissions and dependence on fossil fuels geothermal energy started to receive increased scientific interest. With the development of the Enhanced Geothermal System (EGS) technology, extensive geothermal energy applications have become feasible. However, the geothermal reservoirs are usually situated several kilometers below the ground whichmeans the experiments within the geothermal reservoir are difficult to be implemented. Therefore, the models capable of simulating thermohydraulic (TH) effects were the common approaches to analyzing geothermal reservoir efficiency. To simulate fluid migration and heat propagation within the fractured geothermal reservoir in EGS, discrete fracture models (DFMs) of the TH processes were widely used. However, the heterogeneity of the fracture apertures is most of the times ignored in these models. In this work, considering the aperture heterogeneity, a DFM of the TH processes was established. It is assumed the apertures follow a normal distribution. The outlet temperature and energy production rate are employed to evaluate the efficiency of the geothermal reservoir. The results of the simulation show that the heterogeneity of the aperture strongly affects the performance of the geothermal reservoir. At the end of simulation, the variation in outlet temperature decreased by approximately 20% and the average produced energy had a reduction of over 26%. Furthermore, the average produced energy has an inversely proportional relationship with the aperture heterogeneity. Finally, several statistical realizations of the fracture network were generated to test and verify if the influence from aperture heterogeneity are generally valid.