First field application of a cyclic injection protocol and an advanced traffic light system to mitigate the seismic risk from hydraulic stimulation at the Pohang Enhanced Geothermal System project site in Korea

Hannes Hofmann[1] *, Günter Zimmermann[1], Arno Zang[1], Marton Farkas[1], Ernst Huenges[1], Ki-Bok Min[2], Sehyeok Park[2], Kwang-Il Kim[2], Peter Fokker[3], Rob Westaway[4], Falko Bethmann[5], Peter Meier[5], Frédéric Guinot[5], Kern Shin Yoon[6], Jaiwon Choi[6], Uijin Jeong[6], Young Hun Han[6], Tae Jong Lee[7], Yoon Ho Song[7], Myung Sun Kim[7], Byoung Joon Yoon[7], Keun Soo Lee[7], Kwang Yeom Kim[8]

[1]Helmholtz Centre Potsdam GFZ German Research Centre for Geosciences, Potsdam, Germany
[2]Seoul National University, Seoul, Republic of Korea
[3]TNO, Utrecht, The Netherlands
[4]University of Glasgow, Glasgow, United Kingdom
[5]Geo-Energie Suisse, Zürich, Switzerland
[6]Nexgeo, Seoul, Republic of Korea
[7]Korea Institute of Geoscience and Mineral Resources, Daejeon, Republic of Korea
[8]Korea Institute of Civil Engineering and Building Technology, Goyang, Republic of Korea

* Presenting author. [hannes.hofmann@gfz-potsdam.de]

Abstract

At the Pohang Enhanced Geothermal System (EGS) well doublet in Korea three hydraulic stimulations were performed in February and December 2016 and in April 2017. While the target transmissivity was not yet achieved, these injections were accompanied by relatively large-magnitude seismicity. Therefore, further stimulation was needed and this had to be capable of mitigating the occurrence of seismic events above a certain threshold. As a result, in August 2017 a cyclic injection procedure was applied in combination with an advanced traffic light system in an effort to limit moment magnitudes to values below 2.0, to map the stimulated reservoir with the help of the induced seismicity, to test different injection schemes, to monitor the reservoir performance with pulse testing and to improve the reservoir transmissivity. The stimulation concept adopted is based on knowledge from the previous stimulations, small-scale laboratory experiments, meso-scale experiments in an underground research laboratory and numerical simulations. The first results from this fourth hydraulic stimulation treatment at the Pohang EGS site will be presented.