THE SEISMOGENIC POTENTIAL OF WITHDRAWAL-REINJECTION CYCLES: NUMERICAL MODELLING AND IMPLICATION ON INDUCED SEISMICITY.

Renato Somma[1], Claudia Troise [1], Roberto Schiavone[1], Andrea Borgia[1], Roberto Moretti[2] and Giuseppe De Natale[1]
123

[11]Istituto Nazionale di Geofisica e Vulcanologia Sezione di Napoli 80124 Italy

[22]Università degli Studi della Campania "Luigi Vanvitelli" DICDEA 81034 Italy

This paper aims at understanding how to discriminate the seismogenic potential of withdrawal-reinjection with respect to injection only. We analysed the induced pressure changes, the perturbed volumes of rocks and the potential for induced seismicity due to the above activities. A set of simulations of injection/reinjection cycles into the same reservoirs, by using the numerical code TOUGH2®, is applied to simple models of geothermal reservoirs, with varying permeability and lateral confinement. For each permeability model, we then compare the time growth of perturbed volumes obtained with withdrawal-reinjection cycles to those obtained during simple withdrawal or injection, using the same flow rates. Our results clearly show that, for all models, withdrawal-reinjection is by far less critical than simple injection or withdrawal, because the perturbed volumes are remarkably smaller and remain constant over the simulated time, so minimizing the likelihood of interference with seismogenic faults. Our results have significant implications for geothermal projects, and in the assessment of the potential risk related to fluid stimulation and induced seismicity.