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Antonio P. Rinaldi, Massimo Nespoli



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# TOUGH2-SEED: A COUPLED FLUID FLOW AND MECHANICAL-STOCHASTIC APPROACH TO MODEL INJECTION-INDUCED SEISMICITY

Antonio P. Rinaldi<sup>a,\*</sup> & Massimo Nespoli<sup>b,c</sup>

<sup>a</sup> Swiss Seismological Service, Swiss Federal Institute of Technology, ETHZ, Zürich, Switzerland

<sup>b</sup> Istituto Nazionale di Geofisica e Vulcanologia, Sezione di Bologna, Italy

<sup>c</sup> Department of Physics and Astronomy, University of Bologna, Italy

e-mail: antoniopio.rinaldi@sed.ethz.ch

e-mail: massimo.nespoli@ingv.it

\* Corresponding author at: Swiss Seismological Service, ETHZ, Sonneggstrasse 5, Zürich,  
Switzerland

*submitted to Comput. Geosci.*

## ABSTRACT

Understanding the injection-induced triggering mechanism is a fundamental step towards controlling the seismicity generated by deep underground exploitation. Here we propose a modeling approach based on coupling the TOUGH2 simulator with a geomechanical-stochastic model. The hydro-mechanical-stochastic model provides a good representation of different mechanisms influencing each other during and after the injection phase. Each mechanism affects the induced seismicity in a different way and at different times during the reservoir stimulation, confirming that a complex interaction is in place, and that more sophisticated and physics-based approaches coupled with statistical model are required to explain such a complex interaction. In addition to previous statistical and hybrid models, our approach accounts for a full 3D formulation of both stresses and fluid flow, further including all the TOUGH2 capabilities. Furthermore, it includes interactions between triggered seismic events through calculation of static stress transfer. In this work, we present the main capabilities of TOUGH2-SEED and apply the model to the Basel EGS case, successfully reproducing

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