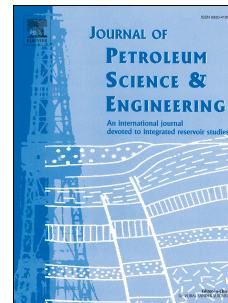


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A study of 3D modeling of hydraulic fracturing and stress perturbations during fluid injection

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# 1 **A study of 3D modeling of hydraulic fracturing and stress perturbations during** 2 **fluid injection**

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15

## 16 **Abstract**

17 This paper investigates a hydraulic fracture development and its potential impact in terms of elastic  
18 stress perturbations and fracture triggering. The hydraulic fracture is simulated during fluid  
19 injection with a fully coupled hydromechanical 3D discrete-element method in a homogeneous  
20 granite without (i.e. intact rock) and with preexisting fractures network. The results of the models  
21 show how preexisting fractures affect the growth rate, the accumulation of the displacement and  
22 interaction between hydraulic and mechanically-induced fractures. In the intact rock model, a  
23 circular hydraulic fracture grows normal to the minimum principal stress due to successive tensile  
24 failures. The measured length of the hydraulic fracture increases as a fractional power of time for a  
25 constant injection rate and the maximum aperture is positively correlated to the length. Stress  
26 perturbations observed in the model promote tensile and shear failure at the hydraulic fracture tips,  
27 but inhibit failure near the fracture walls. We expect microseismicity to be concentrated near the

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