The role of fault offset in induced seismicity potential

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Motivation: faults are commonly present in the subsurface

Geo-energy applications affect fault stability and may cause reactivation, inducing seismicity



<u>Objective:</u> investigate the effect of fault offset on induced seismicity potential

We inject CO_2 in a reservoir within a stratified sedimentary system crossed by a low-permeable fault in a normal faulting stress regime



<u>Material properties:</u> for reservoir, caprock, baserock, fault core, and damage zones are taken from lab. measurements



- Permeability and relative CO₂/brine permeabilities
- Young's modulus and Poisson's ratio
- Gas entry pressure and porosity

Vilarrasa and Makhnenko (2017)

<u>Results:</u> 1 year injecting 0,002 kg/s/m of CO_2 CO_2 plume



The additional pressurization caused by the low-permeable fault displaces the CO₂ plume away from it

<u>Results:</u> Liquid pressure at the center of the fault core

Liquid pressure distribution

Caprock	Reservoir	
	The high-permeabilit of the reservoir	У
	The low-permeability of	Liquid_Pressure 22.628 21.798 20.967 20.136 19.305
Reservoir Baserock	the baserock maintains pressurization of the fault Baserock	18.475 17.644 16.813 15.983 15.152 14.321 13.491 12.66

Fault offset controls fluid pressure at the fault

Pressure change at the fault



The larger the offset, the larger the pressurization of the fault

Fault stability

Ratio of shear stress to effective normal stress along the fault core



As the offset increases, the destabilized fault patch becomes larger and so does the magnitude of induced seismic events

Questions?



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