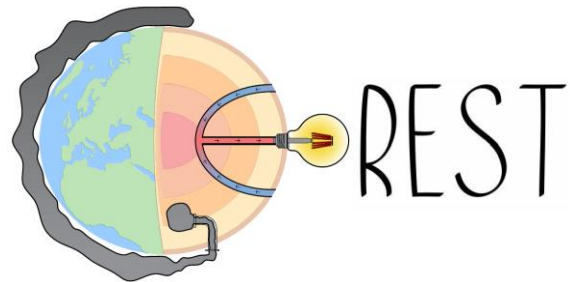# The role of fault offset in induced seismicity potential
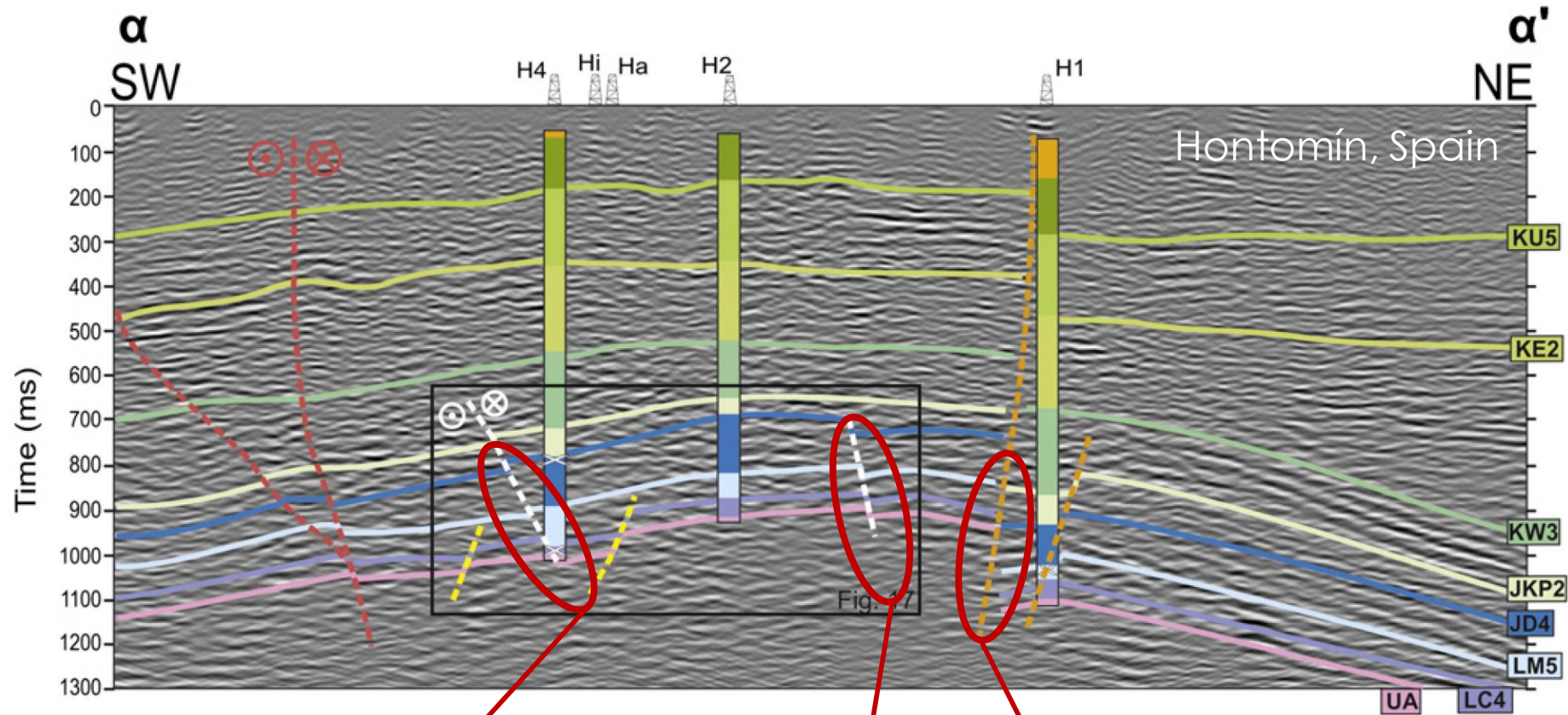
Víctor Vilarrasa, Francesco Parisio, Roman Makhnenko, Haiqing Wu and Iman Rahimzadeh Kivi

EGU2020, Sharing Geoscience online

Motivation: faults are commonly present in the subsurface

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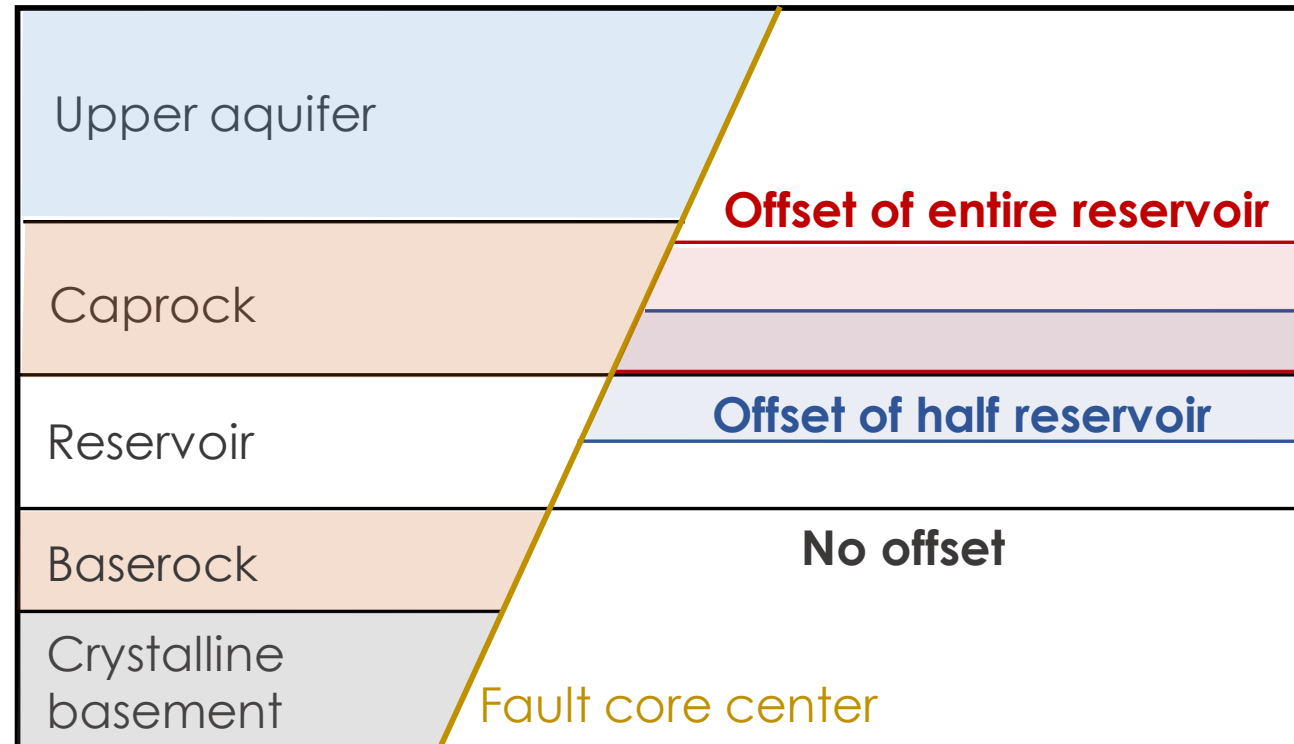

No offset

Offset ≤ reservoir thickness

Offset ≥ reservoir thickness

Alcalde et al. (2014)

Objective: 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
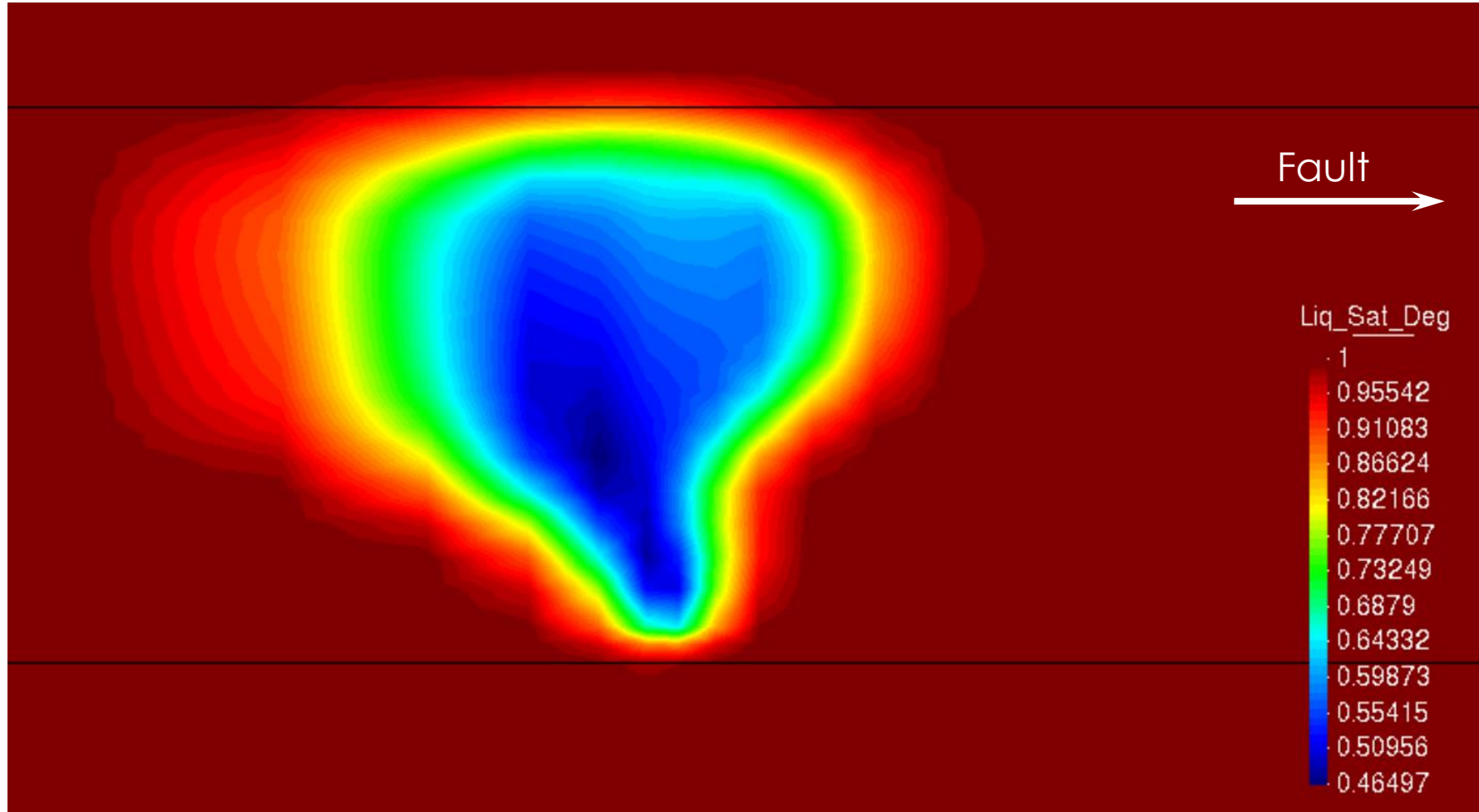
Material properties: for reservoir, caprock, baserock, fault core, and damage zones are taken from lab. measurements
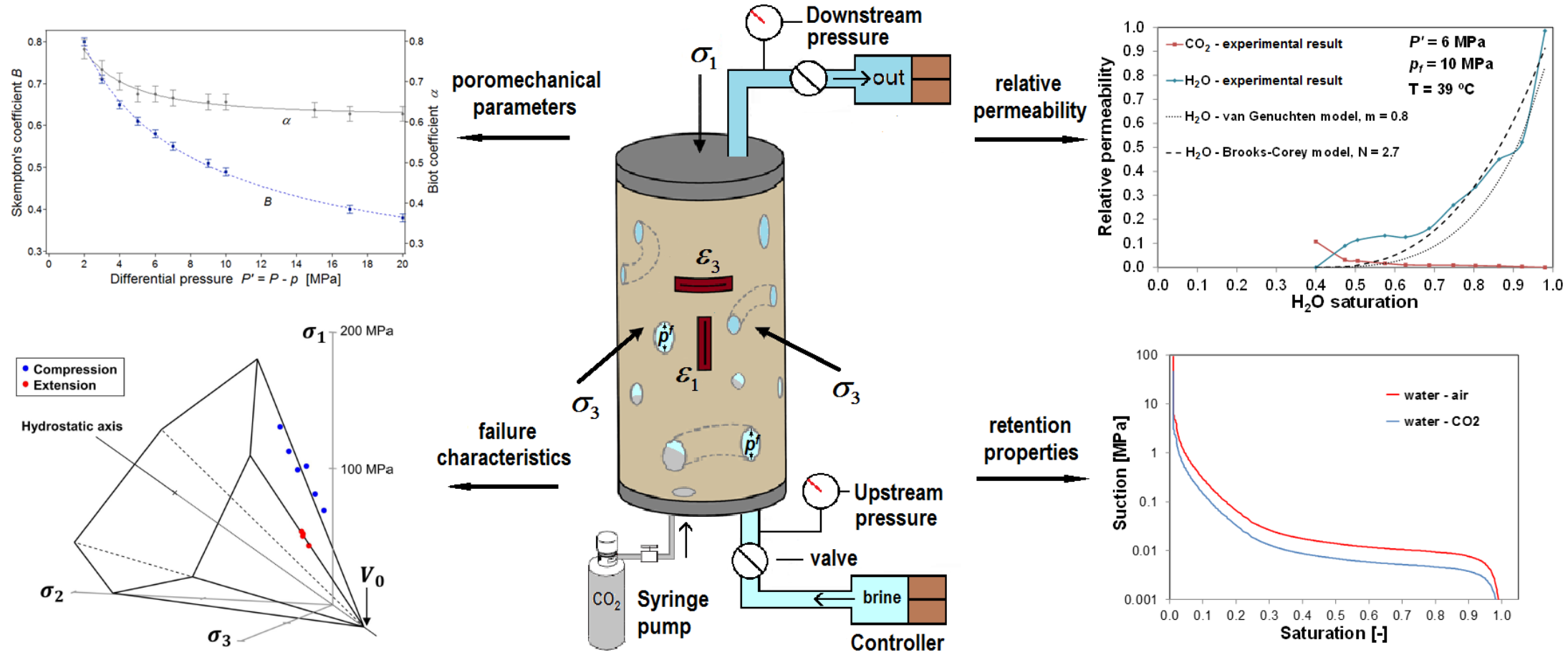
- Permeability and relative CO_2/brine permeabilities
- Young's modulus and Poisson's ratio
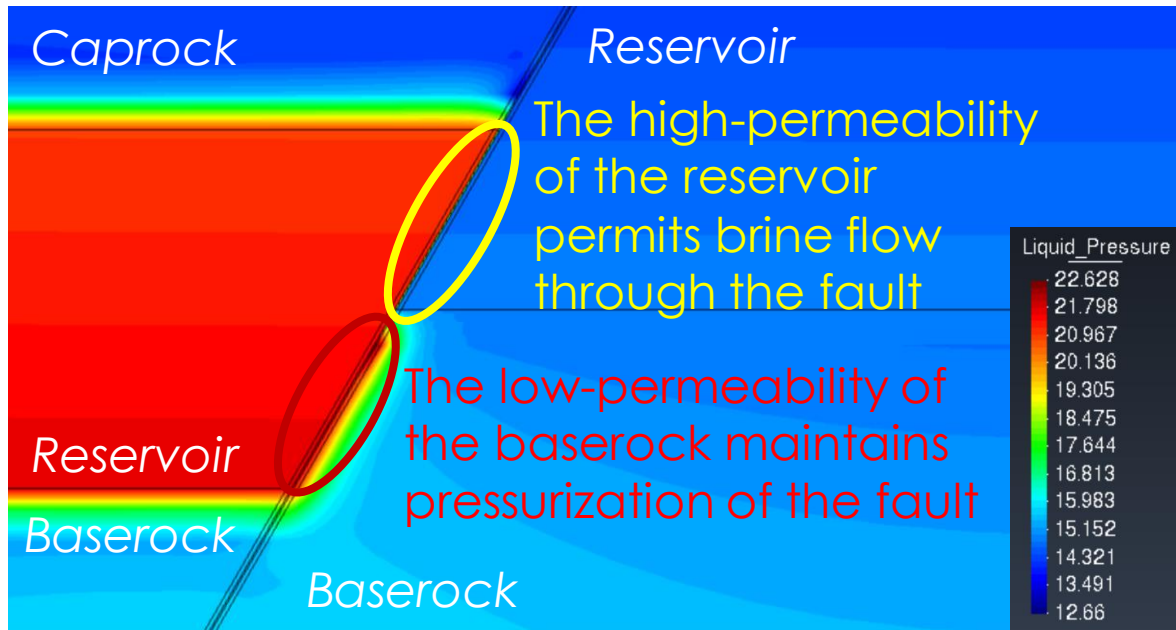- Gas entry pressure and porosity

Vilarrasa and Makhnenko (2017)

Results: 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 CO_2 plume away from it
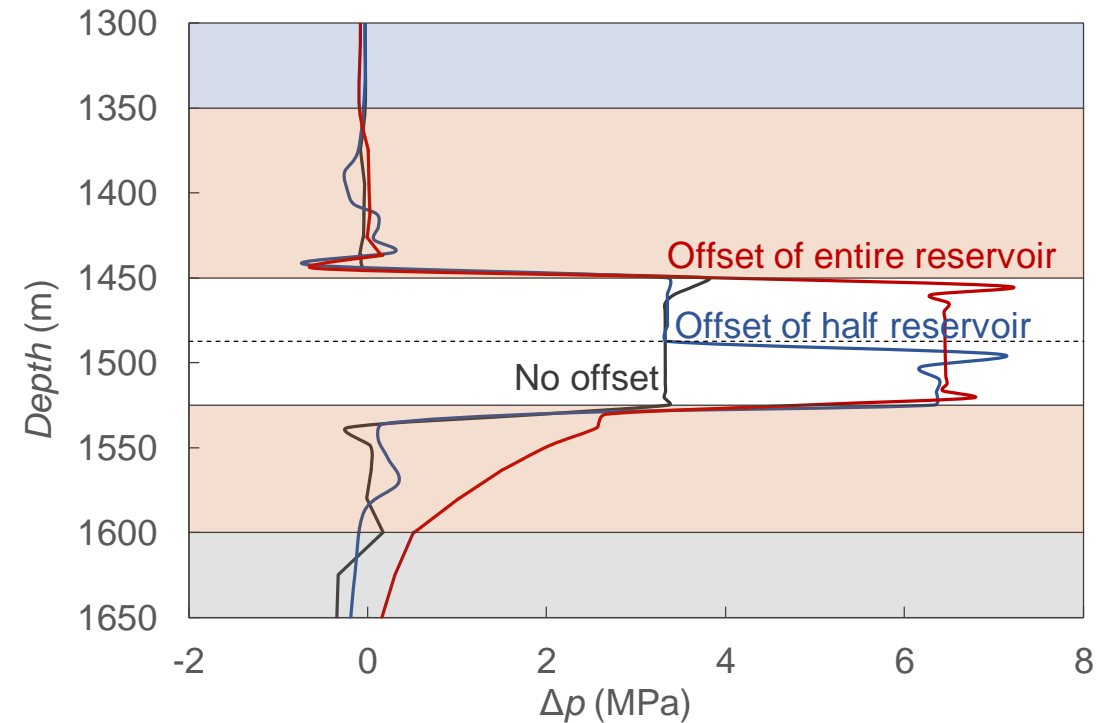
Results: Liquid pressure at the center of the fault core

Liquid pressure distribution

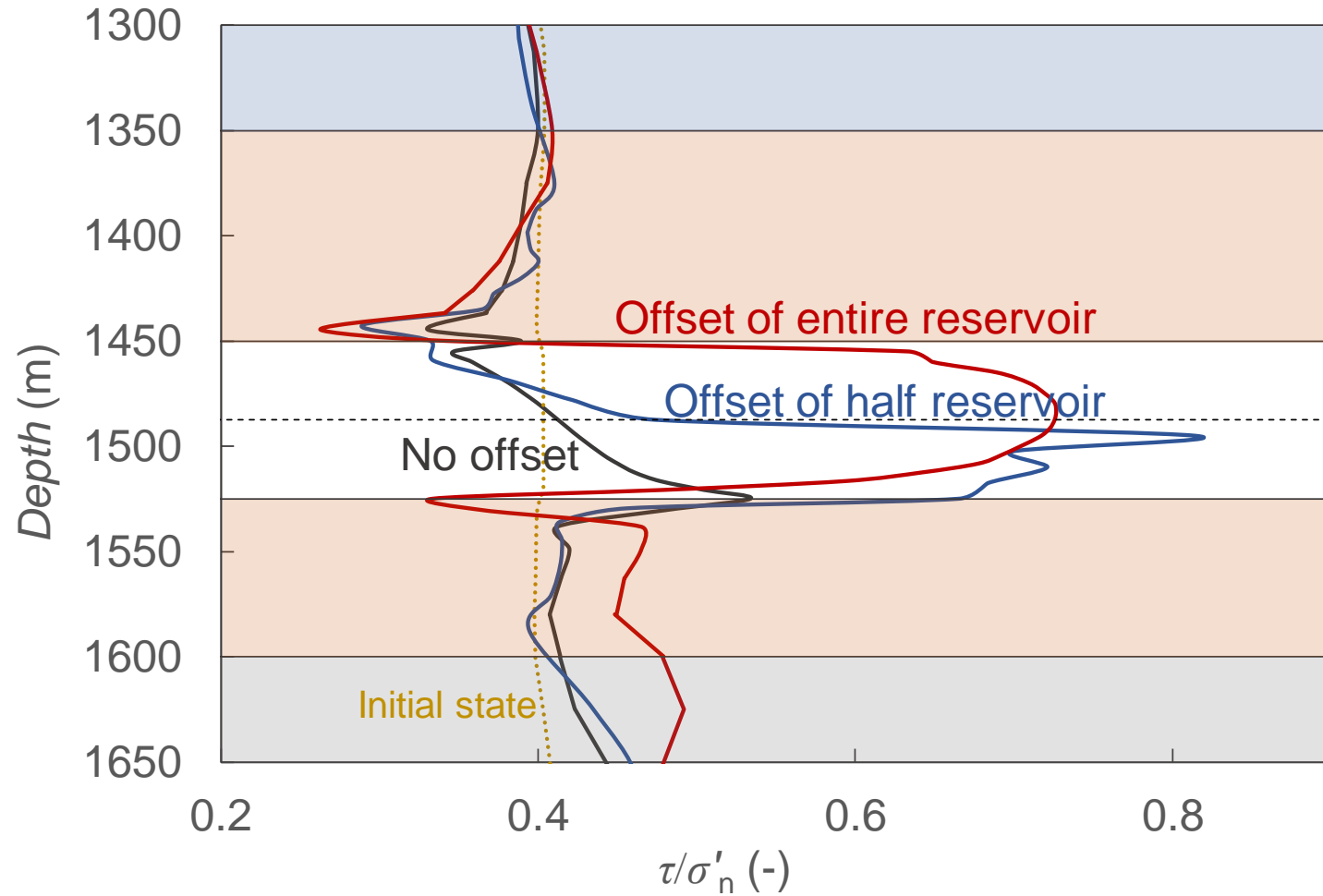Fault offset controls fluid pressure at the fault

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?