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CAPROCK HYDROMECHANICAL CHANGES DURING CO_2 SEQUESTRATION IN DEEP SALINE AQUIFERS

Víctor Vilarrasa[*†], Sebastià Olivella[†] and Jesús Carrera[*]

[*] Institute of Environmental Assessment & Water Studies (IDAEA), GHS, CSIC,
C/Jordi Girona 18-26, 08034 Barcelona, Spain.

[†]Universitat Politècnica de Catalunya (UPC)
C/Jordi Girona 1-3, 08034 Barcelona, Spain

e-mail: victor.vilarrasa@upc.edu

Summary. Large amounts of CO_2 will be injected in deep saline aquifers as a supercritical fluid. Injection can dramatically increase pressures around the injection zone. The resulting overpressure may promote the opening of fractures due to dilatancy in the caprock. This might serve as an escape route for CO_2. To analyze the likelihood of such event, we model an axysimetric horizontal caprock-aquifer system, including fully hydromechanical coupling. Permeability depends on the matrix porosity and the fractures aperture, which vary during the injection. We study failure mechanisms and the conditions for these to occur. Fluid pressure evolution is controlled by the capillary fringe that defines the interface between CO_2 and brine. Fluid pressure presents a peak when this capillary fringe fully develops around the injection well. This is because the reduction in permeability due to desaturation. Once the less viscous CO_2 displaces the capillary fringe away from the injection well, fluid pressure begins to drop. Measuring this pressure evolution in field tests can give valuable information of the capillary properties of the aquifer. The least favorable moment, from a mechanical point of view, coincides with the peak in fluid pressure at the beginning of injection.