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Impact of CO_2 saturated water solution on Grevena sandstone, a potential deep aquifer for carbon dioxide sequestration

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Global warmth might be the most difficult challenge humanity ever faced; emitting less greenhouse gases seems to be the only solution to the problem. The major greenhouse gas, CO_2, is closely related to economic and social growth. Keeping both, growth and low CO_2 emission is a challenge. Green energy sources (wind, solar energy) can contribute in greenhouse gas emission control but not on time. The most promising technology for immediate results is CO_2 capture and underground storage.

Even though Greece has reduced CO_2 emissions per capita during the last decade (mainly due to austerity) has still to find solutions for long time sustainability. Potential CO_2 storage sites have to be selected and tested. By injecting CO_2 underground, acidification of deep saline reservoir water occurs, due to formation of carbonic acid. In long term porous rock mass and its discontinuities might be susceptible to corrosion, especially if their calcite percentage is high. Potential rock mass mechanical losses might impact reservoir's sealing integrity, and lead at CO_2 leakage.

In this study sandstone from a potential storage formation in Greece, is tested in situ with CO_2-water exposure. We measured losses in shear strength. In particular peak shear strength was almost eliminated due to corrosion of fracture's surface at samples exposed in our solution. Even though still rough, the exposed fracture behave identical to plane fractures, reaching only the residual shear stress due to lose attachment of asperities on the fracture's surface which is the result of calcite corrosion (calcite is the sandstone cement).

Initial extracted conclusions were introduced in computer simulation to estimate long term reservoir behavior (considering for simplification only the displacements) and potential nearby fault activation.

Biography

Georgios Dimadis currently is a PhD Student in Laboratory of Technical Geology, Department of Civil Engineering at Aristotle University of Thessaloniki. He Graduated from Civil Engineering School at AUTH and holds two Master degrees in Underground constructions (N.T.U.A.) and Environmental Protection (A.U.Th.).

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