Impact of Fractures and Salt on Stress-Dependent Permeability in the Cane Creek Interval of the Paradox Formation

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Abstract

The Cane Creek interval of the Pennsylvanian Paradox Formation in Southern Utah, estimated to hold 215 million barrels of oil, presents a unique challenge in fluid flow management due to its complex geology comprising interbedded salt layers, clastic rock, and mudstone. This study investigates the effects of stress on permeability within the siltstone and mudstone facies of the Cane Creek, with a focus on the roles of fractures, salt migration, and pore fluid types. Permeability measurements under varying stress conditions were performed using nitrogen, brine, and oil. Results indicate that stress-induced fracture closure in mudstone significantly reduces permeability, with brine exposure causing pore network closure likely due to mica swelling. Conversely, the siltstone facies showed stable nitrogen permeability but exhibited a substantial permeability increase upon brine injection, attributed to halite mobilization. These findings underscore the necessity of understanding and addressing the interactions between fractures, clays, and salts to optimize fluid flow within the Cane Creek formation.