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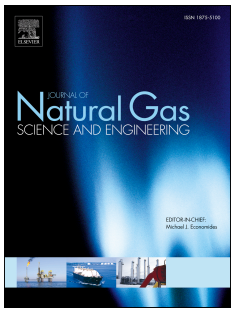

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Numerical investigation of effect of natural fractures on hydraulic-fracture propagation in unconventional reservoirs

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Keywords: hydraulic fracturing, natural fractures, unconventional reservoirs, fracture propagation

Abstract

Field observations show that natural fractures are commonly presented in unconventional reservoirs, acting as planes of weakness that divert hydraulic fracture propagation and generate complex fracture geometry. We systematically investigated the impacts of natural fractures on net injection pressure, fracture geometry, fluid volume distribution, and induced stresses using a complex fracture propagation model. The model fully couples rock deformation and fluid flow in the fractures, perforations, and the wellbore. A simplified three-dimensional displacement discontinuity method is used to calculate multiple fracture interaction within stages as well as between stages and wells. Fluid volume distribution between each fracture is automatically calculated during pumping based on fluid resistance. The simulation results show that when a hydraulic fracture diverts into a natural fracture, the net injection pressure is elevated, resulting in width enlargement of the fracture segment before the natural fracture and reduction of total fracture length. Much less fluid flows into the fracture wing that diverts into the natural fracture.