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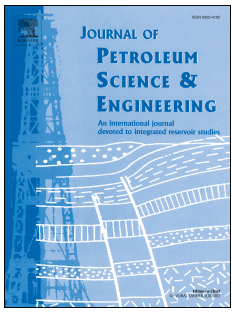

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Numerical Investigation of Fracture-Rock Matrix Ensemble Saturation Functions and their Dependence on Wettability

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Abstract

Quantification of multiphase flow in fractured permeable rocks is vital for hydrocarbon recovery, gas storage, and water resource management. Where fractures provide the permeability and the rock matrix provides the storage for oil and gas, fracture-matrix transfer has a decisive impact on recovery and capillary-driven transfer. However, while most modeling efforts assume a constant fracture aperture and fracture capillary pressure, in reality, fracture aperture and capillary pressure, p_{cf} vary among fractures. Here we contrast and compare relative permeability curves obtained from constant aperture or constant capillary pressure, discrete fracture and matrix (DFM) models with more realistic ones taking variations into account. These models are constructed from line drawings of pervasively fractured layered rock mapped in meter- to kilometer-scale outcrops. Fracture aperture is obtained by mechanical modeling. Capillary pressure is computed from fracture aperture taking into account the wettability of the rock matrix.