

Study of uncertainty quantification and sensitivity analysis of a family of fractional flow expressions used in the Buckley-Leverett equation

Andres R. Valdez*, Bernardo M. Rocha and Rodrigo Weber dos Santos

Computational Modeling Graduate Program. Federal University of Juiz de Fora, Juiz de Fora, Minas Gerais, Brazil
e-mail: arvaldez@ice.ufjf.br

ABSTRACT

Among the family of first order conservation laws it is common to employ the Buckley-Leverett equation to model the multiphase oil-physics (water and oil) in an oil reservoir. After given a closed expression for the fractional flow, analytical solutions can be found for the Buckley-Leverett model characterizing the water/oil flow in two main regimes: (i) shock and (ii) rarefaction. Different fractional flows expressions will retrieve different flowing regimes in the Buckley-Leverett equation. In this work, we study a group of closed expressions for the fractional flow with the addition of stochasticity in every model. Therein we show the discrepancies between each fractional flow expression and we perform uncertainty quantification (UQ) analyzing the spectrum of all possible solutions. For the fractional flow models with more than one stochastic parameter we determine the priority and relevance between the finite set of stochastic parameters and the Buckley-Leverett solution.