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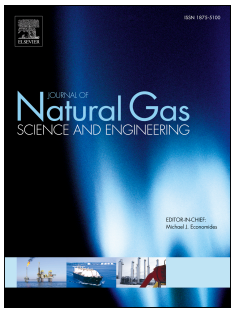

Characterization of tight-gas sand reservoirs from horizontal-well performance data using an inverse neural network

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Characterization of tight-gas sand reservoirs from horizontal-well performance data using an inverse neural network

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Abstract

Characterization of a tight-gas sand formation using data from horizontal wells at isolated locations is challenging due to the inherent heterogeneity and very low permeability characteristics of this class of resources. Furthermore, characterizing the uncontrollable hydraulic-fracture properties along the horizontal wellbore requires financially demanding and time consuming operations. In this study, a reservoir characterization model for tight-gas sand reservoirs is developed and tested. The model described is based on artificial neural networks trained with a large number of numerical-simulation scenarios of tight-gas sand reservoirs. The model is designed in an inverse-looking fashion to estimate the reservoir and hydraulic-fracture characteristics, once known initial conditions, controllable operational parameters, and observed horizontal-well performance are input. Validation with blind cases by estimating reservoir and hydraulic-fracture characteristics resulted in an average absolute error of 20%. The model was also tested successfully with published data of an average-performing well in the Granite Wash Reservoir. A graphical-user-interface application that enables using the model in a practical and efficient manner is developed. Practicality of the model is also demonstrated with a case study for the Williams Fork Formation by obtaining probabilistic estimates of reservoir/hydraulic-fracture characteristics through Monte Carlo simulation that incorporates the ranges of observed

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