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Title **History Matching of Stochastic Models of Field-Scale Fractures: Methodology and Case Study**
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Abstract

This paper focuses on the history matching of stochastic models of large-scale (field-scale) fractures, namely (sub-) seismic faults and fracture swarms. First, we propose an object-based stochastic model for describing geological features of large-scale fractures. This model accounts for static constraints derived from seismic attributes, fault-related-strain-field, structural information (curvature) etc. Second, we review an upscaling procedure for performing fluid flow simulation in the presence of networks of large-scale fractures. Third, we present an algorithm for gradually moving and deforming stochastic fractures in the reservoir field while preserving their consistency with static constraints (location of seismic fractures, fracture density and orientation maps), whereby different realizations of the stochastic fracture network can be obtained. All these elements are integrated in an inverse procedure for calibrating stochastic models of large-scale fracture networks to hydrodynamic two-phase flow data.

The above methodology is applied to an actual fractured reservoir. We build a field-scale fracture network constrained to the fracture density map and the orientations of fracture sets. Then we perform history matching to water-cut data from four different zones of the field. Different calibration procedures are tested: global optimization that allows a general improvement of the model calibration to production data, and local calibration that further improves the match of each well. The results show the validity of the proposed methodology.