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A Methodology for Pseudo-Genetic Stochastic Modeling of Discrete Fracture Networks

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Abstract

Stochastic simulation of fracture systems is an interesting approach to build a set of dense and complex networks. However, discrete fracture models made of planar fractures generally fail to reproduce the complexity of natural networks, both in terms of geometry and connectivity. In this study a *pseudo-genetic* method is developed to generate stochastic fracture models that are consistent with patterns observed on outcrops and fracture growth principles. The main idea is to simulate evolving fracture networks through geometric proxies by iteratively growing 3D fractures. The algorithm defines heuristic rules in order to mimic the mechanics of fracture initiation, propagation, interaction and termination. The growth process enhances the production of linking structure and impacts the connectivity of fracture networks. A sensitivity study is performed on synthetic examples. The method produces unbiased fracture dip and strike statistics and qualitatively reproduces the fracture density map. The fracture length distribution law is underestimated because of the early stop in fracture growth after intersection.

Keywords:
Fracture, Growth, Connectivity, Stochastic Simulation, Genetic Approach, Pseudo-Genetic

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