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On modeling scale-invariant dual-porosity media based on general fractal topography

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Dual-porosity media widely exist in natural reservoirs and have been received much attention in heat and mass transfer. Due to multiplicative cascade effects, the microstructure might be disordered and complicated, with fractures/pores scale-invariantly distributed. In this study, we briefly introduce the concept of General Fractal Topography proposed recently which not only reduces modeling complexity significantly but also admits scaling objects and fractal behaviors as complex as possible. And then, we developed an algorithm to model fractal fracture-pore porous media according to the scaling-invariant topography based on Voronoi tessellations. The original complexity of the fractures and pores distribution is wrapped in the determined phase of scaling object, while the behavior complexity is defined by the fractal topography. Our investigation provides an open framework to unify the definition and modeling of pore, fracture network, and dual-porosity media.

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