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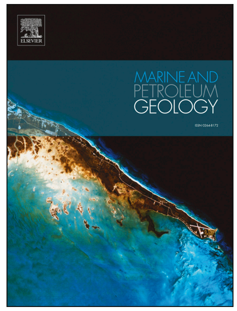

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Shale gas transport model in 3D fractal porous media with variable pore sizes

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Abstract A model for gas transport in shale is proposed by accounting for three major fluid flow mechanisms in shale stratum, which is modeled as a 3D fractal media. The proposed apparent permeability of shale is an analytical expression that also accounts for heterogeneous pore sizes in shale stratum, and is verified using experimental datasets for methane and helium flow in shale. Results of sensitivity analysis indicate that surface diffusion of adsorbed gas plays an important role, specifically in smaller pores, while surface diffusion would be negligible in larger pores. Further, the proposed model shows that flow due to surface diffusion decreases moderately with the increase of isosteric adsorption heat, while it increases significantly with the increase of the maximum adsorption capacity. One of the key novelties of the proposed permeability model is that it accounts for pore size distribution to reveal novel insights on gas transport in shale that can be used to optimize gas