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Renormalized Numerical Simulation of Flow in Fractal Porous Media[1] SAIKIRAN RAPAKA, CHARLES MENEVEAU, SHIYI CHEN, Johns Hopkins University — We present a new technique for modeling flow in fractal porous media using the idea of downscaling, as opposed to traditional upscaling. Only the large scale features of the domain are resolved and the information from the simulation of large scales is used to compute contributions from the smaller scales. The procedure is carried out iteratively, adding finer scales at every iteration. The permeability field is updated at every iteration based on information about the geometry of the finer scales. This method allows us to compute effective permeabilities for complex geometries without the need to resolve numerically the fine scales. The results of this approach are compared to full simulations for a set of simple fractal structures with different porosities. It is shown this method gives a high accuracy for these systems. We also compare the final permeability fields to those obtained from traditional upscaling methods.

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