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On the validity of models of density-driven flows in porous media with low-dimensional fractures

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ABSTRACT

Fractures are usual components of hydrogeological media. They introduce strong heterogeneities, and their influence on the flow of the liquid phase is essential. However, due to their relatively small thickness, considerations of the fractures as full-dimensional subdomains lead typically to difficulties in the numerical methods and make computations on domains with complicated fracture networks impossible. For this, models that consider fractures as low-dimensional manifolds became popular and technically important [1, 2, 3, 4]. We consider such a model for the density-driven flow in fractured porous media where not only the fractures but also the matrix is permeable. Certainly, models of this type have restrictions on their validity depending on the thickness of the considered fractures. We consider this validity numerically and propose a criterion for it. Furthermore, we construct and test a dimensionality-adaptive technique for simulations of the flow in the fractured porous media.

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