Christine Bernardi

Mortar finite element discretization of underground flows in nonhomogeneous media

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Darcy's equations model the flow of a viscous incompressible fluid in a rigid porous medium. One of the parameters of the system depends on the permeability of the medium and, when this one is not homogeneous, the variations of the parameter could be very high. To handle this phenomenon, we propose a discretization of the model that relies on the mortar finite element method. Indeed, the idea is to construct a decomposition of the domain such that the permeability is constant on each element of the partition and to use independent meshes on the different subdomains. We perform the a priori and a posteriori analysis of this discretization and present some numerical experiments which are in good coherency with the results of the analysis.