Reduced models for intersecting fractures in porous media with non-matching grids

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Subsurface flows are influenced by the heterogeneity of the porous medium and, in particular, by the presence of several faults and large fractures which act as preferential paths or barriers for the flow.

In [DS11] the authors extended the reduced model presented in [MJR05] to handle a fracture as an object of dimension $n-1$ in a porous medium of dimension n, to the case of non-matching grids between the fracture and the medium. The numerical scheme is based on the XFEM method, see [HH02], to treat the non-conformity between the meshes.

The aim of the present work is to extend both the reduced model and the XFEM method to the case of intersecting fractures, where the intersection occurs inside a geometrical element of the mesh of the porous medium. Moreover the grids of the two intersecting fractures can be independent of each other, increasing the applicability of the proposed scheme to the simulation of realistic problems with complex geometries such as oil migration in fractured basins, CO_2 storage or pollutant dispersion in groundwater flows.

References

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