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Reduced-dimensional models for flow in fractured porous media

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In a fractured porous medium, the fractures are often characterised by their anisotropic shape. For example, in a two-dimensional situation, the fractures are long and thin formations, in which the medium properties may differ considerably when compared to the corresponding ones in the adjacent blocks. For the numerical simulation of flow in porous media, a commonly adopted strategy is to consider the fractures as reduced-dimensional objects, in this specific case as one-dimensional manifolds. In doing so, two aspects need to be clarified: which mathematical model should be considered inside the reduced-dimensional fracture, and how is this coupled to the mathematical model adopted in the blocks.

In this talk, we discuss these aspects, based on the properties of the porous medium and on the underlying flow models. More precisely, we use the aspect ratio of the fracture as an anisotropic, two-dimensional object, identified below as ε (a small, positive parameter). Depending on how the ratio of the porosities in the fracture and in the blocks, respectively of the permeabilities in the two media, scale with ε , we identify various situations leading to different reduced-dimensional models in the fracture. We conclude by discussing numerical aspects related to this procedure.

Time Block Preference

Time Block B (14:00-17:00 CET)

References

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