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Multiscale model reduction for coupled problems in fractured porous media

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In this work, we consider multi-physics problems (flow, transport, and mechanics) in fractured porous media and present upscaling and multiscale methods for construction of a coarse-grid model. We propose a rigorous and accurate multiscale solver and upscaling framework based on some recently developed multiscale methods. Our proposed method consists of identifying multicontinua parameters via appropriate local solutions in oversampled regions. The method involves two basic steps: (1) the construction of multiscale basic functions that take into account small scale heterogeneities in the local domains and (2) the macroscopic equations for the coarse-scale model. In contrast to the available techniques, this method can give rigorous upper bounds for the erros. This method also more general technology that takes into account the different scale processes. We present numerical results for a transport and flow problems, poroelasticity problems and problems with dual-continuum background models. Our numerical results show that the proposed approach can provide good accuracy for problems in fractured porous media.

References

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