MULTISCALE MODEL REDUCTION OF THE POROELASTICITY PROBLEMS IN HETEROGENEOUS POROUS MEDIA

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In this work, we consider the poroelasticity problems in heterogeneous porous media. Mathematical model contains coupled system of the equations for pressure and displacements. For the numerical solution, we present a Generalized Multiscale Finite Element Method (GMsFEM). This method solves a problem on a coarse grid by construction of the local multiscale basic functions. The procedure begins with construction of multiscale bases for both displacement and pressure in each coarse block. Using a snapshot space and local spectral problems, we construct a basis of reduced dimension. Finally, after multiplying by a multiscale partitions of unity, the multiscale basis is constructed in the online phase and the coarse grid problem then can be solved for arbitrary forcing and boundary conditions. We compare the solutions by choosing different numbers of multiscale basis functions. Next we present results for the Two-stage MCMC method that use coarse-scale system based on the GMsFEM. In presented MCMC simulations we use inexpensive coarse-scale computations using a few number of the multiscale basis functions. The results show that GMsFEM can provide good accuracy for two and three dimentional problems in heterogeneous domains.