A BDDC ALGORITHM FOR A MIXED FORMULATION
OF FLOW IN POROUS MEDIA[*]

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Abstract. The BDDC (balancing domain decomposition by constraints) algorithms are similar to the balancing Neumann-Neumann methods, with a small number of continuity constraints enforced across the interface throughout the iterations. These constraints form a coarse, global component of the preconditioner. The BDDC methods are powerful for solving large sparse linear algebraic systems arising from discretizations of elliptic boundary value problems. In this paper, the BDDC algorithm is extended to saddle point problems generated from the mixed finite element methods used to approximate the scalar elliptic problems for flow in porous media. Edge/face average constraints are enforced and the same rate of convergence is obtained as for simple elliptic cases. The condition number bound is estimated and numerical experiments are discussed. In addition, a comparison of the BDDC method with an edge/face-based iterative substructuring method is provided.

Key words. BDDC, domain decomposition, saddle point problem, condition number, benign space, edge/face-based iterative substructuring method

AMS subject classifications. 65N30, 65N55, 65F10