

TEMPLE UNIVERSITY

Department of Mathematics

Applied Mathematics and Scientific Computing Seminar

Room 617 Wachman Hall

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On Convergence Bounds of Additive Schwarz Preconditioned GMRES

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Additive Schwarz preconditioners, when including a coarse grid correction, are said to be optimal for certain discretized partial differential equations, if the bounds on the convergence of iterative methods are independent of the mesh size h . Cai and Zou [*Numer. Linear Algebra Appl.*, 9:379–397, 2002] showed with a one-dimensional example that in the absence of a coarse grid correction the usual GMRES bound has a factor of the order of $1/\sqrt{h}$. We consider the same example and show that the behavior of the method is not well represented by the above mentioned bound. We use an *a posteriori* bound for GMRES from [Simoncini and Szyld, *SIAM Rev.*, 47:247–272, 2005] and show that for the Cai and Zou example the relevant factor is bounded by a constant. Furthermore, for a sequence of meshes, the convergence curves for that one-dimensional example and for several two-dimensional model problems are very close to each other, and thus the number of preconditioned GMRES iterations needed for convergence with a prescribed tolerance remains almost constant.