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February 2, 2004

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Abstract

Optimized Schwarz preconditioning is applied to a spectral element method for the modified Helmholtz equation and pseudo-Laplacian arising in incompressible flow solvers. The preconditioning is performed on an element-by-element basis. The method enables one to use non-overlapping elements, yielding an effective algorithm in terms of communication between elements and implementation. Two approaches are tested. The first consists of constructing a P_1 finite element problem on each overlapping element. In the second, the preconditioner is applied directly on a non-overlapping spectral element. Numerical results demonstrate an improvement in the iteration count over the classical Schwarz algorithm.