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A two-level non-overlapping optimized Schwarz for spectral elements

Abstract: Semi-implicit time-stepping yields a positive definite Helmholtz problem that needs to be inverted at each time-step. When combined with a semi-Lagrangian approach, the resulting Helmholtz problem can potentially become stiff and the number of iterations required to invert the problem grows without bounds. When discretized in space using spectral elements, it is possible to devise a non-overlapping Schwarz algorithm that uses optimized transmission operators between sub-domains. However, to take care of the stiffness, a coarse solver is required. We report recent results for the Poisson and positive definite Helmholtz operators discretized using 1D and 2D spectral elements.