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Matrix-Free Preconditioner for the steady advection-diffusion equation with spectral element discretization.

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We introduce a preconditioning technique based on Domain Decomposition and the Fast Diagonalization Method which can be applied to tensor product based discretizations of the steady advection-diffusion equation. The method is based on iterative substructuring with fast diagonalization to eliminate the interior degrees of freedom. We demonstrate the effectiveness of this preconditioner in numerical simulations using a spectral element discretization.