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A spectral multidomain penalty method model for high Reynolds number incompressible flows JORGE ESCOBAR-VARGAS, PETER DIAMESSIS, Cornell University — We present the latest results of a spectral multidomain penalty method-based incompressible Navier Stokes solver for high Reynolds number stratified turbulent flows in doubly non-periodic domains that is currently under development. Time is discretized with a high-order stiffly stable scheme, whereas space is discretized with a Gauss-Lobatto-Legendre collocation approach in discontinuous quadrilateral subdomains. Numerical stability is guaranteed through a penalty scheme, spectral filtering and dealiasing techniques. The Poisson system of equations that arises from the temporal discretization is analyzed in detail as well as different preconditioning strategies to solve it efficiently, such as Kronecker product, deflation, multigrid, Jacobi, and finite difference based techniques. The efficiency and accuracy of the Navier Stokes solver are assessed through the solution of the driven cavity flow, Taylor vortex, and Couette flow.

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