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Towards A Fast High-Order Method for Unsteady Incompressible Navier-Stokes Equations using FR/CPR[1] CHRISTOPHER COX, CHUNLEI LIANG, MICHAEL PLESNIAK, George Washington Univ — A high-order compact spectral difference method for solving the 2D incompressible Navier-Stokes equations on unstructured grids is currently being developed. This method employs the gGA correction of Huynh, and falls under the class of methods now refered to as Flux Reconstruction/Correction Procedure via Reconstruction. This method and the artificial compressibility method are integrated along with a dual time-integration scheme to model unsteady incompressible viscous flows. A lower-upper symmetric Gauss-Seidel scheme and a backward Euler scheme are used to efficiently march the solution in pseudo time and physical time, respectively. We demonstrate order of accuracy with steady Taylor-Couette flow at Re=10. We further validate the solver with steady flow past a NACA0012 airfoil at zero angle of attack at Re=1850 and unsteady flow past a circle at Re=100. The implicit time-integration scheme for the pseudo time derivative term is proved efficient and effective for the classical artificial compressibility treatment to achieve the divergence-free condition of the continuity equation.

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