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A high-order solver for unsteady incompressible Navier-Stokes equations using the flux reconstruction method on unstructured grids with implicit dual time stepping[1] CHRISTOPHER COX, CHUNLEI LIANG, MICHAEL PLESNIAK, George Washington Univ — This paper reports development of a high-order compact method for solving unsteady incompressible flow on unstructured grids with implicit time stepping. The method falls under the class of methods now referred to as flux reconstruction/correction procedure via reconstruction. The governing equations employ the classical artificial compressibility treatment, where dual time stepping is needed to solve unsteady flow problems. An implicit non-linear lower-upper symmetric Gauss-Seidel scheme with backward Euler discretization is used to efficiently march the solution in pseudo time, while a second-order backward Euler discretization is used to march in physical time. We verify and validate implementation of the high-order method coupled with our implicit time-stepping scheme. Three-dimensional results computed on many processing elements will be presented. The high-order method is very suitable for parallel computing and can easily be extended to moving and deforming grids. The current implicit time stepping scheme is proven effective in satisfying the divergence-free constraint on the velocity field in the artificial compressibility formulation within the context of the high-order flux reconstruction method.

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