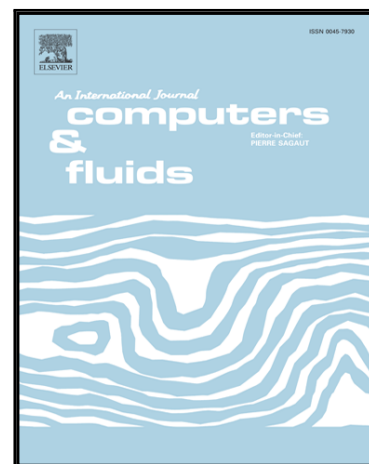


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Application of Nonlinear Krylov Acceleration to a Reconstructed Discontinuous Galerkin Method for Compressible Flows

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Abstract

A variant of Anderson Mixing, namely the Nonlinear Krylov Acceleration (NKA), is presented and implemented in a reconstructed Discontinuous Galerkin (rDG) method to solve the compressible Euler and Navier-Stokes equations on hybrid grids. A nonlinear system of equations as a result of a fully implicit temporal discretization at each time step is solved using the NKA method with a lower-upper symmetric Gauss-Seidel (LU-SGS) preconditioner. The developed NKA method is used to compute a variety of flow problems and compared with a well-known Newton-GMRES method to demonstrate the performance of the NKA method. Our numerical experiments indicate that the NKA method outperforms its Newton-GMRES counterpart for transient flow problems, and is comparable to Newton-GMRES for steady cases, and thus provides an attractive alternative to solve the system of nonlinear equations arising from the rDG approximation.

Keywords: nonlinear Krylov acceleration, reconstructed discontinuous Galerkin, ESDIRK, compressible flows, Euler equations, Navier-Stokes

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