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A low-numerical dissipation immersed interface method for the compressible Navier-Stokes equations CARLOS PANTANO, KOSTAS KARAGIOZIS, RAMJI KAMAKOTI, University of Illinois at Urbana-Champaign — Immersed interface methods are an alternative methodology to unstructured methods for solving fluid dynamical problems around complex geometries. In this approach, a Cartesian mesh is used to discretize the governing equations and a regular numerical method is used everywhere in the domain, except around the complex boundaries, where special stencils are used. We present and discuss results using a stable numerical methodology for the compressible Navier-Stokes equations that uses centered stencils. Specially designed stencils are constructed around the complex objects to ensure stability. These non-dissipative methods are beneficial in the study of noise and turbulence where numerical dissipation tends to attenuate the relevant flow physics. Furthermore, it is shown that the stiffness introduced by the high-order derivatives of the viscous and heat conduction terms in the discretized equations due to non-deforming boundaries can be resolved into an explicit method. Examples of compressible flows with multiple complex objects at different Mach numbers and Reynolds numbers are presented and convergence of the solutions is investigated as a function of resolution and relative position of the objects with respect to the Cartesian mesh.

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