A low Mach correction able to deal with low Mach acoustic and free of checkerboard modes

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It is well known that finite volume schemes are not accurate at low Mach number in the sense that they do not allow to obtain the incompressible limit when the Mach number is small on Cartesian meshes [4]. Increase the order of the method with a Discontinous Galerkin method is not sufficient to get the accuracy at low Mach number [1]. The schemes needs corrections [4, 5, 3, 2]. These corrections aim at reducing the numerical diffusion of the scheme to obtain accurate schemes for flows near the incompressible limit but could induce checkerboard modes [5, 2]. Moreover, since this diffusion is necessary to stabilize the scheme, it is also interesting to focus on the accuracy of the scheme at low Mach number with respect to the acoustic part of the solution. We will present a corrected scheme that is accurate at low Mach number for steady and unsteady flows, has the same CFL restriction as the Roe scheme for an explicit time integration and is free of checkerboard modes.

Références

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