Application of Turkel preconditioning Method in External Free Convection and Incompressible Flows

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Abstract

Over the past decade, several preconditioning methods[1, 4, 3] have been appeared with the aim of solving nearly incompressible flow problems with numerical algorithms designed for the compressible flows. These methods have been shown effective for low Mach number compressible flows[5]. But we can notice that these methods do not make it possible to calculate the incompressible flows at very low Mach number and the external free convection. In free convection flows, we can remark that the hydrostatic equilibrium is not preserved using the Roe scheme[2]. The problem of Turkel preconditionner at very low Mach number resides at the presence of singularities. This paper presents the modification of Roe-Turkel scheme in order to simulate these flows.

Three cas-test are performed in this paper : an incompressible boundary layer, a free convection with vertical parallele plate channel and the one on the vertical surface.

Keywords : Roe scheme, Preconditioning of Turkel, incompressible flows, external free convection.

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