Asociación Argentina
de Mecánica Computacional

Mecánica Computacional Vol XXXII, págs. 1891-1905 (artículo completo)
Carlos G. García Garino, Aníbal E. Mirasso, Mario A. Storti, Miguel E. Tornello (Eds.)
Mendoza, Argentina, 19-22 Noviembre 2013

TWO DIMENSIONAL NUMERICAL SIMULATIONS FOR COMPRESSIBLE FLOW IN THERMO-CHEMICAL EQUILIBRIUM

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Keywords: TVD schemes, chemical equilibrium, hypersonic flows

Abstract. In this paper, a finite difference scheme for the solution of the unsteady and steady, two dimensional Euler equations, considering working gas in thermo-chemical equilibrium, is presented. Three variations of the Total Variation Diminishing (TVD) Harten-Yee scheme are implemented. One of them is a technique based on the adaptive use of different limiter functions in each wave of the Riemann problem. With this technique, the undesired effects of the artificial viscosity on the capture of contact discontinuities are reduced, however without losing robustness in the non-linear waves resolution. Therefore, this work is an extension of this adaptive scheme including gas in thermo-chemical equilibrium. In order to verify the accuracy of the proposed scheme in the bidimensional case, results of the unsteady flows in cylindrical Riemann problems, and of the steady state solutions of hypersonic flow over a blunt body, are presented. Comparisons, considering the accuracy of the results and the convergence properties, between the three Harten-Yee schemes are carried out.