NUMERICAL SIMULATION OF HYPERSONIC NONEQUILIBRIUM FLOWS BY MEANS OF RESIDUAL DISTRIBUTION SCHEMES

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Theoretical developments allowing the symmetrization of the two temperatures model advective jacobian have been performed. This has been done in such way that decoupling of the mass species and the electronic vibrational energy contributions from the momentum and the total energy is achieved at the same time.

Functionalities taking advantage of these results have been coupled to a preexisting conservative residual distribution solver. The improvement in the efficiency of this extended solver has been evaluated for an Euler test case. Influence of the source term evaluation cost in the computational gains obtained has been analysed. Finally, and in order to validate the developments performed, a real life test case namely the hypersonic flow over a double cone geometry has been simulated. Results obtained have shown good agreement with those available in literature.

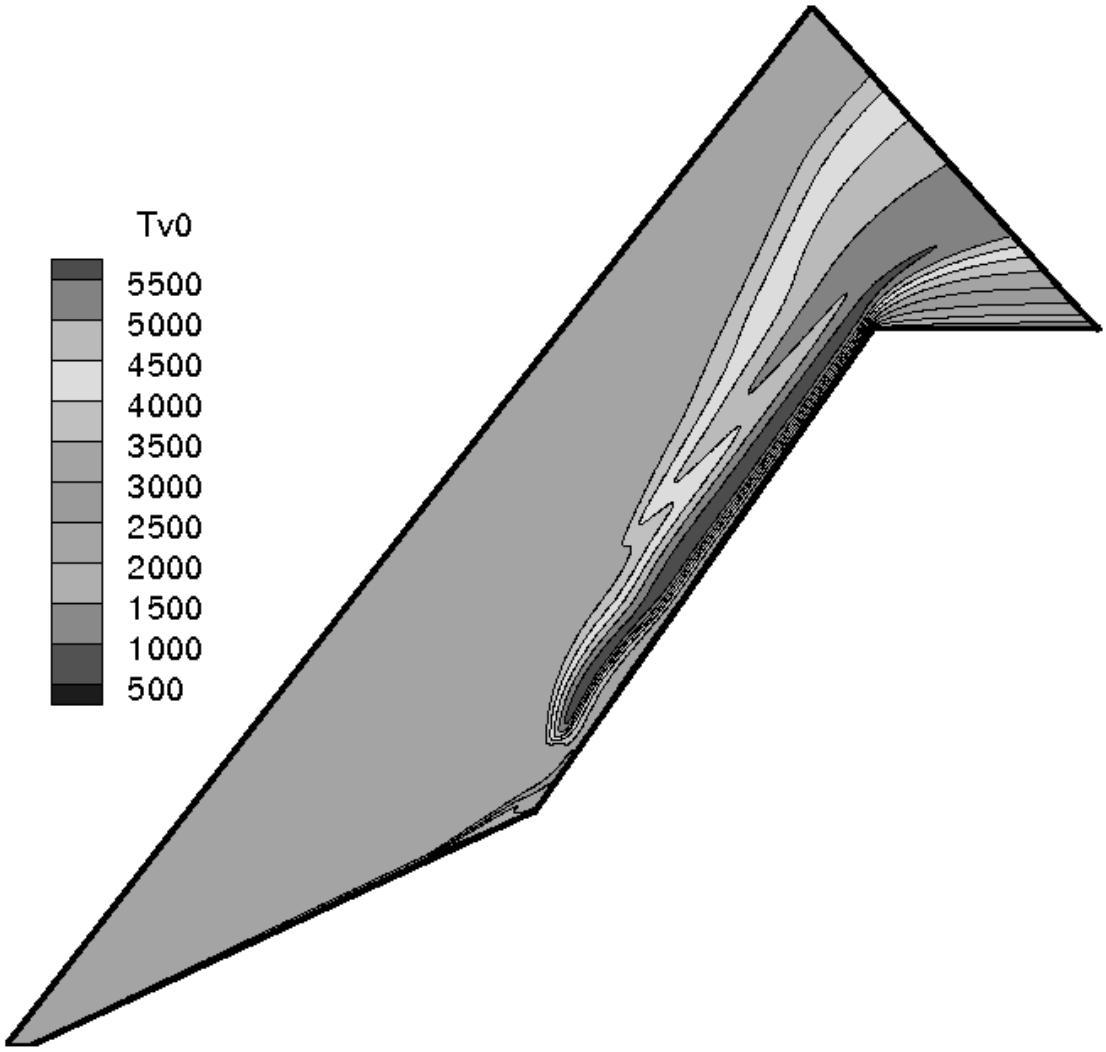

Figure 1: Flow field around a double cone configuration: vibrational temperature field for the run42 test case (M∞=11.5)