



Efficient Simulation of Thermochemical Nonequilibrium Flows using Highly-Resolved H-Adapted Grids

By Christian Windisch

Cuvillier Verlag Jul 2014, 2014. Taschenbuch. Book Condition: Neu. 208x146x5 mm. Neuware - Accurate and easy to handle simulation tools are needed for the design and development of future space transportation systems. The simulation of hypersonic flow fields in thermochemical nonequilibrium is a challenging task, as a variety of flow features on various time and length scales needs to be properly resolved. With this purpose in mind, a general CFD solver framework is developed in this doctoral thesis. It combines the multiscale-based grid adaptation with the necessary physical models and numerical methods for the simulation of arbitrary reaction models in thermochemical nonequilibrium. The developed tools and methods are incorporated into the QUADFLOW solver, an integrated concept of grid generation, grid adaptation and finite-volume flow solver. The modified QUADFLOW solver is then applied to pertinent applications. The injection of various cooling gases into a supersonic boundary layer demonstrates the versatility of the QUADFLOW solver at the example of a low enthalpy configuration. The simulated high-enthalpy Edney type IV and type VII shock-shock interactions represent a complex and challenging flow configuration. A high resolution of the vortex structures in the inner flow field and of the boundary layer is achieved at the...



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