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## Atmosphere Re-Entry Simulation Using Direct Monte Carlo Method (DSMC)

By Pellicani, Francesco

Condition: New. Publisher/Verlag: Edizioni Accademiche Italiane | Validation study of a new fluid dynamics simulation technique, the Monte Carlo method, valid for dense and rarefied gas | Hypersonic re-entry vehicles aerothermodynamic investigations provide fundamental information to other important disciplines like materials and structures, assisting the development of thermal protection systems (TPS) efficient and with a low weight. In the transitional flow regime, where thermal and chemical equilibrium is almost absent, a new numerical method for such studies has been introduced, the direct simulation Monte Carlo (DSMC) numerical technique. Verification and validation efforts are needed to lead to its acceptance. In this work, the Monte Carlo simulator OpenFOAM and Sparta have been studied and benchmarked against numerical and theoretical/experimental data for inert and chemically reactive flows. The results show the validity of the data found with the DSMC. It is shown how a simulation with a mean value of one particle per cell gives sufficiently good results with very low computational resources. This achievement aims to reconsider the correct investigation method in the transitional regime where both the direct simulation Monte Carlo (DSMC) and the computational fluid-dynamics (CFD) can work, can work, but with a different computational effort. | Format: Paperback...



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