



Mathematical Models and Numerical Methods for Radiation Hydrodynamics

By Mohammed Seaid

Shaker Verlag Feb 2004, 2004. Taschenbuch. Condition: Neu. Neuware - We present mathematical models and numerical methods for radiation hydrodynamics. The mathematical models range from compressible Euler to incompressible Navier-Stokes problems for the hydrodynamic part and radiative heat transfer and simplified PN-approximations for the radiation part. The coupling between the hydrodynamical flow and the radiative signal is carried out in two different approaches for the radiative stage. The first approach is based on asymptotic analysis while the second approach is based on entropy principle. The mathematical aspects and the physical features are studied for both approaches by considering experiments in two and three dimensional problems. To develop accurate and efficient solvers for radiation hydrodynamics, we propose two class of numerical procedures: The first class consists of high-order relaxation schemes for the hydrodynamic equations. The main advantage of these schemes lies on the semilinear structure of the relaxation systems which can be solved without using either Riemann solvers or nonlinear iterations. Special attention is given to a third order non-oscillatory reconstruction in space and a TVD implicit-explicit integration in time. Numerical results are shown for a wide variety of benchmark tests from computational fluid dynamics. The second class of numerical methods...



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