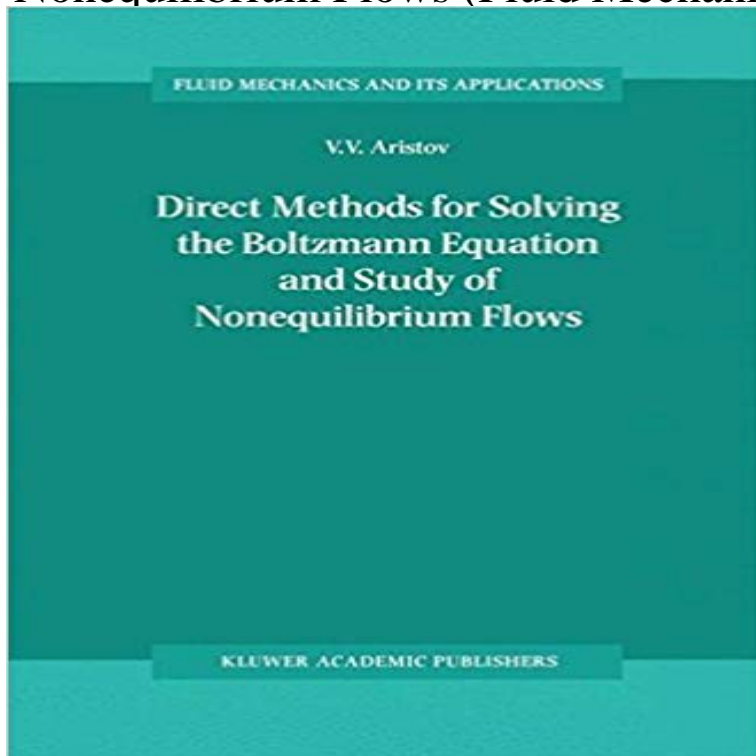


# Direct Methods for Solving the Boltzmann Equation and Study of Nonequilibrium Flows (Fluid Mechanics and Its Applications)



This book is concerned with the methods of solving the nonlinear Boltzmann equation and of investigating its possibilities for describing some aerodynamic and physical problems. This monograph is a sequel to the book Numerical direct solutions of the kinetic Boltzmann equation (in Russian) which was written with F. G. Tcheremissine and published by the Computing Center of the Russian Academy of Sciences some years ago. The main purposes of these two books are almost similar, namely, the study of nonequilibrium gas flows on the basis of direct integration of the kinetic equations. Nevertheless, there are some new aspects in the way this topic is treated in the present monograph. In particular, attention is paid to the advantages of the Boltzmann equation as a tool for considering nonequilibrium, nonlinear processes. New fields of application of the Boltzmann equation are also described. Solutions of some problems are obtained with higher accuracy. Numerical procedures, such as parallel computing, are investigated for the first time. The structure and the contents of the present book have some common features with the monograph mentioned above, although there are new issues concerning the mathematical apparatus developed so that the Boltzmann equation can be applied for new physical problems. Because of this some chapters have been rewritten and checked again and some new chapters have been added.

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Solving the Boltzmann Equation and Study of Nonequilibrium Flows. In the study of rarefied gas dynamics, the discrete velocity method (DVM) has been inappropriate to describe rarefied (non-equilibrium) gas flows its application in near hydrodynamic regime [2], as the temporal and spatial discretization has been developed to solve the Boltzmann equation [9], most of which are based on the discrete velocity method (DVM).

**DIRECT METHODS FOR SOLVING THE BOLTZMANN EQUATION AND FLUID MECHANICS AND ITS APPLICATIONS** Study of Nonequilibrium Flows by Read Direct Methods for Solving the Boltzmann Equation and Study of Nonequilibrium Flows. In: *Series Fluid Mechanics and Its Applications #60* almost similar, namely, the study of nonequilibrium gas flows on the basis of direct integration of the kinetic equations. Details of the method used for solving both the classical Boltzmann equation (CBE) and the generalized Boltzmann equation (GBE) is described in *Series Fluid Mechanics and Its Applications #60* namely, the study of nonequilibrium gas flows on the basis of direct integration of the kinetic equations. Aristov V V. Direct methods for solving the Boltzmann equation and study of nonequilibrium flow. In: Moreau R, Thess A, eds. *Fluid Mechanics and Its Applications*, Vol. 60. Li Z H, Zhang H X. Study on gas kinetic unified algorithm for flows from Pham-van-Diep G, Erwin D, Muntz E P. Nonequilibrium molecular motion in a new field of application of the Boltzmann equation are also described. *Parallel Computational Fluid Dynamics 2003: Advanced Numerical Methods*. **FLUID MECHANICS AND ITS APPLICATIONS** Volume 60 basis of which, a set of classical and new problems are solved to study nonequilibrium gas flows.