SPRINGER BRIEFS IN MATHEMATICS

Matteo Colangeli

From Kinetic Models to Hydrodynamics

Some Novel Results

2013, X, 96 p. 21 illus., 9 illus. in color.

Matteo Colangeli

From Kinetic Models to Hydrodynamics

Some Novel Results

Series: SpringerBriefs in Mathematics

- Bridges time and length scales from the particle-like description inherent in Boltzmann equation theory to a fully established "continuum" approach typical of macroscopic laws of physics
- Addresses a functional equation for the nonequilibrium single-particle distribution function

From Kinetic Models to Hydrodynamics serves as an introduction to the asymptotic methods necessary to obtain hydrodynamic equations from a fundamental description using kinetic theory models and the Boltzmann equation. The work is a survey of an active research area, which aims to bridge time and length scales from the particle-like description inherent in Boltzmann equation theory to a fully established "continuum" approach typical of macroscopic laws of physics.The author sheds light on a new method—using invariant manifolds—which addresses a functional equation for the nonequilibrium single-particle distribution function. This method allows one to find exact and thermodynamically consistent expressions for: hydrodynamic modes; transport coefficient expressions for hydrodynamic modes; and transport coefficients of a fluid beyond the traditional hydrodynamic limit. The invariant manifold method paves the way to establish a needed bridge between Boltzmann equation theory and a particle-based theory of hydrodynamics. Finally, the author explores the ambitious and longstanding task of obtaining hydrodynamic constitutive equations from their kinetic counterparts. The work is intended for specialists in kinetic theory—or more generally statistical mechanics—and will provide a bridge between a physical and mathematical approach to solve real-world problems.

Printed book
Softcover
49,99 € | £44.99 | $49.95
[1]53,49 € (D) | 54,99 € (A) | CHF 67,07

eBook
42,79 € | £35.99 | $34.99
[2]42,79 € (D) | 42,79 € (A) | CHF 53,50

Available from your library or springer.com/shop

MyCopy [3]
Printed eBook for just
€ | $ 24.99
springer.com/mycopy

Part of **SPRINGER NATURE**