

<<流体动力学中的拓扑方法>>

图书基本信息

书名：<<流体动力学中的拓扑方法>>

13位ISBN编号：9787510005305

10位ISBN编号：7510005302

出版时间：2009-8

出版时间：世界图书出版公司

作者：阿诺德

页数：376

版权说明：本站所提供下载的PDF图书仅提供预览和简介，请支持正版图书。

更多资源请访问：<http://www.tushu007.com>

<<流体动力学中的拓扑方法>>

前言

Hydrodynamics is one of those fundamental areas in mathematics where progress at any moment may be regarded as a standard to measure the real success of mathematical science. Many important achievements in this field are based on profound theories rather than on experiments. In fact, those hydrodynamical theories stimulated developments in the domains of pure mathematics, such as complex analysis, topology, stability theory, bifurcation theory, and completely integrable dynamical systems. In spite of all this acknowledged success, hydrodynamics with its spectacular empirical laws remains a challenge for mathematicians. For instance, the phenomenon of turbulence has not yet acquired a rigorous mathematical theory. Furthermore, the existence problems for the smooth solutions of hydrodynamic equations of a three-dimensional fluid are still open. The simplest but already very substantial mathematical model for fluid dynamics is the hydrodynamics of an ideal (i.e., of an incompressible and inviscid) homogeneous fluid. From the mathematical point of view.

<<流体动力学中的拓扑方法>>

内容概要

Hydrodynamics is one of those fundamental areas in mathematics where progress at any moment may be regarded as a standard to measure the real success of mathematical science. Many important achievements in this field are based on profound theories rather than on experiments. In fact, those hydrodynamical theories stimulated developments in the domains of pure mathematics, such as complex analysis, topology, stability theory, bifurcation theory, and completely integrable dynamical systems. In spite of all this acknowledged success, hydrodynamics with its spectacular empirical laws remains a challenge for mathematicians.

<<流体动力学中的拓扑方法>>

作者简介

作者：(法国)阿诺德

<<流体力学中的拓扑方法>>

书籍目录

Preface Acknowledgments I. Group and Hamiltonian Structures of Fluid Dynamics 1. Symmetry groups for a rigid body and an ideal fluid 2. Lie groups, Lie algebras, and adjoint representation 3. Coadjoint representation of a Lie group 3.A. Definition of the coadjoint representation 3.B. Dual of the space of plane divergence-free vector fields 3.C. The Lie algebra of divergence-free vector fields and its dual in arbitrary dimension 4. Left-invariant metrics and a rigid body for an arbitrary group 5. Applications to hydrodynamics 6. Hamiltonian structure for the Euler equations 7. Ideal hydrodynamics on Riemannian manifolds 7.A. The Euler hydrodynamic equation on manifolds 7.B. Dual space to the Lie algebra of divergence-free fields 7.C. Inertia operator of an n-dimensional fluid 8. Proofs of theorems about the Lie algebra of divergence-free fields and its dual 9. Conservation laws in higher-dimensional hydrodynamics 10. The group setting of ideal magnetohydrodynamics 10.A. Equations of magnetohydrodynamics and the Kirchhoff equations 10.B. Magnetic extension of any Lie group 10.C. Hamiltonian formulation of the Kirchhoff and magnetohydrodynamics equations 11. Finite-dimensional approximations of the Euler equation 11.A. Approximations by vortex systems in the plane 11.B. Nonintegrability of four or more point vortices 11.C. Hamiltonian vortex approximations in three dimensions 11.D. Finite-dimensional approximations of diffeomorphism groups 12. The Navier-Stokes equation from the group viewpoint II. Topology of Steady Fluid Flows 1. Classification of three-dimensional steady flows 1.A. Stationary Euler solutions and Bernoulli functions 1.B. Structural theorems 2. Variational principles for steady solutions and applications to two-dimensional flows 2.A. Minimization of the energy 2.B. The Dirichlet problem and steady flows 2.C. Relation of two variational principles 2.D. Semigroup variational principle for two-dimensional steady flows 3. Stability of stationary points on Lie algebras 4. Stability of planar fluid flows 4.A. Stability criteria for steady flows 4.B. Wandering solutions of the Euler equation 5. Linear and exponential stretching of particles and rapidly oscillating perturbations 5.A. The linearized and shortened Euler equations 5.B. The action-angle variables 5.C. Spectrum of the shortened equation 5.D. The Squire theorem for shear flows 5.E. Steady flows with exponential stretching of particles 5.E. Analysis of the linearized Euler equation 5.G. Inconclusiveness of the stability test for space steady flows 6. Features of higher-dimensional steady flows 6.A. Generalized Beltrami flows 6.B. Structure of four-dimensional steady flows 6.C. Topology of the vorticity function 6.D. Nonexistence of smooth steady flows and sharpness of the restrictions III. Topological Properties of Magnetic and Vorticity Fields 1. Minimal energy and helicity of a frozen-in field 1.A. Variational problem for magnetic energy 1.B. Extremal fields and their topology 1.C. Helicity bounds the energy 1.D. Helicity of fields on manifolds 2. Topological obstructions to energy relaxation 2.A. Model example: Two linked flux tubes 2.B. Energy lower bound for nontrivial linking 3. Salcharov-Zeldovich minimization problem IV. Differential Geometry of diffeomorphism Groups V. Kinematic Fast Dynarno Problems VI. Dynamical Systems With Hydrodynamical Background References Index

<<流体力学中的拓扑方法>>

章节摘录

插图：

<<流体动力学中的拓扑方法>>

编辑推荐

《流体动力学中的拓扑方法(英文版)》是由世界图书出版公司出版的。

<<流体动力学中的拓扑方法>>

版权说明

本站所提供下载的PDF图书仅提供预览和简介, 请支持正版图书。

更多资源请访问:<http://www.tushu007.com>