Lecture Notes in Physics

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Small-Scale Structures in Three-Dimensional Hydrodynamic and Magnetohydrodynamic Turbulence

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Smallscale Structures In Threedimensional Hydrodynamic And Magnetohydrodynamic Turbulence

Michael R. Brown,Richard C. Canfield,Alexei A. Pevtsov

Smallscale Structures In Threedimensional Hydrodynamic And Magnetohydrodynamic Turbulence:

Small-Scale Structures in Three-Dimensional Hydrodynamic and Magnetohydrodynamic Turbulence Maurice Meneguzzi,Annick Pouquet,1995-11-17 Small scale structures in turbulent flows appear as a subtle mixture of order and chaos that could play an important role in the energetics The aim here is a better understanding of the similarities and differences between vortex and current dynamics and of the influence of these structures on the statistical and transport properties of hydrodynamic and magnetohydrodynamic turbulence with special concern for fusion plasmas and solar or magnetospheric environments Special emphasis is given to the intermittency at inertial scales and to the coherent structures at small scales Magnetic reconnection and the dynamo effect are also discussed together with the effect of stratification and inhomogeneity The impact of hydrodynamic concepts on astro and geophysical observations are reviewed **Small-scale Structures in Three-dimensional Hydrodynamic and Magnetohydrodynamic Turbulence** M. Meneguzzi,A. Pouquet,P. L. Sulem,1995 Small-Scale Structures in Three-Dimensional Hydrodynamic and Magnetohydrodynamic Turbulence Maurice Meneguzzi,Annick Pouquet,Pierre-Louis Sulem,2013-11-13 Small scale structures in turbulent flows appear as a subtle mixture of order and chaos that could play an important role in the energetics The aim here is a better understanding of the similarities and differences between vortex and current dynamics and of the influence of these structures on the statistical and transport properties of hydrodynamic and magnetohydrodynamic turbulence with special concern for fusion plasmas and solar or magnetospheric environments Special emphasis is given to the intermittency at inertial scales and to the coherent structures at small scales Magnetic reconnection and the dynamo effect are also discussed together with the effect of stratification and inhomogeneity The impact of hydrodynamic concepts on astro and geophysical observations are reviewed **Partial Differential Equations and Their Applications** Peter Charles Greiner,Canadian Mathematical Society. Seminar,1997-01-01 Just list for purposes of NBB **Small-Scale Structure in Three-dimensional Hydrodynamic and Magnetohydrodynamic Turbulence** Maurice Meneguzzi,Annick Pouquet,P. L. Sulem,1995

Tubes, Sheets and Singularities in Fluid Dynamics K. Bajer,H.K. Moffatt,2006-04-11 Modern experiments and numerical simulations show that the long known coherent structures in turbulence take the form of elongated vortex tubes and vortex sheets The evolution of vortex tubes may result in spiral structures which can be associated with the spectral power laws of turbulence The mutual stretching of skewed vortex tubes when they are close to each other causes rapid growth of vorticity Whether this process may or may not lead to a finite time singularity is one of the famous open problems of fluid dynamics This book contains the proceedings of the NATO ARW and IUTAM Symposium held in Zakopane Poland 2 7 September 2001 The papers presented carefully reviewed by the International Scientific Committee cover various aspects of the dynamics of vortex tubes and sheets and of their analogues in magnetohydrodynamics and in quantum turbulence The book should be a useful reference for all researchers and students of modern fluid dynamics Advances in Turbulence VII

Uriel Frisch,2012-12-06 Advances in Turbulence VII contains an overview of the state of turbulence research with some bias towards work done in Europe It represents an almost complete collection of the invited and contributed papers delivered at the Seventh European Turbulence Conference sponsored by EUROMECH and ERCOFTAC and organized by the Observatoire de la C te d Azur New high Reynolds number experiments combined with new techniques of imaging non intrusive probing processing and simulation provide high quality data which put significant constraints on possible theories For the first time it has been shown for a class of passive scalar problems why dimensional analysis sometimes gives the wrong answers and how anomalous intermittency corrections can be calculated from first principles The volume is thus geared towards specialists in the area of flow turbulence who could not attend the conference as well as anybody interested in this rapidly moving field

Millimeter-Wave Astronomy: Molecular Chemistry & Physics in Space W.F. Wall,Alberto Carramiñana,Luis Carrasco,P.F. Goldsmith,2012-12-06 Proceedings of the 1996 INAOE Summer School of Millimeter Wave Astronomy held at INAOE Tonantzintla Puebla M xico 15 31 July 1996 **Computational Methods for the Atmosphere and the Oceans** Roger Temam,Joe Tribbia,2009-06-16 This book provides a survey of the frontiers of research in the numerical modeling and mathematical analysis used in the study of the atmosphere and oceans The details of the current practices in global atmospheric and ocean models the assimilation of observational data into such models and the numerical techniques used in theoretical analysis of the atmosphere and ocean are among the topics covered Truly interdisciplinary scientific interactions between specialties of atmospheric and ocean sciences and applied and computational mathematics Uses the approach of computational mathematicians applied and numerical analysts and the tools appropriate for unsolved problems in the atmospheric and oceanic sciences Contributions uniquely address central problems and provide a survey of the frontier of research *Spectral/hp Element Methods for Computational Fluid Dynamics* George Karniadakis,Spencer Sherwin,2013-01-10 Completely revised and expanded new edition covering the recent and significant progress in multi domain spectral methods at both the fundamental and application level Written by leading experts it is a must have for students academics and practitioners in computational fluid mechanics and related fields The Theory of Quantum Torus Knots Michael Ungs,2009-09-25 A detailed mathematical derivation of space curves is presented that links the diverse fields of superfluids quantum mechanics and hydrodynamics by a common foundation The basic mathematical building block is called the theory of quantum torus knots QTK **Heterogeneity in the Crust and Upper Mantle** John A. Goff,Klaus Holliger,2012-12-06 Most of our knowledge about the physical structure and the chemical composition of the Earth s deep interior is inferred from seismic data The interpretation of seismic waves generally follows the assumption that the Earth s physical structure is grossly layered and that fluctuations of the physical parameters within individual layers are smooth in structure and small in magnitude While this view greatly facilitates the analytic and interpretative procedure it is clearly at odds with evidence from outcrops and boreholes which indicates that compositional structural and petrophysical

heterogeneity in the Earth prevails over a wide range of scales This book is the first to unify three different views of crustal and upper mantle heterogeneity It brings together the geological view which is derived from the analysis of crustal exposures and deep boreholes the stochastic view which attempts to find order and structure in these seemingly chaotic data and the seismological view which considers the end product of the complex interaction of seismic energy with the heterogeneous structure at depth John Goff and Klaus Holliger have compiled chapters that explore and quantify the relationship between geological and petrophysical heterogeneity and its seismic response and use seismic data to probe the fabric of the Earth s interior Geologists geostaticians and geophysicists alike will benefit from the integrative perspective presented in Heterogeneity in the Crust and Upper Mantle Nature Scaling and Seismic Properties making this text an unparalleled reference for professionals and students in Earth science fields Current Trends in International Fusion Research Charles D. Orth,Emilio Panarella,2007 **An Informal Introduction to Turbulence** A. Tsinober,2001-11-30 This book is an informal introduction to the turbulence of fluids The emphasis is placed on turbulence as a physical phenomenon It addresses the unresolved issues misconceptions controversies and major problems of the turbulence of fluids rather than the conventional formalistic elements and models Little use is made of complicated formalisms instead the emphasis is placed on an essentially informal qualitative form The scope of the book is focused on the purely basic aspects of the turbulent flows of incompressible fluids This book will certainly be of interest and use to graduate students as well as scientists active in fields where the turbulence of fluids is of importance The book is intentionally written to appeal to a broad readership with the aim of making the turbulence of fluids interesting and comprehensible to the interested engineer *Advances in Nonlinear Dynamos* Antonio Ferriz-Mas,Manuel Nunez,2019-04-24 Nonlinear dynamo theory is central to understanding the magnetic structures of planets stars and galaxies In chapters contributed by some of the leading scientists in the field this text explores some of the recent advances in the field Both kinetic and dynamic approaches to the subject are considered including fast dynamos topological methods in dynamo theory physics of the solar cycle and the fundamentals of mean field dynamo Advances in Nonlinear Dynamos is ideal for graduate students and researchers in theoretical astrophysics and applied mathematics particularly those interested in cosmic magnetism and related topics such as turbulence convection and more general nonlinear physics *Magnetic Helicity in Space and Laboratory Plasmas* Michael R. Brown,Richard C. Canfield,Alexei A. Pevtsov,1999-01-26 Published by the American Geophysical Union as part of the Geophysical Monograph Series Volume 111 Using the concept of magnetic helicity physicists and mathematicians describe the topology of magnetic fields twisting writhing and linkage Mathematically helicity is related to linking integrals which Gauss introduced in the 19th century to describe the paths of asteroids in the sky In the late 1970s the concept proved to be critical to understand laboratory plasma experiments on magnetic reconnection dynamos and magnetic field relaxation In the late 1980s it proved equally important in understanding turbulence in the solar wind and the interplanetary magnetic field During the last five

years interest in magnetic helicity has grown dramatically in solar physics and it will continue to grow as observations of vector magnetic fields become increasingly sophisticated **Turbulence and Magnetic Fields in Astrophysics** Edith Falgarone,Thierry Passot,2008-01-11 This book contains review articles of most of the topics addressed at the conf ence on Simulations of Magnetohydrodynamic turbulence in astrophysics recent achievements and perspectives which took place from July 2 to 6 2001 at the Institut Henri Poincar e in Paris We made the choice to publish these lectures in a tutorial form so that they can be read by a broad audience As a result this book does not give an exhaustive view of all the subjects addressed during the conference The main objective of this workshop which gathered about 90 scientists from di erent elds was to present and confront recent results on the topic of t bulence in magnetized astrophysical environments A second objective was to discuss the latest generation of numerical codes such as those using adaptive mesh re nement AMR techniques During a plenary discussion at the end of the workshop discussions were held on several topics often at the heart of vivid controversies Topics included the timescale for the dissipation of magneto hydrodynamical MHD turbulence the role of boundary conditions the characteristics of imbalanced turbulence the validity of the polytropic approach to Alfv en waves support within interst lar clouds the source of turbulence inside clouds devoid of stellar activity the timescale for star formation the Alfv en Mach number of interstellar gas motions the formation process for helical elds in the interstellar medium The impact of small upon large scales was also discussed **Discontinuous Galerkin Methods** Bernardo Cockburn,George E. Karniadakis,Chi-Wang Shu,2012-12-06 A class of finite element methods the Discontinuous Galerkin Methods DGM has been under rapid development recently and has found its use very quickly in such diverse applications as aeroacoustics semi conductor device simula tion turbomachinery turbulent flows materials processing MHD and plasma simulations and image processing While there has been a lot of interest from mathematicians physicists and engineers in DGM only scattered information is available and there has been no prior effort in organizing and publishing the existing volume of knowledge on this subject In May 24 26 1999 we organized in Newport Rhode Island USA the first international symposium on DGM with equal emphasis on the theory numerical implementation and applications Eighteen invited speakers lead ers in the field and thirty two contributors presented various aspects and addressed open issues on DGM In this volume we include forty nine papers presented in the Symposium as well as a survey paper written by the organiz ers All papers were peer reviewed A summary of these papers is included in the survey paper which also provides a historical perspective of the evolution of DGM and its relation to other numerical methods We hope this volume will become a major reference in this topic It is intended for students and researchers who work in theory and application of numerical solution of convection dominated partial differential equations The papers were written with the assumption that the reader has some knowledge of classical finite elements and finite volume methods Wave Turbulence Sergey Nazarenko,2011-02-12 Wave Turbulence refers to the statistical theory of weakly nonlinear dispersive waves There is a wide and growing spectrum of physical

applications ranging from sea waves to plasma waves to superfluid turbulence to nonlinear optics and Bose Einstein condensates Beyond the fundamentals the book thus also covers new developments such as the interaction of random waves with coherent structures vortices solitons wave breaks inverse cascades leading to condensation and the transitions between weak and strong turbulence turbulence intermittency as well as finite system size effects such as frozen turbulence discrete wave resonances and avalanche type energy cascades This book is an outgrow of several lectures courses held by the author and as a result written and structured rather as a graduate text than a monograph with many exercises and solutions offered along the way The present compact description primarily addresses students and non specialist researchers wishing to enter and work in this field The Seventh Asian Congress of Fluid Mechanics ,1997

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