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The book addresses recent developments of the mathematical research on the Navier-Stokes and Euler equations . as well as on related problems. In particular, there are covered: 1) existence, uniqueness, and the regularity of weak solutions; 2) stability of the motion in rest and the asymptotic behavior of solutions;

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Recent Developments of Mathematical Fluid Mechanics Editors. Herbert Amann; Yoshikazu Giga; Hideo Kozono; Hisashi Okamoto; Masao Yamazaki; Series Title Advances in Mathematical Fluid Mechanics Copyright 2016 Publisher Birkh ä user Basel Copyright Holder Springer Basel eBook ISBN 978-3-0348-0939-9 DOI 10.1007/978-3-0348-0939-9 Hardcover ISBN 978-3-0348-0938-2 Series ISSN

### Recent Developments of Mathematical Fluid Mechanics ...

Recent Developments of Mathematical Fluid Mechanics Herbert Amann , Yoshikazu Giga , Hideo Kozono , Hisashi Okamoto , Masao Yamazaki (eds.) The aim of this proceeding is addressed to present recent developments of the mathematical research on the Navier-Stokes equations, the Euler equations and other related equations.

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INTRODUCTION : #1 Recent Developments Of Mathematical Fluid Publish By Cor í n Tellado, Recent Developments Of Mathematical Fluid Mechanics the book addresses recent developments of the mathematical research on the navier stokes and euler equations as well as on related problems in particular there are covered 1 existence uniqueness and the

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Module description. In this module, participants will be introduced to an overview of recent developments in mathematics education research. This will include the exploration of research being undertaken at King ' s and in context of recent developments more widely.

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The aim of this proceeding is addressed to present recent developments of the mathematical research on the Navier-Stokes equations, the Euler equations and other related equations. In particular, we are interested in such problems as: 1) existence, uniqueness and regularity of weak solutions2) stability and its asymptotic behavior of the rest motion and the steady state3) singularity and blow-up of weak and strong solutions4) vorticity and energy conservation5) fluid motions around the rotating axis or outside of the rotating body6) free boundary problems7) maximal regularity theorem and other abstract theorems for mathematical fluid mechanics.

This volume brings together four contributions to mathematical fluid mechanics, a classical but still highly active research field. The contributions cover not only the classical Navier-Stokes equations and Euler equations, but also some simplified models, and fluids interacting with elastic walls. The questions addressed in the lectures range from the basic problems of existence/blow-up of weak and more regular solutions, to modeling and aspects related to numerical methods. This book covers recent advances in several important areas of fluid mechanics. An output of the CIME Summer School "Progress in mathematical fluid mechanics" held in Cetraro in 2019, it offers a collection of lecture notes prepared by T. Buckmaster, (Princeton), S. Canic (UCB) P. Constantin (Princeton) and A. Kiselev (Duke). These notes will be a valuable asset for researchers and advanced graduate students in several aspects of mathematical fluid mechanics.

This book consists of six survey contributions that are focused on several open problems of theoretical fluid mechanics both for incompressible and compressible fluids. The first article "Viscous flows in Besov spaces"

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by M area Cannone addresses the problem of global existence of a uniquely defined solution to the three-dimensional Navier-Stokes equations for incompressible fluids. Among others the following topics are intensively treated in this contribution: (i) the systematic description of the spaces of initial conditions for which there exists a unique local (in time) solution or a unique global solution for small data, (ii) the existence of forward self-similar solutions, (iii) the relation of these results to Leray's weak solutions and backward self-similar solutions, (iv) the extension of the results to further nonlinear evolutionary problems. Particular attention is paid to the critical spaces that are invariant under the self-similar transform. For sufficiently small Reynolds numbers, the conditional stability in the sense of Lyapunov is also studied. The article is endowed by interesting personal and historical comments and an exhaustive bibliography that gives the reader a complete picture about available literature. The papers "The dynamical system approach to the Navier-Stokes equations for compressible fluids" by Eduard Feireisl, and "Asymptotic problems and compressible-incompressible limits" by Nader Masmoudi are devoted to the global (in time) properties of solutions to the Navier-Stokes equations and three theorems for compressible fluids. The global (in time) analysis of two dimensional motions of compressible fluids were left open for many years.

On November 3, 2005, Alexander Vasil'evich Kazhikhov left this world, untimely and unexpectedly. He was one of the most influential mathematicians in the mechanics of fluids, and will be remembered for his outstanding results that had, and still have, a considerable significance in the field. Among his many achievements, we recall that he was the founder of the modern mathematical theory of the Navier-Stokes equations describing one- and two-dimensional motions of a viscous, compressible and heat-conducting gas. A brief account of Professor Kazhikhov's contributions to science is provided in the following article "Scientific portrait of Alexander Vasil'evich Kazhikhov". This volume is meant to be an expression of high regard to his memory, from most of his friends and his colleagues. In particular, it collects a selection of papers that represent the latest progress in a number of new important directions of Mathematical Physics, mainly of Mathematical Fluid Mechanics. These papers are written by world renowned specialists. Most of them were friends, students or colleagues of Professor Kazhikhov, who either worked with him directly, or met him many times in official scientific meetings, where they had the opportunity of discussing problems of common interest.

Including previously unpublished, original research material, this comprehensive book analyses topics of fundamental importance in theoretical fluid mechanics. The five papers appearing in this volume are centred around the mathematical theory of the Navier-Stokes equations (incompressible and compressible) and certain selected non-Newtonian modifications.

Mathematical modeling and numerical simulation in fluid mechanics are topics of great importance both in theory and technical applications. The present book attempts to describe the current status in various areas of research. The 10 chapters, mostly survey articles, are written by internationally renowned specialists and offer a range of approaches to and views of the essential questions and problems. In particular, the theories of incompressible and compressible Navier-Stokes equations are considered, as well as stability theory and numerical methods in fluid mechanics. Although the book is primarily written for researchers in the field, it will also serve as a valuable source of information to graduate students.

This volume collects the contributions of a Conference held in June 2005 at the laboratoire Paul Painlevé (UMR CNRS 8524) in Lille, France. The meeting was intended to review hot topics and future trends in fluid dynamics, with the objective to foster exchanges of various viewpoints (e.g. theoretical, and numerical) on the addressed questions. It comprises a collection of research articles on recent advances in the analysis and simulation of fluid dynamics.

This volume consists of five research articles, each dedicated to a significant topic in the mathematical theory of the Navier-Stokes equations, for compressible and incompressible fluids, and to related questions. All

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results given here are new and represent a noticeable contribution to the subject. One of the most famous predictions of the Kolmogorov theory of turbulence is the so-called Kolmogorov-obukhov five-thirds law. As is known, this law is heuristic and, to date, there is no rigorous justification. The article of A. Biryuk deals with the Cauchy problem for a multi-dimensional Burgers equation with periodic boundary conditions. Estimates in suitable norms for the corresponding solutions are derived for "large" Reynolds numbers, and their relation with the Kolmogorov-Obukhov law are discussed. Similar estimates are also obtained for the Navier-Stokes equation. In the late sixties J. L. Lions introduced a "perturbation" of the Navier Stokes equations in which he added in the linear momentum equation the hyper dissipative term  $(-Ll)u, f_3 \sim 5/4$ , where  $Ll$  is the Laplace operator. This term is referred to as an "artificial" viscosity. Even though it is not physically motivated, artificial viscosity has proved a useful device in numerical simulations of the Navier-Stokes equations at high Reynolds numbers. The paper of D. Chae and J. Lee investigates the global well-posedness of a modification of the Navier Stokes equation similar to that introduced by Lions, but where now the original dissipative term  $-Ll u$  is replaced by  $(-Ll)O:u, 0 S Ct$

The present volume celebrates the 60th birthday of Professor Giovanni Paolo Galdi and honors his remarkable contributions to research in the field of Mathematical Fluid Mechanics. The book contains a collection of 35 peer reviewed papers, with authors from 20 countries, reflecting the worldwide impact and great inspiration by his work over the years. These papers were selected from invited lectures and contributed talks presented at the International Conference on Mathematical Fluid Mechanics held in Estoril, Portugal, May 21 – 25, 2007 and organized on the occasion of Professor Galdi's 60th birthday. We express our gratitude to all the authors and reviewers for their important contributions. Professor Galdi devotes his career to research on the mathematical analysis of the Navier-Stokes equations and non-Newtonian flow problems, with special emphasis on hydrodynamic stability and fluid-particle interactions, impressing the worldwide mathematical communities with his results. His numerous contributions have laid down significant milestones in these fields, with a great influence on interdisciplinary research communities. He has advanced the careers of numerous young researchers through his generosity and encouragement, some directly through intellectual guidance and others indirectly by pairing them with well chosen senior collaborators. A brief review of Professor Galdi's activities and some impressions by colleagues and friends are included here.

Pt. I. Recent developments in computational fluid dynamics. ch. 1. Cavity flow -- ch. 2. Hovering aerodynamics. ch. 3. Capturing correct solutions -- pt. II. Recent developments in mathematical physics. ch. 1. Probabilistic and deterministic description. ch. 2. Scaling theories. ch. 3. Chaos in iterative maps -- pt. III. Recent developments in linear algebra. ch. 1. Operator Trigonometry. ch. 2. Antieigenvalues. ch. 3. Computational linear algebra

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