



Recent Research Advances in the Fluid Mechanics of Turbulent Jets and Plumes

Edited by

P. A. Davies and M. J. Valente Neves

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Recent Research Advances In The Fluid Mechanics Of Turbulent Jets And Plumes

**Georgos C. Christodoulou, Anastasios I.
Stamou**



Recent Research Advances In The Fluid Mechanics Of Turbulent Jets And Plumes:

Recent Research Advances in the Fluid Mechanics of Turbulent Jets and Plumes P.A. Davies, M.J. Valente

Neves, 2012-12-06 Challenging problems involving jet and plume phenomena are common to many areas of fundamental and applied scientific research and an understanding of plume and jet behaviour is essential in many geophysical and industrial contexts For example in the field of meteorology where pollutant dispersal takes place by means of atmospheric jets and plumes formed either naturally under conditions of convectively driven flow in the atmospheric boundary layer or anthropogenically by the release of pollutants from tall chimneys In other fields of geophysics buoyant plumes and jets are known to play important roles in oceanic mixing processes both at the relatively large scale as in deep water formation by convective sinking and at the relatively small scale as with plume formation beneath ice leads for example In the industrial context the performances of many engineering systems are determined primarily by the behaviour of buoyant plumes and jets For example i in sea outfalls where either sewage or thermal effluents are discharged into marine and or freshwater environments ii in solar ponds where buoyant jets are released under density interfaces iii in buildings where thermally generated plumes affect the air quality and ventilation properties of architectural environments iv in rotating machinery where fluid jet are used for cooling purposes and v in long road and rail tunnels where safety and ventilation procedures rely upon an understanding of the behaviour of buoyant jets In many other engineering and oceanographic contexts the properties of jets and plumes are of great importance

Turbulent Jets and Plumes Joseph Hun-wei Lee, Vincent

Chu, 2012-12-06 Jets and plumes are shear flows produced by momentum and buoyancy forces Examples include smokestack emissions fires and volcano eruptions deep sea vents thermals sewage discharges thermal effluents from power stations and ocean dumping of sludge Knowledge of turbulent mixing by jets and plumes is important for environmental control impact and risk assessment *Turbulent Jets and Plumes* introduces the fundamental concepts and develops a Lagrangian approach to model these shear flows This theme persists throughout the text starting from simple cases and building towards the practically important case of a turbulent buoyant jet in a density stratified crossflow Basic ideas are illustrated by ample use of flow visualization using the laser induced fluorescence technique The text includes many illustrative worked examples comparisons of model predictions with laboratory and field data and classroom tested problems An interactive PC based virtual reality modelling software VISJET is also provided Engineering and science students researchers and practitioners may use the book both as an introduction to the subject and as a reference in hydraulics and environmental fluid mechanics

Proceedings of the IUTAM Symposium on Turbulent/Non-Turbulent Interface in Turbulent Shear Flows Jinjun Wang, Ivan Marusic, 2024-12-16 The turbulent non turbulent interface TNTI is an irregular boundary between turbulent and irrotational flow which widely exists in various flow types such as turbulent boundary layer combustion flame front turbulent patches in atmosphere and ocean pollutant dispersion etc Due to its importance in affecting the intermittent characteristic and the

mixing and entrainment process of turbulent flows TNTI has become one of the most active branches of turbulent research in the past decades Nevertheless the scientific community still faces various challenges that hinder an ultimate characterization and modelling of TNTI The unresolved problems to name a few spread from the lack of a well accepted definition of TNTI to the intriguing origin of its fractal multi scale nature The dynamics of TNTI which is the key for the mechanism of the exchange of mass momentum and energy between turbulence and irrotational outflows also deserves an interpretation from the perspective of turbulent structures This book presents the proceedings of the IUTAM Symposium on turbulent non turbulent interface in turbulent shear flow will be held in 2024 Oct This book will collect the up to date works from active researchers worldwide to anchor the state of art knowledge of TNTI and to envision the future direction of this field The focus includes but is not limited to the scaling for the geometries kinematics and dynamics of TNTI the role of turbulent structures in the entrainment process multiphase flow with TNTI high fidelity turbulent model that accounts for the intermittency of TNTI and reduce order model based prediction for engineering application The content is a valuable reference for researchers engineers and students who are interested in understanding the complex behavior of TNTI in turbulent shear flows This is an open access book **Coanda Effect** Noor A Ahmed, 2019-08-28 Coanda effect is a complex fluid flow phenomenon enabling the production of vertical take off landing aircraft Other applications range from helicopters to road vehicles from flow mixing to combustion from noise reduction to pollution control from power generation to robot operation and so forth Book starts with description of the effect its history and general formulation of governing equations simplifications used in different applications Further it gives an account of this effect s lift boosting potential on a wing and in non flying vehicles including industrial applications Finally occurrence of the same in human body and associated adverse medical conditions are explained Environmental Hydraulics. Volume 1 Georgos C. Christodoulou, Anastasios I. Stamou, 2022-03-07 Over the last two decades environmental hydraulics as an academic discipline has expanded considerably caused by growing concerns over water environmental issues associated with pollution and water balance problems on regional and global scale These issues require a thorough understanding of processes related to environmental flows and transport phenomena and the development of new approaches for practical solutions Environmental Hydraulics includes about 200 contributions from 35 countries presented at the 6th International Symposium on Environmental Hydraulics Athens Greece 23-25 June 2010 They cover the state of the art on a broad range of topics including fundamentals aspects of environmental fluid mechanics environmental hydraulics problems of inland coastal and ground waters interfacial processes computational experimental and field measurement techniques ecological aspects and effects of global climate change Environmental Hydraulics will be of interest to researchers civil environmental engineers and professional engineers dealing with the design and operation of environmental hydraulic works such as wastewater treatment and disposal river and marine constructions and to academics and graduate students in related fields *Environmental Hydraulics, Two Volume Set*

George C. Christodoulou, Anastasios I. Stamou, 2010-06-09 Over the last two decades environmental hydraulics as an academic discipline has expanded considerably caused by growing concerns over water environmental issues associated with pollution and water balance problems on regional and global scale These issues require a thorough understanding of processes related to environmental flows and transport Environmental Fluid Mechanics Wolfgang Rodi, Markus

Uhlmann, 2012-05-28 This book contains the written versions of invited lectures presented at the Gerhard H Jirka Memorial Colloquium on Environmental Fluid Mechanics held June 3 4 2011 in Karlsruhe Germany Professor Jirka was widely known for his outstanding work in Environmental Fluid Mechanics and 23 eminent world leading experts in this field contributed to

Transport and Fate of Chemicals in the Environment John S. Gulliver, 2012-12-12 What happens when a chemical is released into the environment It diffuses disperses adsorbs reacts and or changes state To predict and analyze this process the mathematics of diffusion is applied to lakes rivers groundwater the atmosphere the oceans and transport between these media A sustainable world requires a deep understanding of the transport of chemicals through the environment and how to address and harness this process This volume presents a succinct and in depth introduction to this critical topic Featuring authoritative peer reviewed articles from the Encyclopedia of Sustainability Science and Technology Transport and Fate of Chemicals in the Environment represents an essential one stop reference for an audience of researchers undergraduate and graduate students and industry professionals *Advances in Turbulence V* Roberto Benzi, 2012-12-06 Under the auspices of

the Euromech Committee the Fifth European Turbulence Conference was held in Siena on 5 8 July 1994 Following the previous ETC meeting in Lyon 1986 Berlin 1988 Stockholm 1990 and Delft 1992 the Fifth ETC was aimed at providing a review of the fundamental aspects of turbulence from a theoretical numerical and experimental point of view In the magnificent town of Siena more than 250 scientists from all over the world spent four days discussing new ideas on turbulence As a research worker in the field of turbulence I must say that the works presented at the Conference on which this book is based covered almost all areas in this field I also think that this book provides a major opportunity to have a complete overview of the most recent research works I am extremely grateful to Prof C Cercignani Dr M Loffredo and Prof R Piva who as members of the local organizing committee share the success of the Conference I also want to thank Mrs Liu Catena for her invaluable contribution to the work done by the local organizing committee and the European Turbulence Committee in the scientific organization of the meeting The Servizio Congressi of the University of Siena provided perfect organization in Siena and wonderful hospitality The Conference has been supported by CNR Cira Alenia the Universities of

Rome Tor Vergata and La Sapienza Environmental Fluid Mechanics Hayley H. Shen, Alexander H.D. Cheng, Keh-Han Wang, Michelle H. Teng, Clark C. K. Liu, 2002-01-01 Sponsored by the Fluids Committee of the Engineering Mechanics Division of ASCE This report provides environmental engineers with a comprehensive survey of recent developments in the application of fluid mechanics theories to treat environmental problems Chapters cover principles of fluid mechanics as well

as contemporary applications to environmental problems involving river lake coastal and groundwater areas Topics include turbulent diffusion mixing of a turbulent jet in crossflow the advected line puff multi phase plumes in uniform stratified and flowing environments turbulent transport processes across natural streams three dimensional hydrodynamic and salinity transport modeling in estuaries fluid flows and reactive chemical transport in variably saturated subsurface media heat and mass transport in porous media parameter identification of environmental systems finite element analysis of stratified lake hydrodynamics water quality modeling in reservoirs and linear systems approach to river water quality analysis In addition to providing valuable information to practitioners this book also serves as a text for an advanced undergraduate or introductory graduate level course Turbulence in River and Maritime Hydraulics Michele Mossa,Donatella Termini,Peter A.

Davies,2019-03-08 Understanding of the role of turbulence in controlling transport processes is of paramount importance for the preservation and protection of aquatic ecosystems the minimization of the deleterious consequences of anthropogenic activity and the successful sustainable development of river and maritime areas In this context the present Special Issue collects 15 papers which provide a representation of the present understanding of turbulent processes and their effects in river and maritime environments The presented collection of papers is not exhaustive but it highlights the key priority areas and knowledge gaps in this field of research The published papers present the state of the art knowledge of complex environmental flows which are useful for researchers and practitioners The paper contents are an overview of some recent topics of research and an exposure of the current and future challenges associated with these topics Shallow Flows

Gerhard H. Jirka,Wim S.J. Uijttewaai,2004-09-15 This text presents the key findings of the International Symposium held in Delft in 2003 which explored the process of shallow flows Shallow flows are found in lowland rivers lakes estuaries bays coastal areas and in density stratified atmospheres and may be observed in puddles as in oceans They impact on the life and work of a wide variety of readers who are here provided with a clear overview of the subject Shallow flows are intrinsically turbulent On one hand there are strongly three dimensional small scale turbulent motions and on the other hand large scale quasi two dimensional turbulence This book explains and examines these differences and their effects with sections on transport processes in shallow flows shallow jets wakes and mixing layers stratified and rotating flows in ocean and atmosphere river and channel flows and numerical modelling and turbulence closure techniques The reader is provided with the pick of current studies and a fresh approach to the subject with expert examination of a fascinating and crucial phenomenon of our world s water systems Environmental Hydraulics V.P. Singh,Willi H. Hager,2013-06-29 Triggered

primarily by ill effects of polluted air soil and water resources on living species public concern for environmental quality has been growing during the past four decades or so One manifestation of this concern is found in occurrence of public debates as well as in the demand for full environmental impact assessment before a water resources project is approved Engineering soundness and economic feasibility are no longer sufficient criteria for construction of hydraulic works As a result

environmental considerations have become very much a part of hydraulic analyses In response to growing environmental concerns the field of hydraulics has expanded and a new branch called Environmental Hydraulics has emerged The focus of this branch is on hydraulic analyses of those environmental issues that are important for protection restoration and management of environmental quality The motivation for this book grew out of the desire to provide a hydraulic discussion of some of the key environmental issues It is hoped that the book would serve to stimulate others to write more comprehensive texts on this subject of growing importance

Progress In Astronautics and Aeronautics Herman Branover,1998

Advances in Water Resources & Hydraulic Engineering Changkuan Zhang,Hongwu Tang,2010-07-28 *Advances in Water Resources and Hydraulic Engineering* Proceedings of 16th IAHR APD Congress and 3rd Symposium of IAHR ISHS discusses some serious problems of sustainable development of human society related to water resources disaster caused by flooding or draught environment and ecology and introduces latest research in river engineering and fluvial processes estuarine and coastal hydraulics hydraulic structures and hydropower hydraulics etc The proceedings covers new research achievements in the Asian Pacific region in water resources environmental ecology river and coastal engineering which are especially important for developing countries all over the world This proceedings serves as a reference for researchers in the field of water resources water quality water pollution and water ecology Changkuan Zhang and Hongwu Tang both are professors at Hohai University China

Hydrodynamics : Theory and Applications A. T. Chwang,Joseph H. W. Lee,D. Y. C. Leung,1996

Fluid Flow Phenomena Paolo Orlandi,2000 Dealing with the simulation of the incompressible Navier Stokes equations for laminar and turbulent flows this work permits the reader to play with the Navier Stokes equations and to understand the complex physics related to fluid mechanics Numerical simulations are useful tools for understanding the complexity of the flows which often is difficult to derive from laboratory experiments This book then can be very useful to scholars doing laboratory experiments since they often do not have extra time to study the large variety of numerical methods furthermore they cannot spend more time in transferring one of the methods into a computer language By means of numerical simulations for example insights into the vorticity field can be obtained which are difficult to obtain by measurements This book can be used by graduate as well as undergraduate students while reading books on theoretical fluid mechanics it teaches how to simulate the dynamics of flow fields on personal computers This will provide a better way of understanding the theory

Environmental Hydraulics and Sustainable Water Management, Two Volume Set J.H.W. Lee,K.M. Lam,2004-12-15

This two volume set with cd rom comprises the Proceedings of the 4th International Symposium on Environmental Hydraulics the 14th Congress of Asia and Pacific Division International Association of Hydraulic Engineering and Research held in December 2004 in Hong Kong Volume 1 covers the selected papers presented at the 4th International

Remote Sensing of Turbulence Victor Raizer,2021-10-04 This book offers a unique multidisciplinary integration of the physics of turbulence and remote sensing technology Remote Sensing of Turbulence provides a new vision on the research of

turbulence and summarizes the current and future challenges of monitoring turbulence remotely The book emphasizes sophisticated geophysical applications detection and recognition of complex turbulent flows in oceans and the atmosphere Through several techniques based on microwave and optical IR observations the text explores the technological capabilities and tools for the detection of turbulence their signatures and variability FEATURES Covers the fundamental aspects of turbulence problems with a broad geophysical scope for a wide audience of readers Provides a complete description of remote sensing capabilities for observing turbulence in the earth s environment Establishes the state of the art remote sensing techniques and methods of data analysis for turbulence detection Investigates and evaluates turbulence detection signatures their properties and variability Provides cutting edge remote sensing applications for space based monitoring and forecasts of turbulence in oceans and the atmosphere This book is a great resource for applied physicists the professional remote sensing community ecologists geophysicists and earth scientists Engineering Turbulence Modelling and Experiments - 3 G. Bergeles,W. Rodi,2012-12-02 This book presents and discussses new developments in the area of turbulence modelling and measurements with particular emphasis on engineering related problems At present turbulence is one of the key issues in tackling engineering flow problems Powerful computers and numerical methods are now available for solving the flow equations but the simulation of turbulence effects which are nearly always important in practice is still in an unsatisfactory state and introduces considerable uncertainties in the accuracy of CFD calculations These and other aspects of turbulence modelling and measurements are dealt with in detail by experts in the field The resulting book is an up to date review of the most recent research in this exciting area

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