



ERCOTAC SERIES

Direct and Large Eddy Simulation II

Edited by Jean-Pierre Chollet, Peter R. Voke
and Leonhard Kleiser

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Direct And Large Eddy Simulation Ii Ercoftac Series

Brian Edward Launder, N. D. Sandham



Direct And Large Eddy Simulation II Ercoftac Series:

Direct and Large-Eddy Simulation II Jean-Pierre Chollet, Peter R. Voke, Leonhard Kleiser, 2012-12-06 Progress in the numerical simulation of turbulence has been rapid in the 1990s New techniques both for the numerical approximation of the Navier Stokes equations and for the subgrid scale models used in large eddy simulation have emerged and are being widely applied for both fundamental and applied engineering studies along with novel ideas for the performance and use of simulation for compressible chemically reacting and transitional flows This collection of papers from the second ERCOFTAC Workshop on Direct and Large Eddy Simulation held in Grenoble in September 1996 presents the key research being undertaken in Europe and Japan on these topics Describing in detail the ambitious use of DNS for fundamental studies and of LES for complex flows of potential and actual engineering importance this volume will be of interest to all researchers active in the area

Direct and Large-Eddy Simulation V Rainer Friedrich, Bernard Geurts, Olivier Métais, 2004-04-30 The fifth ERCOFTAC workshop Direct and Large Eddy Simulation 5 DLES 5 was held at the Munich University of Technology August 27 29 2003 It is part of a series of workshops that originated at the University of Surrey in 1994 with the intention to provide a forum for presentation and discussion of recent developments in the field of direct and large eddy simulation Over the years the DLES series has grown into a major international venue focussed on all aspects of DNS and LES but also on hybrid methods like RANS/LES coupling and detached eddy simulation designed to provide reliable answers to technical flow problems at reasonable computational cost DLES 5 was attended by 111 delegates from 15 countries Its three day programme covered ten invited lectures and 63 original contributions partially presented in parallel sessions The workshop was financially supported by the following companies institutions and organizations ANSYS Germany GmbH AUDI AG BMW Group ERCOFTAC FORTVER Bavarian Research Association on Combustion JM BURGERS CENTRE for Fluid Dynamics Their help is gratefully acknowledged The present Proceedings contain the written versions of nine invited lectures and fifty nine selected and reviewed contributions which are organized in four parts 1 Issues in LES modelling and numerics 2 Laminar turbulent transition 3 Turbulent flows involving complex physical phenomena 4 Turbulent flows in complex geometries and in technical applications

Direct and Large-Eddy Simulation VIII Hans Kuerten, Bernard Geurts, Vincenzo Armenio, Jochen Fröhlich, 2011-10-05 This volume continues previous DLES proceedings books presenting modern developments in turbulent flow research It is comprehensive in its coverage of numerical and modeling techniques for fluid mechanics After Surrey in 1994 Grenoble in 1996 Cambridge in 1999 Enschede in 2001 Munich in 2003 Poitiers in 2005 and Trieste in 2009 the 8th workshop DLES8 was held in Eindhoven The Netherlands again under the auspices of ERCOFTAC Following the spirit of the series the goal of this workshop is to establish a state of the art of DNS and LES techniques for the computation and modeling of transitional turbulent flows covering a broad scope of topics such as aerodynamics acoustics combustion multiphase flows environment geophysics and bio medical applications This gathering of specialists in the field was a unique

opportunity for discussions about the more recent advances in the prediction understanding and control of turbulent flows in academic or industrial situations *Direct and Large Eddy Simulation of Turbulence II* Jean-Pierre Chollet, Peter R. Voke, Leonhard Kleiser, 1997 *Quality and Reliability of Large-Eddy Simulations II* Maria Vittoria Salvetti, Bernard Geurts, Johan Meyers, Pierre Sagaut, 2010-11-03 The second Workshop on Quality and Reliability of Large Eddy Simulations QLES2009 was held at the University of Pisa from September 9 to September 11 2009 Its predecessor QLES2007 was organized in 2007 in Leuven Belgium The focus of QLES2009 was on issues related to predicting assessing and assuring the quality of LES The main goal of QLES2009 was to enhance the knowledge on error sources and on their interaction in LES and to devise criteria for the prediction and optimization of simulation quality by bringing together mathematicians physicists and engineers and providing a platform specifically addressing these aspects for LES Contributions were made by leading experts in the field The present book contains the written contributions to QLES2009 and is divided into three parts which reflect the main topics addressed at the workshop i SGS modeling and discretization errors ii Assessment and reduction of computational errors iii Mathematical analysis and foundation for SGS modeling **Direct and Large-Eddy Simulation VII** Vincenzo Armenio, Bernard Geurts, Jochen Fröhlich, 2010-04-28 After Surrey in 1994 Grenoble in 1996 Cambridge in 1999 Enschede in 2001 Munich in 2003 and Poitiers in 2005 the 7th Workshop DLES7 will be held in Trieste again under the auspices of ERCOFTAC Following the spirit of the series the goal of this latest workshop is to establish a state of the art of DNS and LES techniques for the computation and modeling of transitional turbulent flows covering a broad scope of topics such as aerodynamics acoustics combustion multiphase flows environment geophysics and bio medical applications This gathering of specialists in the field should once again be a unique opportunity for discussions about the more recent advances in the prediction understanding and control of turbulent flows in academic or industrial situations **Direct and Large Eddy Simulation XII** Manuel García-Villalba, Hans Kuerten, Maria Vittoria Salvetti, 2020-05-09 This book gathers the proceedings of the 12th instalment in the bi annual Workshop series on Direct and Large Eddy Simulation DLES which began in 1994 and focuses on modern techniques used to simulate turbulent flows based on the partial or full resolution of the instantaneous turbulent flow structure With the rapidly expanding capacities of modern computers this approach has attracted more and more interest over the years and will undoubtedly be further enhanced and applied in the future Hybrid modelling techniques based on a combination of LES and RANS approaches also fall into this category and are covered as well The goal of the Workshop was to share the state of the art in DNS LES and related techniques for the computation and modelling of turbulent and transitional flows The respective papers highlight the latest advances in the prediction understanding and control of turbulent flows in academic and industrial applications *Direct and Large-Eddy Simulation X* Dimokratis G.E. Grigoriadis, Bernard J. Geurts, Hans Kuerten, Jochen Fröhlich, Vincenzo Armenio, 2017-10-06 This book addresses nearly all aspects of the state of the art in LES DNS of turbulent flows ranging from flows in biological systems and

the environment to external aerodynamics domestic and centralized energy production combustion propulsion as well as applications of industrial interest Following the advances in increased computational power and efficiency several contributions are devoted to LES DNS of challenging applications mainly in the area of turbomachinery including flame modeling combustion processes and aeroacoustics The book includes work presented at the tenth Workshop on Direct and Large Eddy Simulation DLES 10 which was hosted in Cyprus by the University of Cyprus from May 27 to 29 2015 The goal of the workshop was to establish a state of the art in DNS LES and related techniques for the computation and modeling of turbulent and transitional flows The book is of interest to scientists and engineers both in the early stages of their career and at a more senior level *Direct and Large-Eddy Simulation I* Peter R. Voke, Leonhard Kleiser, Jean-Pierre Chollet, 2012-12-06

It is a truism that turbulence is an unsolved problem whether in scientific engineering or geophysical terms It is strange that this remains largely the case even though we now know how to solve directly with the help of sufficiently large and powerful computers accurate approximations to the equations that govern turbulent flows The problem lies not with our numerical approximations but with the size of the computational task and the complexity of the solutions we generate which match the complexity of real turbulence precisely in so far as the computations mimic the real flows The fact that we can now solve some turbulence in this limited sense is nevertheless an enormous step towards the goal of full understanding Direct and large eddy simulations are these numerical solutions of turbulence They reproduce with remarkable fidelity the statistical structural and dynamical properties of physical turbulent and transitional flows though since the simulations are necessarily time dependent and three dimensional they demand the most advanced computer resources at our disposal The numerical techniques vary from accurate spectral methods and high order finite differences to simple finite volume algorithms derived on the principle of embedding fundamental conservation properties in the numerical operations Genuine direct simulations resolve all the fluid motions fully and require the highest practical accuracy in their numerical and temporal discretisation Such simulations have the virtue of great fidelity when carried out carefully and represent a most powerful tool for investigating the processes of transition to turbulence *Direct and Large-Eddy Simulation XI* Maria Vittoria Salvetti, Vincenzo Armenio, Jochen Fröhlich, Bernard J. Geurts, Hans Kuerten, 2019-02-02

This book gathers the proceedings of the 11th workshop on Direct and Large Eddy Simulation DLES which was held in Pisa Italy in May 2017 The event focused on modern techniques for simulating turbulent flows based on the partial or full resolution of the instantaneous turbulent flow structures as Direct Numerical Simulation DNS Large Eddy Simulation LES or hybrid models based on a combination of LES and RANS approaches In light of the growing capacities of modern computers these approaches have been gaining more and more interest over the years and will undoubtedly be developed and applied further The workshop offered a unique opportunity to establish a state of the art of DNS LES and related techniques for the computation and modeling of turbulent and transitional flows and to discuss about recent advances and applications This volume contains most of the contributed

papers which were submitted and further reviewed for publication They cover advances in computational techniques SGS modeling boundary conditions post processing and data analysis and applications in several fields namely multiphase and reactive flows convection and heat transfer compressible flows aerodynamics of airfoils and wings bluff body and separated flows internal flows and wall turbulence and other complex flows *Direct and Large-Eddy Simulation VI* E.

Lamballais,Rainer Friedrich,Bernard J. Geurts,Olivier Métais,2006-10-19 The sixth ERCOFTAC Workshop on Direct and Large Eddy Simulation DLES 6 was held at the University of Poitiers from September 12 14 2005 Following the tradition of previous workshops in the DLES series this edition has reflected the state of the art of numerical simulation of transitional and turbulent flows and provided an active forum for discussion of recent developments in simulation techniques and understanding of flow physics *Direct and Large-Eddy Simulation IX* Jochen Fröhlich,Hans Kuerten,Bernard J.

Geurts,Vincenzo Armenio,2015-01-27 This volume reflects the state of the art of numerical simulation of transitional and turbulent flows and provides an active forum for discussion of recent developments in simulation techniques and understanding of flow physics Following the tradition of earlier DLES workshops these papers address numerous theoretical and physical aspects of transitional and turbulent flows At an applied level it contributes to the solution of problems related to energy production transportation magneto hydrodynamics and the environment A special session is devoted to quality issues of LES The ninth Workshop on Direct and Large Eddy Simulation DLES 9 was held in Dresden April 3 5 2013 organized by the Institute of Fluid Mechanics at Technische Universität Dresden This book is of interest to scientists and engineers both at an early level in their career and at more senior levels **Direct and Large Eddy Simulation XIII**

Cristian Marchioli,Maria Vittoria Salvetti,Manuel Garcia-Villalba,Philipp Schlatter,2023-11-15 This book covers the diverse and cutting edge research presented at the 13th ERCOFTAC Workshop on Direct and Large Eddy Simulation The first section of the book focuses on Aerodynamics Aeroacoustics comprising eight papers that delve into the intricate relationship between fluid flow and aerodynamic performance The second section explores the dynamics of Bluff Moving Bodies through four insightful papers Bubbly Flows the subject of the third section is examined through four papers Moving on the fourth section is dedicated to Combustion and Reactive Flows presenting two papers that focus on the complex dynamics of combustion processes and the interactions between fluids and reactive species Convection and Heat Mass Transfer are the central themes of the fifth section which includes three papers These contributions explore the fundamental aspects of heat and mass transfer in fluid flows addressing topics such as convective heat transfer natural convection and mass transport phenomena The sixth section covers Data Assimilation and Uncertainty Quantification featuring two papers that highlight the importance of incorporating data into fluid dynamic models and quantifying uncertainties associated with these models The subsequent sections encompass a wide range of topics including Environmental and Industrial Applications Flow Separation LES Fundamentals and Modelling Multiphase Flows and Numerics and Methodology These sections collectively present a

total of 23 papers that explore different facets of fluid dynamics contributing to the advancement of the field and its practical applications **Closure Strategies for Turbulent and Transitional Flows** Brian Edward Launder,N. D.

Sandham,2002-02-21 Publisher Description **Particle-Laden Flow** Bernard Geurts,Herman Clercx,Wim

Uijttewaai,2007-08-27 This book contains a selection of the papers that were presented at the EUROMECH colloquium on particle laden flow held at the University of Twente in 2006 The multiscale nature of this challenging field motivated the calling of the colloquium and reflects the central importance that the dispersion of particles in a flow has in various geophysical and environmental problems The spreading of aerosols and soot in the air the growth and dispersion of plankton blooms in seas and oceans or the transport of sediment in rivers estuaries and coastal regions are striking examples

Parallel Computational Fluid Dynamics 2000 C.B. Jenssen,T. Kvamdal,H.I. Andersson,B. Pettersen,P. Fox,N. Satofuka,A. Ecer,Jacques Periaux,2001-04-27 Parallel CFD 2000 the Twelfth in an International series of meetings featuring computational fluid dynamics research on parallel computers was held May 22 25 2000 in Trondheim Norway Following the trend of the past conferences areas such as numerical schemes and algorithms tools and environments load balancing as well as interdisciplinary topics and various kinds of industrial applications were all well represented in the work presented In addition for the first time in the Parallel CFD conference series the organizing committee chose to draw special attention to certain subject areas by organizing a number of special sessions We feel the emphasis of the papers presented at the conference reflect the direction of the research within parallel CFD at the beginning of the new millennium It seems to be a clear tendency towards increased industrial exploitation of parallel CFD Several presentations also demonstrated how new insight is being achieved from complex simulations and how powerful parallel computers now make it possible to use CFD within a broader interdisciplinary setting Obviously successful application of parallel CFD still rests on the underlying fundamental principles Therefore numerical algorithms development tools and parallelization techniques are still as important as when parallel CFD was in its infancy Furthermore the novel concepts of affordable parallel computing as well as metacomputing show that exciting developments are still taking place As is often pointed out however the real power of parallel CFD comes from the combination of all the disciplines involved Physics mathematics and computer science This is probably one of the principal reasons for the continued popularity of the Parallel CFD Conferences series as well as the inspiration behind much of the excellent work carried out on the subject We hope that the papers in this book both on an individual basis and as a whole will contribute to that inspiration Further details of Parallel CFD 99 as well as other conferences in this series are available at <http://www.parcfd.org> Direct and Large-Eddy Simulation IV Bernard Geurts,Rainer Friedrich,Olivier Métais,2013-06-29 The workshop Direct and Large Eddy Simulation 4 was held at the University of Twente July 18 20 2001 DLES4 is part of a series of ERCOFTAC workshops that originated at the University of Surrey in 1994 Over the years the DLES series has grown into a major international venue focused on the development and

application of direct and large eddy simulation Fundamental turbulence and modeling issues but also elements from modern numerical analysis are at the heart of this field of interest a fact which is clearly reflected by the contents of these proceedings Modeling and simulation of complex flow phenomena forms a central element in a large volume of scientific and applied research The problem of simulating turbulent flows and capturing their main dynamical features remains a highly motivating challenge This three day workshop focused on recent developments in numerical and physical modeling of complex flow phenomena concentrating on modern strategies in the field of direct and large eddy simulation A major aim was to promote the exchange of ideas and problems from both industrial and academic background paying attention to physical mathematical and engineering aspects

Direct and Large-Eddy Simulation VII Vincenzo Armenio, Bernard Geurts, Jochen Fröhlich, 2010 The seventh ERCOFTAC Workshop on Direct and Large Eddy Simulation DLES 7 was held at the University of Trieste from September 8-10 2008 Following the tradition of previous workshops in the DLES series this edition reflects the state of the art of numerical simulation of transitional and turbulent flows and provided an active forum for discussion of recent developments in simulation techniques and understanding of flow physics At a fundamental level this workshop addressed numerous theoretical and physical aspects of transitional and turbulent flows At an applied level it contributes to the solution of problems related to energy production transportation and the environment This book is of interest to scientists and engineers both at an early level in their career as well as at more senior levels

International Aerospace Abstracts, 1998

Turbulent Flow Computation D. Drikakis, Bernard Geurts, 2002-03-31 In various branches of fluid mechanics our understanding is inhibited by the presence of turbulence Although many experimental and theoretical studies have significantly helped to increase our physical understanding a comprehensive and predictive theory of turbulent flows has not yet been established Therefore the prediction of turbulent flow relies heavily on simulation strategies The development of reliable methods for turbulent flow computation will have a significant impact on a variety of technological advancements These range from aircraft and car design to turbomachinery combustors and process engineering Moreover simulation approaches are important in materials sign prediction of biologically relevant flows and also significantly contribute to the understanding of environmental processes including weather and climate forecasting The material that is compiled in this book presents a coherent account of contemporary computational approaches for turbulent flows It aims to provide the reader with information about the current state of the art as well as to stimulate directions for future research and development The book puts particular emphasis on computational methods for incompressible and compressible turbulent flows as well as on methods for analysing and quantifying numerical errors in turbulent flow computations In addition it presents turbulence modelling approaches in the context of large eddy simulation and unfolds the challenges in the field of simulations for multiphase flows and computational fluid dynamics CFD of engineering flows in complex geometries Apart from reviewing main research developments new material is also included in many of the chapters

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