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ERCOFTAC (European Research Community on Flow, Turbulence and Combustion) was founded as an international association with scientific objectives in 1988. ERCOFTAC strongly promotes joint efforts of European research institutes and industries that are active in the field of flow, turbulence and combustion, in order to enhance the exchange of technical and scientific information on fundamental and applied research and design. Each year, ERCOFTAC organizes several meetings in the form of workshops, conferences and summerschools, where ERCOFTAC members and other researchers meet and exchange information.

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Direct and Large-Eddy Simulation XI

 Springer

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Preface

The DLES Workshop series, which started in 1994, focuses on modern techniques to simulate 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.

With the growing capacities of modern computers, these approaches have been gaining more and more interest over the years. Significant progress has been made in computational techniques as well as in subgrid scale (SGS) modeling. In parallel, these approaches are applied to more and more complex flow problems and configurations, both in academic and industrial contexts, and they will undoubtedly be further enhanced and applied in the future. Nonetheless, open problems and challenges still remain. The increasing complexity of the simulated problems and the use of turbulence resolving approaches in an engineering context require the development of numerical methods being accurate but at the same time able to deal with complex geometries and/or with physical phenomena interacting with turbulence, e.g., particle/droplet dispersion, combustion, or heat transfer. At the same time, physical models must be developed, improved, and validated for the increasing complexity and variety of applications. Validation is indeed a crucial issue for LES and hybrid simulations, since different sources of errors may be present (numerics, boundary conditions, closure models) and these errors may interact in a complicated way. Moreover, systematic sensitivity studies to computational or modeling parameters are difficult to be carried out because of the large cost of each single simulation. On the other hand, the availability of more and more DNS data sets provides a detailed and accurate reference to validate the other approaches and to guide in the development of physical models.

The goal of the workshop series is 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 provide an opportunity for discussions about recent advances and applications.

The 11th edition of the bi-annual Workshop series on Direct and Large-Eddy Simulation (DLES11) was held in Pisa, Italy on May 29–31, 2017. A record number of 140 participants from 17 different countries attended this 3-day workshop. The majority of participants was from academia and research institutes, but several companies were also represented. Eight keynote lectures were given by experts in different scientific fields: extreme scale direct numerical simulations of turbulent combustion (Jacqueline Chen, Sandia National Laboratories, USA), modulation and control of jets and flames (Arthur Tyliczszak, University of Czestochowa, Poland), ocean modeling and idealized DNS applied to rotating and stratified flows (Beth Wingate, University of Exeter, UK), direct numerical simulations of fluid–structure interaction in biological flows (Marco De Tullio, Politecnico di Bari, Italy), simulation and control of wind farms by means of large-eddy simulation (Johan Meyers, Katholieke Universiteit Leuven, Belgium), new insight on how roughness affects the dynamics of turbulence (Ugo Piomelli, Queen’s University, Kingston, Canada), applications of DNS and LES to multiphase flows of industrial interest (Djamel Lakehal, ASCOMP, Switzerland), and direct numerical simulations of particulate flows (Markus Uhlmann, Karlsruhe Institute of Technology, Germany).

Next to the invited lectures, 114 oral and poster presentations were selected by a Scientific Committee of 28 experts. 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.

The organization of DLES11 and the preparation of these proceedings would not have been possible without the help of many. Funding from ERCOFTAC (SIG1) enabled the participation of Ph.D. students to DLES11 to be supported. J. M. Burgerscentrum and University of Pisa are also gratefully acknowledged for their support. Finally, thanks go to the members of the Scientific Committee for their help in reviewing the submitted abstracts and the contributions to the proceedings.

Pisa, Italy
March 2018

Maria Vittoria Salvetti
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Contents

Part I Numerical Methods

| | |
|--|----|
| Adaptive Direct Numerical Simulation with Spatially-Anisotropic Wavelet-Based Refinement | 3 |
| G. De Stefano, E. Brown-Dymkoski and O. V. Vasilyev | |
| Towards Adaptive Mesh Refinement for the Spectral Element Solver Nek5000 | 9 |
| N. Offermans, A. Peplinski, O. Marin, P. F. Fischer and P. Schlatter | |
| Discrete Conservation of Helicity in Numerical Simulations of Incompressible Turbulent Flows | 17 |
| D. Vallefucoco, F. Capuano and G. Coppola | |
| A Massively Parallel, Direction-Splitting Solver for DNS in Complex Geometries | 23 |
| F. Auteri, M. D. de Tullio, J.-L. Guermond, D. Montagnani and P. D. Konghar | |
| An Analysis of Time-Integration Errors in Large-Eddy Simulation of Incompressible Turbulent Flows | 31 |
| F. Capuano, E. M. De Angelis, G. Coppola and L. de Luca | |
| Evaluation of the Spectral Element Dynamic Model for LES on Unstructured, Deformed Meshes | 39 |
| G. Lodato and J. B. Chapelier | |
| A Discontinuous Galerkin Variational Multiscale Approach to LES of Turbulent Flows | 47 |
| M. de la Llave Plata, E. Lamballais and V. Couaillier | |
| Implicit LES Approaches via Discontinuous Galerkin Methods at Very Large Reynolds | 53 |
| R. C. Moura, J. Peiró and S. J. Sherwin | |

| | |
|--|-----|
| Implicit LES of a Turbulent Channel Flow with High-Order Discontinuous Galerkin and Finite Volume Discretization | 61 |
| M. Bergmann, C. Morsbach and M. Franke | |
| An Implicit Discontinuous Galerkin Method with Reduced Memory Footprint for the Simulation of Turbulent Flows | 69 |
| A. Crivellini, M. Franciolini and A. Nigro | |
| On the Development of an Implicit High-Order Discontinuous Galerkin Solver for a Hybrid RANS-LES Model | 75 |
| F. Bassi, L. Botti, A. Colombo, A. Ghidoni, F. Massa and G. Noventa | |
| Assessment of High-Order Discontinuous Galerkin Methods for LES of Transonic Flows | 83 |
| J. S. Cagnone, Z. Zeren, A. Châtel, M. Rasquin, K. Hillewaert and L. Bricteux | |
| Efficient Pressure-Correction Method for Interfacial Tracking Appropriate for the Immersed Boundary Method | 91 |
| C. Frantzis and D. G. E. Grigoriadis | |
| Part II LES Modeling | |
| On the Eddy Viscosity Associated with the Subgrid Stresses | 101 |
| A. Cimarelli, A. Abbà and M. Germano | |
| Implicit/Explicit Spectral Viscosity and Large-Scale SGS Effects | 107 |
| E. Lamballais, T. Dairay, S. Laizet and J. C. Vassilicos | |
| Realizable Dynamic Large Eddy Simulation | 115 |
| R. Mokhtarpoor, S. Heinz and M. K. Stoellinger | |
| The Dynamic Smagorinsky Model in 512^3 Pseudo-Spectral LES of Decaying Homogeneous Isotropic Turbulence at Very High Re_λ | 123 |
| O. Thiry, G. Winckelmans and M. Duponcheel | |
| Nonlinear Subgrid-Scale Models for Large-Eddy Simulation of Rotating Turbulent Flows | 129 |
| M. H. Silvis and R. Verstappen | |
| A New Subgrid Characteristic Length for LES | 135 |
| F. X. Trias, A. Gorobets and A. Oliva | |
| On the Richardson Extrapolation of the Reynolds Stress with the Systematic Grid and Model Variation Method | 143 |
| M. Klein, G. Scovazzi and M. Germano | |
| Spatial Filtering for Reduced Order Modeling | 151 |
| L. C. Berselli, D. Wells, X. Xie and T. Iliescu | |

A RANS Assisted LES Approach 159
 A. Abbà, M. Germano and M. Nini

Part III Pre-processing, Post-processing and Data Analysis

Analysis of a Synthetic Turbulence Generation Method for Periodic Configurations 169
 C. Morsbach and M. Franke

The Effect of Lossy Data Compression in Computational Fluid Dynamics Applications: Resilience and Data Postprocessing 175
 E. Otero, R. Vinuesa, P. Schlatter, O. Marin, A. Siegel and E. Laure

Augmented Prediction of Turbulent Flows via Sequential Estimators 183
 M. Meldi and A. Poux

Part IV Multiphase and Reactive Flows

High Performance CFD/DEM Approach in Complex Geometries on Unstructured Meshes 193
 Y. Dufresne, G. Lartigue, V. Moureau, E. Masi and O. Simonin

Direct Numerical Simulation of Spherical Bubbles in a Downward Turbulent Channel Flow 201
 C. Santarelli and J. Fröhlich

DNS of Thermocapillary Migration of Deformable Droplets 207
 N. Balcázar, O. Antepará, J. Rigola and A. Oliva

The Motion of Settling Particles in Isotropic Turbulence: Filtering Impact and Kinematic Simulations as Subfilter Model 215
 J. Pozorski and B. Rosa

Evaporation Dynamics in Dilute Turbulent Jet Sprays 221
 F. Dalla Barba and F. Picano

A Novel Turbulent Inflow Data Generation Method and its Application to the Simulation of Primary Breakup 229
 S. Ketterl and M. Klein

Studying Transient Jet Flames by High-Resolution LES Using Premixed Flamelet Chemistry 237
 E. Inanc, F. Proch and A. M. Kempf

Identification of Combustion Trajectories Using t-Distributed Stochastic Neighbor Embedding (t-SNE) 245
 E. Fooladgar and C. Duwig

| | |
|--|-----|
| Impact of Scalar Dissipation Rate on Turbulent Spray Combustion Investigated by DNS | 253 |
| A. Abdelsamie and D. Thévenin | |
| Modeling of Convective and Conductive Conjugate Heat Transfer in a Kerosene/Air Spray Flame Used for Aeronautical Fire Resistance Tests | 261 |
| L. Boulet, P. Bénard, G. Lartigue, V. Moureau and S. Didorally | |
| Part V Convection and Heat Transfer | |
| Towards the Direct Numerical Simulation of a Simplified Pressurized Thermal Shock | 269 |
| A. Shams and E. M. J. Komen | |
| Study of the Flow Around a Heated Cylinder in Mixed Convection Regime | 277 |
| S. Rolfo, K. Kopsidas, S. A. Rahman, C. Moulinec and D. R. Emerson | |
| Direct Numerical Simulation of Convective Turbulent Channel Flow of Fluid Mixtures | 285 |
| P. Bahavar and C. Wagner | |
| Momentum and Buoyancy Repartition in Turbulent Mixed Convection | 291 |
| T. Wetzel and C. Wagner | |
| Buoyancy-Driven Flow Inside An Asymmetrically Heated Cavity | 299 |
| A. D. Demou, D. G. E. Grigoriadis and B. J. Geurts | |
| LES of Natural Convection in a Closed Cavity | 307 |
| A. Pilkington and B. Rosic | |
| Part VI Compressible Flows | |
| Polynomial Adaptivity in LES: Application to Compressibility Effects Investigation on Bluff Bodies | 317 |
| M. Tugnoli and A. Abbà | |
| Direct Numerical Simulation of Compressible Flows Around Spherical Bodies Using the Immersed Boundary Method | 325 |
| H. Riahi, E. Constant, J. Favier, P. Meliga, E. Serre, M. Meldi and E. Goncalves | |
| Large Eddy Simulation of Highly Compressible Jets with Tripped Boundary Layers | 333 |
| R. Gojon, C. Bogey and M. Mihaescu | |

Analysis of Dense Gas Effects in Compressible Turbulent Channel Flows 341
 L. Sciacovelli, P. Cinnella and X. Gloerfelt

Part VII Airfoils and Wings

Effect of Inflow Turbulence on LES of an Airfoil Flow with Laminar Separation Bubble 351
 M. Breuer and S. Schmidt

Flow Around Thick Airfoils at Very High Reynolds Number. Stall and Dynamic Stall Applications 359
 F. Barnaud, P. Bénard, G. Lartigue, V. Moureau and P. Deglaire

On the Resolution of Mean Skin Friction by Hybrid RANS/LES Simulations at High Reynolds Numbers 367
 N. Renard and S. Deck

DNS of Separated Low-Re Flow Around a Cambered Aerofoil 373
 M. F. Shahab, M. Omidyeganeh and A. Pinelli

High Reynolds Number Airfoil: From Wall-Resolved to Wall-Modeled LES 381
 A. Frère, K. Hillewaert, P. Chatelain and G. Winckelmans

Robust Feedback Control of Two and Three Dimensional Flow Separation Around a NACA0012 Profile Using Plasma Actuators 389
 R. Broglia, D. Durante and L. Pasquale

Performance Analysis of a Heaving Wing Using DNS and LES 397
 N. De Tullio, Z. Xie, J. Chalke and N. D. Sandham

A Numerical Study of Low-Aspect-Ratio Flapping-Wings in Forward Flight 405
 A. Gonzalo, G. Arranz, M. Moriche, O. Flores and M. García-Villalba

The Influence of the Reynolds Number on the Auto-Rotation of Samaras 411
 G. Arranz, M. Moriche, M. Uhlmann, O. Flores and M. García-Villalba

Part VIII Bluff-Body and Separated Flows

A Priori Analysis and Benchmarking of the Flow Around a Rectangular Cylinder 419
 A. Cimarelli, A. Leonforte and D. Angeli

Benchmark on the Aerodynamics of a 5:1 Rectangular Cylinder: Further Experimental and LES Results 427
 C. Mannini, A. Mariotti, L. Siconolfi and M. V. Salvetti

| | |
|--|-----|
| Large-Eddy Simulation of a Sheared Air-Water Flow Around a Cylinder | 433 |
| S. López Castaño and V. Armenio | |
| Scaling Laws in the Axisymmetric Wake of a Sphere | 439 |
| K. Chongsiripinyo, A. Pal and S. Sarkar | |
| Hybrid Versus Pure-LES Models Comparison for Subcritical Cylinder Flows | 445 |
| E. Itam, S. Wornom, B. Koobus and A. Dervieux | |
| Modeling of Wind Gusts for Large-Eddy Simulations Related to Fluid-Structure Interactions | 453 |
| G. De Nayer, M. Breuer, P. Perali and K. Grollmann | |
| Dissipation in Front of a Wall-Mounted Bluff Body | 461 |
| W. Schanderl and M. Manhart | |
| Dynamic Unified RANS-LES Simulations of Periodic Hill Flow | 469 |
| R. Mokhtarpoor, S. Heinz and M. K. Stoellinger | |
| DNS of Separated Flow: Scale-by-Scale Analysis | 477 |
| J.-P. Mollicone, F. Battista, P. Gualtieri and C. M. Casciola | |
| Investigation of Turbulent Flow Over Two Wall-Mounted Cubes Using LBM | 483 |
| M. Teng and D. J. Bergstrom | |
| Drag Reduction of Boat-Tailed Bluff Bodies Through Transverse Grooves | 489 |
| A. Mariotti, G. Buresti and M. V. Salvetti | |
| Flow Over a Realistic Car Model: WMLES Assessment and Turbulent Structures | 497 |
| D. E. Aljure, J. Calafell, A. Báez and A. Oliva | |
| Numerical Study of the Flow Around 25° Ahmed Bodies with Hybrid Turbulence Models | 505 |
| F. Delassaux, I. Mortazavi, V. Herbert and C. Ribes | |
| Part IX Internal Flows and Wall Turbulence | |
| Large Eddy Simulation of a Compressor Blade Passage Operating at Low Reynolds Number | 513 |
| O. Wilsby, S. Rolfo, A. Agarwal, P. Harley and C. Moulinec | |
| Eddy Resolving Simulations of Intake Under Crosswinds | 523 |
| N. R. Vadlamani and P. G. Tucker | |

On Stability and Transition in Bent Pipes 531
 J. Canton, R. Örlü and P. Schlatter

Scaling of High-Order Statistics in Turbulent Pipe Flow 537
 C. Bauer and C. Wagner

Turbulent-Drag Reduction by Oblique Wavy Wall Undulations 545
 S. Ghebbali, S. I. Chernyshenko and M. A. Leschziner

**Estimation of the Roughness Function in Turbulent Flows
 Using the Slope of the Roughness** 553
 M. De Marchis, B. Milici and E. Napoli

Part X Complex Applications

**Large-Eddy Simulation of Reactive Plume Dispersion Over
 Hypothetical Urban Areas** 563
 C. H. Liu, Z. Wu and Y. K. Ho

**Large-Eddy Simulation of an Open Channel Flow
 with Submerged Rigid Vegetation** 571
 A. Monti, M. Omidyeganeh and A. Pinelli

**Detached Eddy Simulations of the Flow Around the Japan
 Bulk Carrier (JBC)** 579
 E. Guilmineau, G. B. Deng, P. Queutey, M. Visonneau and J. Wackers

Large Eddy Simulation of a Tornado Flow Around a Train 587
 K. Obara, S. Krajnovic, G. Minelli, B. Basara, N. Okura and M. Suzuki

Large Eddy Simulation of a Wind Farm Experiment 595
 B. Rocchio, U. Ciri, M. V. Salvetti and S. Leonardi

On Direct Aeroacoustics Calculations of the Vocal Tract 603
 L. Schickhofer, A. Dahlkild and M. Mihaescu