CONTENT

Welcome Note

Dear Colleagues,

It is my great pleasure to present to you the program of ETMM13, the 13th International ERCOFTAC Symposium on Engineering Turbulence Modelling and Measurements. The ETMM series of conferences celebrate ERCOFTAC's focus on Engineering Science in the field of fluid mechanics, discussing new developments in modelling and measurement of turbulent flows. In line with the established format, both fundamental issues in modern fluid mechanics and prime application areas feature in the contributed papers. The wonderful island of Rhodes presents the venue of ETMM13, continuing the lineage of over 30 years of conferences all around the Mediterranean Sea.

The organising committee could attract the contribution of 7 prominent keynote lectures from all around the world. These contributions set an appealing framework of recent breakthroughs in which all the contributed papers find context, illustrating the multiple dimensions in which Engineering Science evolves. True to the focus of ERCOFTAC, application areas such as energy, combustion, and multi-phase flow are well represented.

While these few words read as a standard introduction to yet one more, much anticipated ETMM conference, this time almost all is very different. Because of the Corona pandemic, ETMM13 got delayed by one year and takes a 'hybrid' shape in which 1/3 of the participants take part in the conference 'on-site' on Rhodes, and 2/3 of our participants join online. While this poses new challenges to our community, the continuing expert support of EASY Conferences has been invaluable to enable ETMM13 as ERCOFTAC's main event. The program of ETMM13 displays many timely high-level developments in the field of flow, turbulence, and combustion. It is hoped that this hybrid event will present a unique and valuable platform for our work.

On behalf of ERCOFTAC and the organising scientific committee, I would like to wish all of you three wonderful days of Engineering Science and look forward to new discussions and collaboration that keep our community vital and stimulates new collaboration in a challenging and friendly atmosphere.

Bernard Geurts

Professor for Multiscale Modeling and Simulation
University of Twente and Eindhoven University of Technology
The Netherlands

About ETMM

The ETMM series of conferences was initiated in 1990, with the first conference being held in Dubrovnik, under the chairmanship of Prof. Wolfgang Rodi. The goal was to create a highly focused forum at which academic and industrial researchers would be given the opportunity to present and discuss new developments in modelling and measurement of turbulent flows, including combustion and multi-phase transport of immediate relevance to practical applications in fluid-flow engineering and related areas.

At that time, most conferences on turbulence and turbulent flows – especially those in Europe – had a distinctly fundamental flavour, attracting papers dealing primarily with the physics of turbulence, and with methods, both theoretical and experimental, designed to illuminate generic phenomena and universal laws in conditions far removed from those encountered in practice. ETTM thus gave itself the mission of exposing efforts that targeted the translation of fundamental discoveries into practically relevant models and experimental systems that would serve the design process in mechanical, aeronautical and civil engineering, and the prediction of physically and geometrically complex processes in the natural environment.

The background against which ETMM was established was one characterized by rapid developments in the area of statistical (RANS) turbulence modeling and their exploitation in commercial and industrial CFD codes. At the same time, sophisticated experimental techniques, such as 3D LDV, time-resolving PIV and PLIF, were becoming widely available in the form of commercially produced systems, and entered the industrial R&D environment. This strengthening link between academic research and industrial practice also motivated the foundation of the ERCOFTAC organisation, in 1998, intended to establish itself as the premier European network for academic and industrial researchers in flow, turbulence and combustion.

Until now twelve ETMM conferences were held over the past 30 years, all around the Mediterranean area: www.ercoftac.org

Keynotes

Jochen Fröhlich

Institute of Fluid Mechanics, TU Dresden, Dresden, Germany

“Direct Numerical Simulations of bedload transport with non-spherical particles”

The transport of particles by a fluid flowing over a bottom bed is an important process in natural water bodies, such as sediment transport in rivers, but also in process technology, where sand is encountered in oil pipelines or hydraulic transport is used with granular material, for example. Over the last years Direct Numerical Simulations have contributed to a deeper understanding of the intricate coupling between the turbulent flow over such propagating roughness and the motion of the particles themselves. These studies, however, have practically all been conducted with spherical particles.

The talk will first highlight the different complications introduced by non-spherical particles and describe appropriate sub-models. The resulting method is then used to investigate the impact of the particle shape on the properties of the flow and the formation of particle structures. The highly resolved data provide important insight into the physics of such flows.

Short CV

Jochen Fröhlich studied Mechanical Engineering at RWTH Aachen and obtained his PhD in Engineering Sciences at the University of Nice – Sophia-Antipolis, France. After two post-doctoral positions in Kaiserslautern and Berlin, he worked at the University of Karlsruhe (TH), nowadays KIT, where he submitted his habilitation thesis on Large Eddy Simulation.

Since 2007 Jochen Fröhlich is holding the Chair of Fluid Mechanics and is Managing Director of the Institute of Fluid Mechanics at Technische Universität Dresden. His research interests cover numerical methods, high-performance computing, modelling and simulation of single-phase turbulence as well as multiphase flows.

Catherine Gorlé

Stanford University, United States

“Physics-based and Data-Driven Methods for Turbulence Model Form Uncertainty Quantification”

Reynolds-averaged Navier-Stokes simulations are commonly used for analyzing turbulent flow in complex configurations. The use of reduced-order turbulence models raises questions regarding the accuracy of the results; a method to quantify model-form uncertainty would provide valuable information when using the simulations for engineering design. In this talk I will first present physics-based approaches to quantify uncertainty in turbulence and turbulent mixing models.

Results for simulations of a pin-fin array heat exchanger demonstrate that the models can successfully provide interval predictions that contain a reference solution provided by large-eddy simulations; however, the predicted intervals can be too large to meaningfully inform design. This leads to the second part of the talk, where I will present initial results on the use of data-driven approaches to obtain predictions with a reduced uncertainty. The results indicate that combining physics-based and data-driven approaches presents a promising route for progress in turbulence model form uncertainty quantification.

Short CV

Catherine Gorlé is an Assistant Professor of Civil and Environmental Engineering at Stanford University. Her research activities focus on the development of predictive computational fluid dynamics (CFD) simulations to support the design of sustainable buildings and cities. Specific topics of interest are: the coupling of large- and small-scale models and experiments to quantify uncertainties related to the variability of boundary conditions, the development of uncertainty quantification methods for low-fidelity models using high-fidelity data, and the use of data assimilation to improve CFD predictions.

Catherine received her BSc (2002) and MSc (2005) degrees in Aerospace Engineering from the Delft University of Technology, and her PhD (2010) from the von Karman Institute for Fluid Dynamics in cooperation with the University of Antwerp. She has been the recipient of a Stanford Center for Turbulence Research Postdoctoral Fellowship (2010), a Pegasus Marie Curie Fellowship (2012), and an NSF CAREER award (2018).

Marcus Hultmark

Princeton University, United States

“Revealing the details of wind turbine wakes through high Reynolds number experiments”

Wind turbines and wind farms present unique challenges, fluid mechanically, as they combine extremely high Reynolds numbers with additional time scales imposed by the rotation and three-dimensional effects. This implies that resolved numerical solutions are too computationally expensive and investigations in conventional wind tunnels are impossible due to the flow speeds and rotational rates needed in order to satisfy the dynamic similarity requirements.

At Princeton, we achieve the conditions a large wind turbine experiences, experimentally, by compressing the air around it up to 238 bar. This yields conditions similar to those experienced in the field on a model that is only 20cm in diameter. The extremely high Reynolds number wake is investigated using the nano-scale thermal anemometry probe (NSTAP), enabling well-resolved turbulence measurements, both temporally and spatially. The morphology of the wake, including the evolution of the tip vortices and turbulent structures is characterized and the effect of Reynolds number, free-stream turbulence, and rotation studied.

Short CV

Marcus Hultmark is associate professor in the Department of Mechanical and Aerospace Engineering at Princeton University and director of the Princeton Gas Dynamics Laboratory. His research interests include a variety of problems related to fluid mechanics, with focus on problems involving turbulence, such as heat and mass transfer as well as drag reduction and wind energy. Theoretical work is combined with experimental studies, and an important part of his research program is the development and evaluation of new sensing techniques to investigate these phenomena with high accuracy and resolution. He was awarded the 2016 Air Force Young Investigator award, the 2017 NSF Career award and in 2017 he received the Nobuhide Kasagi Award. He received his M.Sc. degree from Chalmers University in 2007 and his Ph.D. from Princeton University in 2011.

Andreas Kempf

University of Duisburg-Essen, Germany

“Nano-particle formation from turbulent flames”

The talk will present recent work on the modeling and simulation of nano-particle formation in flames – laminar and turbulent, from gaseous and liquid fuels and precursors, by RANS, LES and DNS. Of special interest is the description of particle property distributions and their spatial distributions, which can (almost) not be captured by DNS or high-resolution LES: The problem is due to the smallest scalar scales (Batchelor), which for nano-particle fields, are one to two orders of magnitude smaller than the Kolmogorov scale, due to the very high Schmidt-numbers.

The distribution on these small scales must be known, as key modelling quantities depend non-linearly on the concentration, so that „naive“ averaging of filtering would lead to large modelling errors. At the current time, the development of suitable models is highly needed.

Short CV

- Since 2011: Professor at the University Duisburg-Essen and Head of the chair “Fluid dynamics”
- 2005-2011: (Senior) Lecturer at the Imperial College London (Assistant/Associate Professor), section ‘Multiscale Simulations in the field of Thermal Fluids’ of the mechanical engineering department, examinations officer of the mechanical engineering department
- 1999-2004: Doctoral thesis and postdoctoral research with Prof. Dr.-Ing. J. Janicka in the engineering department at the TU Darmstadt, Dissertation: Large-Eddy Simulation of Non-Premixed Turbulent Flames.
- 1994-1999: Study in Mechanical Engineering at the TU Darmstadt, diploma thesis: ‘Large-Eddy Simulation of a Counter Flow Configuration’, Mentor: Prof. J.-Y. Chen, University of Berkeley, CA, USA

Alison Marsden

Stanford University, United States

“Computational modeling of coronary artery hemodynamics for personalized medicine in children and adults”

Cardiovascular disease is the leading cause of death worldwide, with nearly 1 in 4 deaths caused by heart disease alone. In children, congenital heart disease affects 1 in 100 infants, and is the leading cause of infant mortality in the US. Patient-specific modeling based on medical image data increasingly enables personalized medicine and individualized treatment planning in cardiovascular disease patients, providing key links between the mechanical environment and subsequent disease progression. I will discuss recent methodological advances in cardiovascular simulations that aim to increase rigor and clinically applicability, including (1) development of a complete pipeline from clinical data assimilation to uncertainty quantification in patient-specific simulations, and (2) novel methods for fluid structure interaction with fully incompressible tissue properties and incorporating wall mechanobiology.

Clinical application of these methods will be demonstrated in two applications of patient-specific modeling in the coronary arteries: 1) coronary bypass graft surgery and the biomechanics of vein graft failure, and 2) risk stratification in pediatric patients with Kawasaki disease. We will provide an overview of our open source SimVascular project, which makes our tools available to the scientific community (www.simvascular.org). Finally, I will discuss future directions in fluid solid growth simulations and whole-heart modeling, challenges of translating modeling tools to the clinic, and applications to a range of adult and pediatric cardiovascular diseases.

Short CV

Alison Marsden is an associate professor in the departments of Pediatrics, Bioengineering, and, by courtesy, Mechanical Engineering at Stanford University. She is a member of the Institute for Mathematical and Computational Engineering. From 2007-2015 she was a faculty member in Mechanical and Aerospace Engineering at UCSD. She graduated with a BSE degree in Mechanical Engineering from Princeton University in 1998, and a PhD in Mechanical Engineering from Stanford in 2005. She was a postdoctoral fellow at Stanford University in Bioengineering from 2005-07. She was the recipient of a Burroughs Wellcome Fund Career Award at the Scientific Interface in 2007, an NSF CAREER award in 2011, and was elected as a fellow of AIMBE and SIAM in 2018. She has published over 100 peer reviewed journal papers and serves on the editorial board of several journals. Her research focuses on the development of numerical methods for cardiovascular blood flow simulation and application of engineering tools to impact patient care in cardiovascular surgery and congenital heart disease.

Johan Meyers

Katholieke Universiteit Leuven, Belgium

“Real-time LES and fast flow models for wind-farm applications”

With next generation wind turbines surpassing a rated power of 10MW and large wind-farm projects exceeding 1GW in installed capacity, complex flow interactions between turbines, the farm, the atmospheric boundary layer and meso-scale weather systems become more and more important for the design and control of wind-energy systems. Processes that are important include turbine wake interaction, effects of turbulence, wind veer and wind shear on loads, wind-farm blockage and gravity wave excitation, and farm-farm interaction. In the last decade, large-eddy simulations have evolved into a high-fidelity testing environment that has been instrumental in better understanding these different physical processes.

However, for design, real-time monitoring and control, much faster models are necessary. In the current talk, the prospect of using LES as a real-time flow model for wind-farm applications is discussed. It is shown that coarse-grid LES can produce accurate flow predictions over time horizons up to 30min, while being two orders of magnitude faster than real time. Moreover, state-estimation in LES based on lidar measurements is discussed, for which Bayesian inference and 4-Dvar are used. Finally, fast models for wind-farm–gravity-wave coupling are also discussed. These phenomena occur at a larger scale that encompasses the boundary layer. To this end, an atmospheric perturbation model is presented that can either be coupled to LES, or can be used as a driver for simpler wind-farm engineering models, such as the Gaussian wake merging model.

Short CV

Johan Meyers is a professor of Mechanical Engineering at KU Leuven since 2009. His research focuses on the simulation of turbulent flows and the atmospheric boundary layer with applications in wind energy. JM obtained a PhD in 2004 at KU Leuven, was a postdoctoral researcher at Univ. Paris 6, and a postdoctoral research fellow of the Science Foundation Flanders. In 2012, he obtained an ERC grant on wind-farm control, and since then he has been involved in various European projects on wind energy. Since 2017, Johan Meyers serves as the vice-president of the European Academy of Wind Energy, and he is also active as an associate editor for Computers and Fluids and for Wind Energy Science.

Philipp Schlatter
KTH Mechanics, Stockholm, Sweden
"Pressure gradient turbulent boundary layers: Simulations and Experiments"

The flow around streamlined bodies leads to the development of thin boundary layers, which are however crucial for determining key aspects of the global flow behaviour, including the prediction of drag and separation. Whereas there has been a clear focus on zero-pressure gradient (ZPG) turbulent boundary layers in the past, this shifted now towards boundary layers under the influence of pressure gradients, as e.g. imposed by surface curvature (for instance on wings) or by adequately adjusting the free-stream velocity (as done e.g. in wind-tunnel experiments).

The main challenges are to find similarly canonical conditions as could be established for the ZPG cases, which is complicated by the need to include history effects of the pressure gradient. In this talk, we will review some of the previous works on pressure-gradient boundary layers, and discuss some of our attempts to address key questions, both from simulations and experiments. In particular we will look at boundary layers developing on flat plates, and discuss the various energy-transfer mechanisms, and also on different wing profiles. In both cases, simulations are complemented with new experimental data obtained at the KTH wind tunnel. The work is done in collaboration with a number colleagues, but I would like to acknowledge Ricardo Vinuesa and Ramis Örlü from KTH already now.

Short CV

Philipp Schlatter is Professor of Fluid Mechanics at KTH Mechanics, Stockholm, Sweden, and focuses on large-scale simulations of (more or less) complex turbulent wall-bounded flows. He received a Master's (2001) and PhD (2005) from ETH in Zurich (Switzerland), and moved then to KTH. His main current interests are in the simulation and fundamental physical aspects of the turbulent flow with pressure gradients, and the internal flow in bent pipes. He is mainly using high-order (spectral) methods, for which adaptive meshing is another research interest.

Committees

Organizing Committee

Bernard Geurts
University of Twente, Netherlands

Marianna Braza
IMF Toulouse, France

Stefan Hickel
TU Delft, Netherlands

Maria Vittoria Salvetti
University of Pisa, Italy

Ananias Tomboulides
Aristotle University of Thessaloniki, Greece

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D. Von Terzi (Germany)
S. Wallin (Sweden)
G. Winckelmans (Belgium)

Overview
Programme

Wednesday, 15 Sep 2021

8:00 - 8:30	Support Desk hours: 08:00-13:00 and 14:00-17:30	
8:45 - 9:00	Welcome and Orientation - Dominic von Terzi, Bernard J. Geurts	Room A
9:00 - 9:45	Keynote Lecture - Jochen Fröhlich (TU-Dresden) Direct Numerical Simulations of bedload transport with non-spherical particles Chair: Markus Klein (UniBW)	Room A
9:45 - 10:30	Keynote lecture - Catherine Gorlé (Stanford University) Physics-based and Data-Driven Methods for Turbulence Model Form Uncertainty Quantification - Chair: Johan Meyers (KU Leuven)	Room A
10:30 - 11:00	Break	
11:00 - 12:40	Parallel Sessions	
12:40 - 14:00	Lunch	
14:00 - 15:40	Parallel Sessions	
15:40 - 16:10	Break	
16:10 - 17:50	Parallel Sessions	
18:00 - 19:30	Social gathering	

Thursday, 16 Sep 2021

8:00 - 8:30	Support Desk hours: 08:00-13:00 and 14:00-17:30	
8:30 - 9:15	Keynote Lecture - Johan Meyers (KU Leuven) Real-time LES and fast flow models for wind-farm applications - Chair: Prof. Ananias Tomboulides (Aristotle University of Thessaloniki)	Room A
9:15 - 10:55	Parallel Sessions	
10:55 - 11:25	Break	
11:25 - 13:05	Parallel Sessions	
13:05 - 14:25	Lunch	
14:25 - 16:25	Parallel Sessions	
16:25 - 17:00	Break	
17:00 - 17:45	Keynote Lecture - Markus Hultmark (Princeton University) Revealing the details of wind turbine wakes through high Reynolds number experiments - Chair Dominic von Terzi (TU Delft)	Room A
17:45 - 18:30	Keynote Lecture - Alison Marsden (Stanford University) Computational modeling of coronary artery hemodynamics for personalized medicine in children and adults - Chair: Alistair Revell (University of Manchester)	Room A
19:00 - 21:00	Conference Dinner	

Friday, 17 Sep 2021

8:00 - 8:30	Support Desk hours: 08:00-13:00 and 14:00-17:30	
8:30 - 9:15	Keynote Lecture - Philipp Schlatter (KTH Stockholm) Pressure gradient turbulent boundary layers: Simulations and Experiments Chair: Prof. Andrzej Boguslawski (Czestochowa University of Technology)	Room A
9:15 - 10:00	Keynote Lecture - Andreas Kempf (U Duisburg-Essen) Nano-particle formation from turbulent flames - Chair: Prof. Lars Davidson (Chalmers)	Room A
10:00 - 10:30	Break	
10:30 - 12:30	Parallel Sessions	
12:40 - 14:00	Lunch	
14:00 - 15:40	Parallel Sessions	
15:40 - 16:10	Break	
16:10 - 17:50	Parallel Sessions	
18:00 - 18:20	Closing Address - Announcing ETMM14 - Stefan Hickel, Bernard Geurts	Room A

Wednesday, 15 Sep 2021

11:00 - 12:40 Parallel Sessions

ROOM A

Wings
Chair: Prof. Marianna Braza

11:00 Aerodynamic and Aeroacoustic Investigation of a Circulation Controlled High-Lift Wing by Zonal Overset-LES
Rinie Akkermans, Varun Bharadwaj Ananthan.

11:20 Active flow control of an aircraft in full stall
Oriol Lehmkuhl, Ivette Rodriguez, Adrian Lozano-Duran

11:40 Towards adaptive simulations of turbulent wings at high Reynolds numbers
Fermin Mallor, Alvaro Tanarro, Nicolas Offermans, Adam Peplinski, Ricardo Vinuesa, Philipp Schlatter

12:00 Energy budgets and performance development of turbulent boundary-layer control on airfoils
Georg Fahland, Alexander Stroh, Davide Gatti, Marco Atzori, Ricardo Vinuesa, Philipp Schlatter, Bettina Frohnapfel

12:20 Aerodynamic Performance of Biomimetic Wings in Soaring Flight - a Numerical Study
Eike Tangermann, Gianantonio Ercolani, Markus Klein

ROOM B

Near Wall Reactive Flows: Numerical Modelling and Validation Experiments - 1
Chair: Prof. Amsini Sadiki

11:00 Simultaneous flow, flame and wall temperature measurements in an IC engine for the investigation of flame-wall interactions
Carl-Philipp Ding, Marius Schmidt, Andreas Dreizler, Benjamin Boehm

11:20 A comparison between head- on quenching of turbulent methane-air and hydrogen-air flames using detailed chemistry Direct Numerical Simulations
Jiawei Lai, Umair Ahmed, Markus Klein, Nilanjan Chakraborty

11:40 Effects of turbulent boundary layer on the near-wall flame dynamics in the case of adiabatic walls
Umair Ahmed, Nilanjan Chakraborty, Markus Klein

12:00 Parametric forcing approach for secondary motions formation over inhomogeneous rough surfaces
Alexander Stroh, Kay Schäfer, Bettina Frohnapfel, Pourya Forooghi

ROOM C

Bubbly multiphase flows
Chair: Prof. Jochen Fröhlich

11:00 A novel generalized multifluid modelling approach for the simulation of multiphase flows: model development and validation
Marco Colombo, Andrea De Santis, Bruce Hanson, Michael Fairweather

11:20 DNS of mass transfer in turbulent bubbly flow in a vertical pipe
Néstor Vinicio Balcázar Arciniega, Joaquim Rigola, Assensi Oliva

11:40 Assessment of High-Resolution Numerical Simulation of Bubble-Wall Collision
Sagy Ephrati, Paolo Cifani, Benjamin Krull, Jochen Fröhlich, Bernard Geurts

12:00 Microbubble-laden flows with bubble breakup and coalescence: An Euler-Lagrange LES study
Michael Breuer, Felix Hoppe

12:20 Towards LES of bubble-laden channel flows: Sub-grid scale closures for momentum advection
Elias Trautner, Josef Hasslberger, Paolo Cifani, Roel Verstappen, Markus Klein, Theresa Trummler

ROOM D

Hybrid RaNS-LES
Chair: Prof. Suad Jakirlic

11:00 A rational hybrid RANS-LES approach to prediction of air flow and pollutant dispersion in real urban configurations
Mahir Hafizović, Muhamed Hadziabdic, Bojan Niceno, Kemal Hanjalić

11:20 Data-driven modeling of the pressure-strain term in second-moment closure RANS models
Felix Köhler, Suad Jakirlic, Sebastian Wegt, Michael Schäfer

11:40 Advanced RANS and hybrid RANS/LES simulations of a turbulent boundary layer under pressure gradients
Jaime Vaquero, Nicolas Renard, Sébastien Deck

12:00 Development and validation of Explicit Algebraic Reynolds stress modelling for hybrid RANS-LES computations
Matteo Montecchia, Stefan Wallin

12:20 A new formulation of Hybrid Temporal Large-Eddy Simulation
Vladimir Duffal, Benoît de Laage de Meux, Rémi Manceau

Wednesday, 15 Sep 2021

14:00 - 15:40 Parallel Sessions

ROOM A

Transition
Chair: Prof. Witold Elsner

14:00 Turbulent flow over rough to smooth surface transition under adverse pressure gradient
Paweł Niegodajew, Witold Elsner, Artur Tyliszczak, Ewa Szymanek, Artur Dróżdż

14:20 Dynamic Mode Decomposition and Koopman spectral analysis comparison in boundary layer separationinduced transition study
Alessandro Dotto, Daniele Simoni, Davide Lengani, Alberto Tacchella

14:40 An algebraic LCTM Transition Model
Florian Menter, Richard Lechner

15:00 A sub-grid activity sensor applied to a-posteriori LES modeling of laminar-turbulent transition
Josef Hasslberger, Markus Klein

15:20 Transitional ddes study over a circular cylinder and an airfoil profile
Özgür Yalçın, Kenan Cengiz, Yusuf Özyörük, Lars Wein, Joerg R. Seume

ROOM B

Heat Transfer Engineering
Chair: Prof. Wolfgang Rodi

14:00 Direct numerical simulation of turbulent heat transfer of surfaces with regularly distributed hemispheres
Rika Nagura, Kazuhiko Suga, Yusuke Kuwata

14:20 DNS Study of Turbulent Heat Transfer in a Channel under Combined Influences of Buoyancy and Wall-Normal System Rotation
Cale Bergmann, Bing-Chen Wang

14:40 Towards High-Fidelity Simulation of Wall Turbulence Subjected to Conjugate Heat Transfer in Complex Geometry
Rodrigo Vicente Cruz, Eric Lamballais, Rodolphe Perrin

15:00 Pulsed slot jets in crossflow for heat transfer enhancement
Rodrigo Castellanos, Gianfranco Salih, Marco Raiola, Andrea Ianiro, Stefano Discetti

15:20 Radiative modification to general turbulent heat transfer models
Simone Silvestri, Dirk Roekaerts, Rene Pecnik

ROOM C

Direct and large-eddy simula- tions: numerical methods, modeling and validation
Chair: Prof. Maria Vittoria Salvetti

14:00 Application of the ILSA model to passive scalar transport
Zvi Hantsis, Ugo Piomelli

14:20 Large Eddy Simulation of Cavity Stabilized Supersonic Flow
Christer Fureby

14:40 Cost of low-and high-order direct numerical simulation of turbulent convection
Bernard Geurts

15:00 Numerical simulation and experiment of the three-dimensional leading-edge vortex generated by a plunging wing
Ankang Gao, Chris D. Cantwell, Spencer Sherwin, Onur Son, Zhijin Wang, Ismet Gursul

15:20 Proper SGS heat flux models and numerical methods for LES
F.Xavier Trias, Daniel Santos, Firas Dabbagh, Andrey Gorobets, Assensi Oliva

ROOM D

Near Wall Reactive Flows: Numerical Modelling and Validation Experiments - 2
Chair: Prof. Amsini Sadiki

14:00 Application of large eddy simulation technique to derive correlations of Nusselt numbers for designing exhaust gas systems
Yongxiang Li, Florian Ries, Kaushal Nishad, Amsini Sadiki

14:20 AdBlue Spray-Wall Impingement Process and Wall Film Formation in a SCR De-NOx System: Thermal and Conversion Analysis using Large Eddy Simulation
Kaushal Nishad, Nikhil Mutalik, Florian Ries, Yongxiang Li, Federica Ferraro, Amsini Sadiki

14:40 Highly Resolved Near-Wall Boundary Layer Measurements in a Side-Wall Quenching Burner
Florian Zentgraf, Pascal Johe, David Escofet-Martin, Robert Barlow, Benjamin Böhm, Brian Peterson, Andreas Dreizler

15:00 Thermoacoustic Instabilities of Hydrogen- enriched Partially Premixed Flames in a Swirl Combustor
Yu Gong, Daniel Fredrich, William Jones, Andrew Marquis

15:20 PIV/PLIF investigation of unsteady turbulent mixing in a model GT-combustor
Dmitriy Sharaborin, Alexey Savitskii, Alexey Lobasov, Dmitriy Markovich, Vladimir Dulin

Wednesday, 15 Sep 2021

16:10 - 17:50 Parallel Sessions

Convection

Chair: Prof. Xavier Trias

ROOM A

16:10 Determination of numerical errors in les of turbulent rayleigh- bénard convection
Sahin Yigit, Josef Hasslberger, Markus Klein, Philipp Wenig

16:30 Natural Convection between Vertically Heated Smooth and Rough Walls Using Fully Navier-Stokes Equations Simulation
Boqi Ren, ChungGang Li, Makoto Tsubokura

16:50 Turbulent heat and momentum transfer in heated and cooled pipe flow with temperature-dependent fluid properties
Helfried Steiner, Lorenzo Sufrà

17:10 Analysis of the reverse teardrop shape of the velocity gradient tensor invariants joint pdf close to walls in turbulent rayleigh- bénard convection
Sahin Yigit, Josef Hasslberger, Nilanjan Chakraborty, Markus Klein

17:30 Unstable phenomena of vertical natural convection in an open-ended channel with hot-cold wall configuration
ChungGang Li, Makoto Tsubokura

Flow over complex terrain

Chair: Prof. Stefan Hickel

ROOM B

16:10 CFD evaluation of airflow patterns around beach houses with different wind facing sides
Paran Pourteimouri, Geert Campmans, Kathelijne Wijnberg, Suzanne Hulscher

16:30 Computational modelling of vegetation in urban areas and its impact on air quality, temperature and velocity'
Azin Hosseinzadeh, Amir Keshmiri, Andrea Bottacin Busolin

16:50 Reynolds Average Navier- Stokes simulations of atmo- spheric boundary layer flows around building-like obstacles using nek5000
Dimitrios Fytanidis, Ananias Tom- boulides, Ramesh Balakrishnan, Rao Kotamarthi, Paul Fischer

17:10 The effect of a micro- cavity array on burst events in a turbulent boundary layer
Van Thuan Hoang, Azadeh Jafari, Anton Silvestri, Benjamin Cazzolato, Maziar Arjomandi

Innovations in LES modeling: AI and UQ

Chair: Prof. Ricardo Garcia Mayoral

ROOM C

16:10 CPU-based Deployment Neural Networks for LES of Reacting Flows in OpenFOAM
Paola Breda, Elias Trautner, Markus Klein, Maximilian Hasinger, Michael Pfitzner

16:30 Physics-informed neural networks for solving Reynolds -averaged Navier-Stokes equations
Hamidreza Eivazi, Philip Schlatter, Ricardo Vinuessa

16:50 Application of gene expres- sion programming to a-posteriori les modelling of a taylor green vortex
Maximilian Reissmann, Josef Hasslberger, Richard Sandberg, Markus Klein

17:10 Towards Uncertainty Quantification of LES and URANS for Internal Natural Convection - Differentially Heated Cavity of Aspect Ratio 4
Philipp Wenig, Ruiyun Ji, Stephan Kelm, Markus Klein

Flame Interactions

Chair: Prof. Luc Vervisch

ROOM D

16:10 Combustion regime identification in turbulent flames from machine learning trained by Raman/Rayleigh line measurements
Kaidi Wan, Sandra Hartl, Luc Vervisch, Pascale Domingo, Robert Barlow, Christian Hasse

16:30 Effects of buoyancy on turbulent kinetic energy transport in turbulent premixed flames
Arun Ravi Varma, Umair Ahmed, Nilanjan Chakraborty

16:50 DNS and les of a syngas turbulent oxy-flame with side- wall effects using machine learning based chemistry
Kaidi Wan, Camille Barnaud, Luc Vervisch, Pascale Domingo

17:10 Low-order modeling of ignition in annular combustors
Leo C. C. Mesquita, Roberto Ciardiello, Epaminondas Mastorakos

Thursday, 16 Sep 2021

9:15 - 10:55 Parallel Sessions

Flames

Chair: Prof. Epaminondas Mastorakos

ROOM A

9:15 LES study of the impact of fuel composition on a swirl spray flame approaching blow-off
Ambrus Both, Daniel Mira, Oriol Lehmkuhl

9:35 Numerical prediction of soot formation in a turbulent diffusion flame using the LES- PBE-PDF approach
Binxuan Sun, Stelios Rigopoulos

9:55 Modelling of Nanoparticle Synthesis from Flames
Andreas Kempf, Johannes

10:15 A digital-twin population balance equation for solving soot PSD
Andrea SELTZ, Alexandre Bouaniche, Pascale Domingo, Luc Vervisch

Sprays and Jets

Chair: Prof. Gregoire Winckelmans

ROOM B

9:15 Numerical investigation of a turbulent reacting kerosene spray in vitiated cross-flow
Daniel Fredrich, W.P.Jones, Andrea Giusti

9:35 Assessment of chemistry reduction in high-pressure spray flames of oxymethylene ethers using largeeddy simulations
Daniel Mira, Anurag Surapaneni, Eduardo J. Perez-Sanchez, Ambrus Both, Oriol Lehmkuhl, Guillaume Houzeaux

9:55 LES deduced TKE and dissipation rate for acoustic modelling of subsonic jets
Alex Howlett, Hao Xia, Chris Ellis, Gary Page

10:15 Detailed chemistry LES-CMC simulations of lean blow-off in kerosene spray flames
Jenna Foale, Andrea Giusti, Epaminondas Mastorakos

10:35 Global instability in counter-current round jets - a numerical study
Karol Wawrzak, Andrzej Boguslawski, Artur Tyliszczak

DES and LES

Chair: Prof. Helfried Steiner

ROOM C

9:15 Detached Eddy Simulation coupled with steady RANS in the wall region
Lars Davidson

9:35 Detached Eddy Simulations: Analysis of a limit on the dissipation term for increased stability
Lars Davidson, Christophe Friess

9:55 Bi-species ZDES Computation of a Four-Nozzle Space Launcher Configuration
Jolan Reynaud, Pierre-Elie Weiss, Sébastien Deck

10:15 Numerical simulation of the 3d effects of a morphing wing using electroactive trailing-edge actuations by means of hybrid turbulence model
Abderahmane Marouf, Nikolaos Simiriotis, Jean- François Rouchon, Yannick Hoarau, Marianna Braza

10:35 Filtering and Log-layer Mismatch in Wall-Modeled Large Eddy Simulation
Hadi Hosseinzade, Donald J. Bergstrom

Data-driven modeling

Chair: Dr. Florian Menter

ROOM D

9:15 Predicting the near-wall region of turbulence through convolutional neural networks
Luca Guastoni, Alejandro Güemes, Andrea Ianiro, Stefano Discetti, Philipp Schlatter, Hossein Azizpour, Ricardo Vinuesa, GB

9:35 A New Approach to Using Artificial Neural Networks in LES-PDF Simulations: Application to Sydney Flame L
Tom Readshaw, Tianjie Ding, Stelios Rigopoulos

9:55 Artificial Neural Networks for LES of Turbulent Combustion and Application to Sandia D Flame
Tianjie Ding, Tom Readshaw, Stelios Rigopoulos

10:15 Data-driven Incompletely Stirred Reactor Network Modeling of an Aero-Engine Model Combustor
Salvatore Iavarone, Savvas Gkantonas, Andrea Giusti, Epaminondas Mastorakos

Thursday, 16 Sep 2021

11:25 - 13:05 Parallel Sessions

Roughness 1

Chair: Prof. Bernard Geurts

ROOM A

11:25 Surface Roughness Effects On Cavity Flows
Ganesh N, Ananth SM, NR Vadlamani, Sriram R, K Kontis

11:45 Turbulent channel flow over ratchet-type roughness
Angela Busse, Oleksandr Zhdanov

12:05 Riblets in the Rough Regime
Lars H. von Deyn, Davide Gatti, Bettina Frohnapfel

12:25 Study of irregular roughness in minimal channels
Jiasheng Yang, Alexander Stroh, Suad Jakirlic, Bettina Frohnapfel, Pourya Forooghi

Pipe and Junction flow

Chair: Prof. Rinie Akkermans

ROOM B

11:25 Emerging structures of low turbulent flow in a 90° pipe bend
Katrin Bauer, Johannes Burkert, Rüdiger Schwarze

11:45 Thermal mixing processes in horizontal and vertical t-junction configurations
Cenk Evrim, Eckart Laurien

12:05 DNS study on development of turbulent boundary layer in entrance region of pipe
Hirofumi Hattori, Hiroyuki Baba, Tomoya Houra, Masato Tagawa

12:25 Analysis Of Mass Transfer In A Turbulent Pipe Flow Using Extended Proper Orthogonal Decomposition
Rasmus Korslund Schlander, George Papadakis, Stelios Rigopoulos

Particles in flow

Chair: Prof. Michael Breuer

ROOM C

11:25 Aerosol separation in different fibre matrices under laminar and turbulent flow conditions
Martin Sommerfeld, Manuel Taborda, Guzel Shaikhutdinova, Lars Pasternek

11:45 Secondary flow effects on preferential concentration and clustering of inertial particles in a turbulent square duct flow
Yanzhi Wang, Michael Fairweather, Lee Mortimer, Yanlin Zhao, Jun Yao

12:05 Numerical Investigation of the Effect of Humid Air on Inhaled Hygroscopic Particles in the Human Airways
Fotos Stylianou, Stavros Kassinos, Pantelis Koullapis, Constantinos Panagiotou, Charalambos Frantzis, Dimokratis Grigoriadis

12:25 Study of turbulent precipitation in a T-mixer with DNS and DPB
Hin Yan Tang, Stelios Rigopoulos, George Papadakis

12:45 Large-eddy Euler- Lagrange simulation of breakup of dry powder agglomerates due to fluid forces and wall impact
Ali Khalifa, Michael Breuer

Decomposition and reconstruction from data

Chair: Prof. Andreas Kempf

ROOM D

11:25 Analysis of space- time correlations for the two-dimensional periodic hill problem to support the development of wall models
Margaux Boxho, Koen Hillewaert, Grégoire Winckelmans, Michel Rasquin, Thomas Toulorge, Sophie Mouriaux, Renaud Mercier

11:45 The flow inside a scour hole around a circular cylinder: comparison between Particle Image Velocimetry and Large Eddy Simulation
Ulrich Jenssen, Wolfgang Schanderl, Lukas Unglehrt, Alaa Bashir, Michael Manhart

12:05 Reconstruction of 3D meso-scale structures inside a stirred tank from limited velocity measurements
Kirill Mikhaylov, George Papadakis, Stelios Rigopoulos

12:25 Decomposition Of The Two Point Correlations And The Dissipation From Filtered Data
Massimo Germano, Josef Hasslberger, Markus Klein

Thursday, 16 Sep 2021

14:25 - 16:25 Parallel Sessions

Computational engineering methods

Chair: Prof. Artur Tyliszczak

ROOM A

14:25 On the discontinuous Galerkin ILES of incompressible flows
Andrea Crivellini, Alessandra Nigro

14:45 Assessment of CFD approaches for the numerical simulation of a 3D single- phase natural circulation loop for nuclear passive cooling applications
Dean Wilson, Hector Iacovides, Tim Craft

15:05 Numerical viscosity model for implicit large eddy simulations of wllbounded turbulent flows.
Omar Mahfoze, Sylvain Laizet

15:25 PITM simulations of passive scalar transport fields in turbulent flow at low, medium and high Prandtl numbers
Bruno Chaouat, Roland Schiestel

Wind energy

Chair: Prof. Catherine Gorle

ROOM B

14:25 Can windbreaks increase the power production of wind farms?
Luoqin Liu, Richard Stevens

14:45 Injection of Wind Gusts in Large-Eddy Simulations
Michael Breuer, Guillaume De Nayer

15:05 Modeling wind direction changes in large-eddy simulations using a rotating reference frame
Anja Stieren, Srinidhi N. Gadde, Richard J. A. M. Stevens

15:25 Large eddy simulation study of extended wind farms with large inter turbine spacing
Richard Stevens, Charles Meneveau

15:45 A novel conservative immersed boundary method for wind turbine simulations
Iason Tsetoglou, Pierre Benard, Ghislain Lartigue, Vincent Moureau, Julien Reveillon

Flow and Heat

Chair: Prof. Philipp Schlatter

ROOM C

14:25 Assessment and comparison of large eddy simulations in asymmetrically heated and highly turbulent channel flows
Martin David, Adrien Toutant, Françoise Bataille

14:45 An explicit algebraic closure for passive scalar-flux: Applications in heated channel flows at a wide range of Reynolds numbers
Konstantinos Panagiotou, Fotos Stylianou, Evangelos Akylas, Panos Papanastasiou, Stavros Kassinos

15:05 Effect of thermal boundary conditions in forced convective flow with temperature- dependent material properties
Lorenzo Sufrà, Helfried Steiner

15:25 Automatic surface and volume mesh generation for roughness-resolved LES of additive-manufacturing heat exchangers
Serge Meynet, Vincent MOUREAU, Ghislain Lartigue, Abdellah Hadjadj

15:45 On sub-grid scale modeling in a differentially heated cubical cavity using coarse large eddy simulation
Mohamed Sayed, Abdel Dehbi, Bojan Niceno, Muhamed Hadziabic, Konstantin Mikityuk

Multiphase Flow

Chair: Prof. Martin Sommerfeld

ROOM D

14:25 Simulation of multiphase turbulent channel flow modulation by polymer additives
Lee Mortimer, Michael Fairweather

14:45 A novel generalized multifluid modelling approach for the simulation of multiphase flows: application to intensified liquid-liquid extraction
Andrea De Santis, Marco Colombo, Bruce Hanson, Michael Fairweather

15:05 Investigation of turbulence statistics in two-phase gas-liquid flow
Radouan Boukharfane, Saad Benjelloun, Matteo Parsani, Nilanjan Chakraborty

15:25 Aerodynamically driven rupture of a liquid film by turbulent shear flow
Melissa Kozul, Pedro S. Costa, James R. Dawson, Luca Brandt

15:45 Development of an effective stochastic collision method for use in four-way coupled turbulent flows
David Rupp, Lee Mortimer, Michael Fairweather

16:05 Analysis of fine particle deposition in swirl-type dry powder inhalers *Martin Sommerfeld*

Friday, 17 Sep 2021

10:30 - 12:30 Parallel Sessions

Jet flow

Chair: Prof. Stefan Wallin

ROOM A

10:30 **Experimental Studies Of Free Jets Issuing From Non- Circular Nozzles**
Agnieszka Pawlowska, Andrzej Bogusławski, Artur Tyliszczak

10:50 **Advanced Techniques For Gray Area Mitigation In Des Simulations And Their Effects On The Subsonic Round Jet Acoustic Spectra**
Alexey Duben, Jesus Ruano, Joaquim Rigola, Francesc Xavier

11:10 **A Study Of Turbulent Coagulation In A Jet With Discretised Population Balance And Dns**
Malamas Tsagkaridis, Stelios Rigopoulos, George Papadakis

11:30 **Les Of Jet Flows Issuing From Long, Contracted And Orifice Type Triangular Nozzles At Various Aspect Ratios**
Jakub Stempka, Łukasz Kuban, Andrzej Boguslawski, Artur Tyliszczak, Bernard Geurts

11:50 **Dns Of Turbulent Impinging Jets On Rough Surfaces Using A Parametric Forcing Approach**
Francesco Secchi, Davide Gatti, Bettina Frohnapfel

Roughness 2

Chair: Prof. Koji Fukagata

ROOM B

10:30 **Direct Numerical Simulation On The Influence Of Slope And Skewness On Turbulent Flows Over Irregular Rough Surfaces**
Yusuke Kuwata

10:50 **Experimental Study On Torque Enhancementand Changes In Taylor-Couette Turbulencedue To Wall Roughness**
Yukihiro Ihara, Yasufumi Horimoto, Yasuo Kawaguchi

11:10 **Effect Of Wavy Surface On Turbulent Boundary Layer Separation**
Artur Dróżdż, Paweł Niegodajew, Witold Elsner, Mathias Romańczyk

11:30 **Turbulence Over Acoustic- Liner Roughness**
Stefan Hickel, Davide Modesti, Haris Shahzad

Wall-bounded flows

Chair: Prof. Yannick Hoarou

ROOM C

10:30 **Modification Of The Ssg/ Lrr-Omega Rsm For Adverse Pressure Gradients Using Turbulent Boundary Layer Experiments At High Re**
Tobias Knopp, Matteo Novara, Erich Schuelein, Daniel Schanz, Christian Willert, Andreas Schroeder, Nico Reuther, Rainer Hain, Christian Kaehler

10:50 **Direct Numerical Simulation Of Adverse Pressure Gradient Turbulent Boundary Layer Up To Reθ~8000**
Hussein Rkein, Jean-Philippe Laval

11:10 **An Adapted One- Equation Model For Large Eddy Simulations Of Wall-Bounded Turbulent Flows**
Florian Ries, Louis Dressler, Yongxiang Li, Kaushal Nishad, Amsini Sadiki

11:30 **The Influence Of Wall Directional Permeability On Turbulent Boundary Layer**
Azadeh Jafari, Benjamin Cazzolato, Maziar Arjomandi

11:50 **A New Tripping Method For Rans Simulations Of Complex Turbulent Boundary Layers**
Narges Tabatabaei, Georg Fahland, Alexander Stroh, Davide Gatti, Bettina Frohnapfel, Marco Atzori, Ricardo Vinuesa, Philipp Schlatte

12:10 **Suppression Of Either Large-Scale Modulation Or Superposition In Wall Turbulence**
Andrea Andreolli, Davide Gatti, Ricardo Vinuesa, Ramis Örlü, Philipp Schlatter

Interacting flow mechanisms near walls

Chair: Prof. Ricardo Vinuesa

ROOM D

10:30 **Modelling Of Turbulent Kinetic Energy Equation In Spherical Shockturbulence Interaction**
Song Fu, Boxuan Chen, Bowen Yan

10:50 **Unsteady Interaction Between Shock Wave And Separated Boundary Layer Over A Forward/Backwardfacing Step**
Weibo Hu, Stefan Hickel, Bas Van Oudheusden

11:10 **Reduction In The Near-Wall Turbulence By Using Micro-Cavities**
Shantanu Bhat, Anton Silvestri, Benjamin Cazzolato, Maziar Arjomandi

11:30 **Wall-Resolved Les Of Turbulent Flow In A Supersonic Nozzle**
Romain Debroeyer, Thomas Toulorge, Michel Rasquin, Grégoire Winckelmans, Yann Bartosiewicz

11:50 **Implementation And Validation Of An Algebraic Wall Model For Les In Nek5000**
Emmanuel Gillyns, Grégoire Winckelmans, Sophia Buckingham

Friday, 17 Sep 2021

14:00 - 15:40 Parallel Sessions

Wakes

Chair: Prof. Marlene Sanjose

ROOM A

14:00 Effects Of Micromixing In The Near-Field Evolution Of A Chemically-Reactive Plume Behind A Ship
Savvas Gkantonas, Epaminondas Mastorakos

14:20 A Wake-Triggered Double- Secondary Vortex Topology Over A Multi-Element Airfoil: A Sensitized-Rans Modelling Study
Jiangsheng Wang, Robert Maduta, Sebastian Wegt, Jinjun Wang, Suad Jakirlic

14:40 Turbulent Wake Flow Of Light-Duty Truck: Comparison Of Les And Experiments
Jingwei Xie, Fei Wang, Chun-Ho Liu

15:00 Assessment Of Flow Prediction For The Flow Around A Finite Rectangular Prism: Influences Of The Turbulence Model And The Mesh
Xutong Zhang, Maxime Savoie, Ben Parslew, Alistair Revell

15:20 Improved Clauser Chart Method For Decelerating Flows
Paweł Niegodajew, Artur Dróżdż, Witold Elsner

Canopies

Chair: Dr. Eike Tangermann

ROOM B

14:00 Large Eddy Simulation Of Different Regimes In Canopy Flows
Shane Nicholas, Mohammad Omidyeganeh, Alfredo Pinelli

14:20 Flow Structure And Turbulence During Sweep And Ejection Events In A Heterogeneous Canopy
Lior Shig, Alex Liberzon, Ron Shnapp, Yardena Bohbot-Raviv, Valery Babin, Eyal Fattal

14:40 Drag Reduction Effect Of Wave-Machine-Like Traveling Waves In Turbulent Channel Flow
Yusuke Nabae, Koji Fukagata

15:00 Scaling And Dynamics Of Turbulence In Sparse Canopies
Akshath Sharma, Ricardo Garcia-Mayoral

Environmental flows

Chair: Prof. Richard Stevens

ROOM C

14:00 Approximation of near-wall velocity profiles at flow over periodic hills using the Falkner-Skan solutions
Daniel Quosdorf, Lukas Unglehrt, Michael Manhart

14:20 Large Eddy Simulation of Isothermal and Non-isothermal Turbulent Flows in Ventilated Classrooms
Ramesh Balakrishnan, Rao Kotamarthi, Paul Fischer

14:40 Direct Numerical Simulation of the turbulent wind over waves
Federica Romoli, Andrea Cimarelli, Enrico Stalio

15:00 Application of Hybrid Meteorological Model/ Engineering LES Analysis to Very Strong Typhoon Jebi 2018
Masaharu Kawaguchi, Tetsuro Tamura, Wataru Mashiko

Friday, 17 Sep 2021

16:10 - 17:50 Parallel Sessions

Flow forcing

Chair: Dr. Josef Hasslberger

ROOM A

16:10 A Simple Immersed Boundary Method For High- Fidelity Simulations Of Moving Objects On A Cartesian Mesh
Athanasios Giannenas, Sylvain Laizet, Georgios Rigas

16:30 Addressing Challenges Of Confined Embedded Les
Andrew Mole, Alex Skillen, Tim Craft, Alistair Revell

16:50 Skin-Friction Contributions Modified By A Large-Eddy Break- Up Device
Chi Ip Chan, Cheng (Rey) Chin,

17:10 A New Linear Forcing Method For Isotropic Turbulence With Controlled Lengthscale
Jérémie Janin, Fabien Duval, Christophe Friess, Pierre Sagaut

Flow simulation in complex domains

Chair: Prof. Oriol Lehmkuhli

ROOM B

16:10 Numerical Simulation of Sibilant Sound Generation of Human Voice Using Implicit LES of Compressible Flow and Hierarchical Grid System
HsuehJui Lu, ChungGang Li, Akiyoshi Iida, Tsukasa Yoshinaga,

16:30 Large Eddie Simulation of CS0 Defuser on Resolved and Under-Resolved Meshes
Dmitry Kolmogorov, Andrey Viktorovich Garbaruk, Andrey Sergeevich Stabnikov, Florian Menter

16:50 Symmetry-preserving discretizations in unstructured staggered meshes
Nicolas Valle, F.Xavier Trias, Roel Verstappen

17:10 Fluid dynamics of right ventricular filling in the presence of pulmonary regurgitation
Francesco Capuano, Yue-Hin Loke, Laura Olivieri, Elias Balaras

17:30 Unsteadiness In A Pressure-Induced Laminar Separation Bubble
Abdelouahab Mohammed-Taifour, Marlene Sanjose, Julien Weiss

Boundary layers affecting particle transport and combustion

Chair: Dr. Matteo Montecchia

ROOM C

16:10 Concentration And Preferential Orientation Of Inertial Ellipsoids In Channel Flows At Re_\Tau=180 And 550
Antoine Michel, Boris Arcen

16:30 Simultaneous High Speed Micro Piv And Heat Flux Measurements Near Piston Top Under Tumble Enhanced Engine Condition
Eiji Yokoyama, Makoto Kamata, Masayasu Shimura, Osamu Nakabeppu, Takeshi Yokomori, Mamoru Tanahashi

16:50 Auto-Ignition In An Isotropic And Anisotropic Turbulence
Agnieszka Wawrzak, Artur Tyliszczak

Separation and buoyancy

Chair: Prof. Daniel Quosdorf

ROOM D

16:10 Dynamics Of The Shear Layers Detaching From The Front Edges And Flow Features On The Side Of A 5:1 Rectangular Cylinder
Alessandro Mariotti, Benedetto Rocchio, Elena Pasqualetto, Gianmarco Lunghi, Maria Vittoria Salvetti

16:30 Reliability Of Large-Eddy Simulations Of The Flow Around A 5:1 Rectangular Cylinder: Sharp Vs. Rounded Front Edges
Maria Vittoria Salvetti, Benedetto Rocchio, Alessandro Mariotti

16:50 Use Of 2-D And 3-D Unsteady Rans In The Computation Of Buoyant Flows *Constantinos Katsamis, Timothy Craft, Hector Iacovides, Juan Uribe*

17:10 Effect Of Reynolds Number On Turbulent Boundary Layer Approaching Separation *Witold Elsner, Artur Dróżdż, Paweł Niegodajew, Mathis Romańczyk*

17:30 Assessment Of Scale- Resolving Turbulence Models To Capture The Drag Crisis Around A Circular Cylinder At High Reynolds Numbers
Michael Mays, Sylvain Laizet, Sylvain Lardeau

Welcome Reception

Date: Wednesday, 15th of September
Time: 18:00-19:30
Location: Sheraton Rhodes Resort - Venue

The Welcome Reception is the first social gathering between all conference delegates and it will take place at the Venue Hotel.

It will be a relaxing evening during which delegates will have the opportunity to talk to colleagues and peers, while enjoying local drinks and ample canapés.

Welcome Reception is included in all Registration fees

Tour & Conference Dinner

Date: Thursday, 16th of September
Time: 19:00-21:00
Location: TBA

The Gala Diner is usually planned at a venue other than the hotel where the conference takes place. We will all convene at a restaurant were Local Cuisine is served and enjoy a diner with local drinks and entertainment.

The background music will create a festive atmosphere that will give a chance to all delegates to dance and unwind from the busy conference schedule.

About Rhodes

The island of the Knights

Welcome to Rhodes, the capital of the Dodecanese, an island with bright green hills, rich green valleys and uninterrupted line of golden beaches; Rhodes is truly a blessed place.

Thanks to its strategic position, Rhodes has been important since ancient times. The ancient city of Rhodes, the construction of which began in 407 BC, was designed according to the city planning system devised by the greatest city planner of antiquity, Hippodamus of Miletus. Rhodes soon developed into one of the most important seafaring and trading centres in the Eastern Mediterranean. When it became a province of the Roman, and later the Byzantine Empire, it initially lost its ancient glory. But in 1309 the Knights of Saint John of Jerusalem conquered Rhodes.

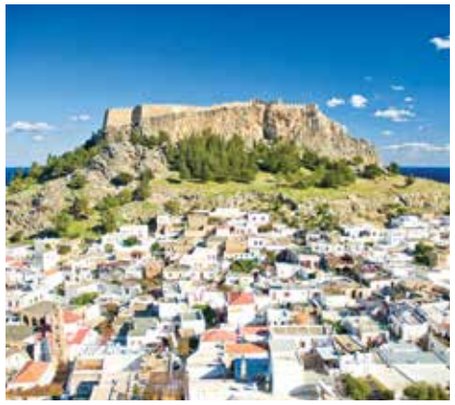
They built strong fortifications to protect the island, turning it into an important administrative centre and a thriving multinational medieval city. In 1523 Rhodes was conquered by the Ottoman Turks, and the Greeks had to settle outside the city walls. During the Ottoman occupation, new buildings were erected within the Old Town, mainly mosques and baths. In 1912 Rhodes and the rest of the Dodecanese, were seized by the Italians. The new rulers embellished the city with magnificent buildings, wide roads and squares. The Palace of the Grand Master was rebuilt and the Street of the Knights was reconstructed in order to regain its medieval purity. It was not until 1948 that Rhodes officially became part of Greece. In 1988 the Medieval City of Rhodes was listed as a UNESCO World Heritage site.

Old Town: priceless global heritage
One of the best preserved mediaeval settlements in the world, the Old Town has been declared a Unesco World Heritage Site, and is one of the many reasons to choose Rhodes as your holiday destination. Protected inside its imposing wall – a boundary between past and present – is the island's coat of arms.
In the Old Town every stone tells a story, a history of 2,400 years. Ancient statues, marble crests, fountains, the Street of the Knights, the Palace of the Grand Masters, mosques and hammams, the Clock Tower with its breathtaking view of the Aegean, a rich heritage left behind by past civilisations.

From Grand Masters to Street of the Knights
The most famous road in the Old Town of Rhodes is the Street of the Knights, restored just as it was in the Middle Ages. Here you'll find the inns of the 'tongues', or national guards, that made up the Order of the Knights. At the highest point in the road is a significant attraction: the grandiose castle, the Palace of the Grand Masters, with its enormous towers, now a wonderful museum.

Cosmopolitan Mandraki
A modern city, with a shopping centre, large hotels and resorts, numerous cafes, restaurants, clubs, impressive sights and attractions, but also traditional villas called marasiotika (from Marasia). Guarding Mandraki's marina, from the tops of two tall limestone columns, are the island's emblems: a deer and doe. At the edge of the dock stands the small fort of Agios Nikolaos, built between 1464 and 1467.
Along the coastal road, public buildings erected by the Italians are sure to impress you; the New Market, the National Bank of Greece, Government House, the National Theatre, the Archbishop's Residence, City Hall and the famous Grande Albergo delle Rose, one of the most luxurious hotels in Europe in the 1930s that today houses the world-famous Rhodes Casino in one of its wings. In front of the aquarium you'll find one of the island's most cosmopolitan beaches, a place to see and be seen.

The Colossus of Rhodes
Although no traces of the statue remain, it is said that the Colossus of Rhodes (one of the Seven Wonders of the Ancient World) once stood in place of the statues of deer now at the harbour. According to the stories, ships sailed beneath its giant legs and every night the passage was closed with an enormous chain.



Lovely Lindos
The ancient acropolis of Lindos is one of the most popular shrines of antiquity, surrounded by walls constructed by the knights, standing 116m above sea level. Here you'll admire the impressive Doric Temple of Athena Lindia, built in the 4th century B.C. The village of Lindos, built on a slope, is the most attractive and popular on the island. In the summer its little streets fill with visitors bar-hopping and window-shopping or buying gifts, like the island's famous decorative plates. This picturesque town should definitely be on your list of things to do in Rhodes.

Fun in Faliraki
Faliraki is a popular destination in Rhodes for young British tourists. Riff off its super-charged atmosphere with loud music and lashings of alcohol. A paradise for adrenaline junkies, with water sports, go-carting and bungee jumping.

Valley of the Butterflies
In a lush, green canyon, about 1km wide, there is a unique forest with zities, trees that look like planes. The smell of the nectar they secrete attracts millions of butterflies of the species Panaxia guadripunctaria, with its trademark four orange dots on each wing. Tread carefully so as not to scare these miraculous little angels away!

Shop till you drop
Inside the Old Town of Rhodes, and also at Mandraki, there are all types of stores – from tourist shops to stylish boutiques with brand-name clothing and accessories.

A stay for every taste
Rhodes is one of the most popular and luxurious destinations in Greece. In Rhodes you'll find accommodation for every taste. This includes large hotel chains, luxurious all-inclusive resorts, boutique hotels in the Old Town – no matter your style, your stay on this Aegean island will be an enjoyable experience.

Infinite beaches
If you are a beach lover, Rhodes is the destination for you: infinite beaches of exceptional beauty and activities of all kinds abound. Topping the list are Kiotari, Kallithea, Agathi, Apolakkia, Kolymbia, the Anthony Quinn Beach, Lardos, Afandou with its golf course, Traounou with its motocross tracks, Trianda Tsabika... all wonderful, with sand, crystal-clear water and water sports. Windsurfers flock to Prasonissi, a green island to the south of Rhodes.

The Sheraton's offers wireless internet throughout the meeting spaces, a fully operational business centre and Link@Sheraton® where hotel guests can check their e-mails in comfortable surroundings. The hotel features 15 meeting rooms & over 3000sqm of flexible meeting and conference space most having natural daylight and access to a terrace with sea view.

Venue

Sheraton Rhodes Resort ★★★★★

Rhodes, a city with 2.400 year history, the place that gave birth to legends and hosted significant personalities of politics, the arts and culture, with a beauty that enthralled its conquerors through the centuries, hosts the welcoming Sheraton Rhodes Resort.
The hotel, cocooned in the beauty of its attractive lush gardens with the blue expanse of the pristine waters in front of its private beach, is ideally situated in a key spot in Ixia, just 4 kilometres from the famous Medieval Town of Rhodes – the best preserved medieval city in the world and an UNESCO World Heritage Monument. Sheraton Rhodes Resort encompasses in its grounds and services the very things that Rhodes offers: natural beauty, unique architecture, a variety of entertainment options, modern infrastructure and traditional hospitality.

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TO SUIT YOUR CONFERENCE NEEDS

Easy Conferences Ltd has been in business since 1992 and has been specializing in the complete coordination and organization of conferences and all related activities. Through the development of its own online registration software, the company has expanded its operations outside Cyprus. We have extensive experience in organizing events ranging from 20 to 2000 participants for physical, hybrid or online participation. We consult, manage, and assist in every step of the process of any event, and we deliver top professional services throughout.

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P.O.Box 24420, 1704, Nicosia, Cyprus
+357 22 591900
+357 22 591700
info@easyconferences.eu

www.easyconferences.eu
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