Contents

Part I Invited Keynote Papers

PANS Method as a Computational Framework from an Industrial Perspective .................................................. 3
B. Basara

Hybrid LES/RANS of Internal Flows: A Case for More Advanced RANS ...................................................... 19
K. Hanjalić, D. Borello, G. Delibra and F. Rispoli

Universal Reynolds Number of Transition and Derivation of Turbulent Models ............................................. 37
V. Yakhot, C. Bartlett, H. Chen, R. Shock, I. Staroselsky and J. Wanderer

Part II LES and Embedded LES

Overset DNS with Application to Sound Source Prediction ............... 59
R.A.D. Akkermans, R. Ewert, S.M.A. Moghadam, J. Dierke and N. Buchmann

High-Order Flux Reconstruction Schemes for LES on Tetrahedral Meshes ................................................. 69
Jonathan R. Bull and Antony Jameson

Forced Synthetic Turbulence Approach to Stimulate Resolved Turbulence Generation in Embedded LES .......... 81
Daniela G. Francois, Rolf Radespiel and Axel Probst
Assessment of Local LES-Resolution Sensors for Hybrid RANS/LES Simulations ........................................... 93
S. Reuß, T. Knopp, A. Probst and M. Orlt

Constrained Large-Eddy Simulation for Aerodynamics ............... 105
Zhenhua Xia, Zuoli Xiao, Yipeng Shi and Shiyi Chen

Part III Detached Eddy Simulations

Grey-Area Mitigation for the Ahmed Car Body Using Embedded DDES. ...................................................... 119
N. Ashton, A. Revell and R. Poletto

Detached-Eddy Simulation of Separated Wake Flow
Around Complex Helicopter Fuselage Configuration ................. 131
M. Fuchs, F. Le Chuiton, C. Mockett, J. Sesterhenn and F. Thiele

Zonal Detached Eddy Simulation (ZDES) Using Turbulent Inflow and High Order Schemes: Application to Jet Flows ....... 141
F. Gand, V. Brunet and G. Mancel

A Renormalized Detached Eddy Simulation Method
Without Log-Layer Mismatch ........................................... 153
Ning Hu, Han-Dong Ma and Wei-Min Zhang

Improved Delayed Detached-Eddy Simulation of Transonic and Supersonic Cavity Flows ............................... 163
Kunyu Luo and Zhixiang Xiao

Combining ZDES with Immersed Boundary Conditions
Technique for the Treatment of Complex Geometries .............. 175
L. Mochel, P.-É. Weiss and S. Deck

Two Non-zonal Approaches to Accelerate RANS to LES Transition of Free Shear Layers in DES ............................. 187
Charles Mockett, Marian Fuchs, Andrey Garbaruk, Michael Shur,
Philippe Spalart, Michael Strelets, Frank Thiele and Andrey Travin

On the Interface Positioning in a Zonal Detached Eddy Simulation (ZDES) of a Spatially Developing Flat Plate Turbulent Boundary Layer ........................................... 203
Nicolas Renard and Sébastien Deck
Simple Improvements in the SST-DES Formulation for Mild Aerofoil Trailing-Edge Separation .......................... 215
Xiangyu Wang and Dong Li

Part IV Hybrid and Zonal Methods

Prediction of Transonic Duct Flow Using a Zonal Hybrid RANS-LES Modeling Approach .................................. 229
Sebastian Arvidson, Shia-Hui Peng and Lars Davidson

Hybrid RANS-LES Methods Applied to Acoustic Problems ........ 243
Abdelkader Frendi

On the Hybrid RANS-LES of Compressible Flows ............... 253
Massimo Germano

Unified RANS-LES Simulations of Turbulent Swirling Jets and Channel Flows ............................................. 265
Stefan Heinz, Michael K. Stöllinger and Harish Gopalan

Hybrid RANS-LES Versus URANS Simulations of a Simplified Compressor Blades Cascade ......................... 277
Y. Hoarau, D. Szubert and M. Braza

Analysis of Scale Adaptive Approaches Based on the Rotta Transport Equation ........................................... 287
A. Mehdizadeh, J.G. Brasseur, T. Nandi and H. Foroutan

Go4Hybrid: A European Initiative for Improved Hybrid RANS-LES Modelling .................................................. 299
Charles Mockett, Werner Haase and Frank Thiele

Automatic Hybrid RANS/LES Strategy for Industrial CFD ..... 305
Grégoire Pont, Paola Cinnella, J.C. Robinet and Pierre Brenner

Reynolds Stress Closure in Hybrid RANS-LES Methods ....... 319
Michael Stoellinger, Stefan Heinz and Pankaj Saha

Hybrid RANS-LES and URANS Simulations of a Laminar Transonic Airfoil ..................................................... 329
D. Szubert, F. Grossi, Y. Hoarau and M. Braza
Model-Invariant Hybrid LES-RANS Computation of Separated Flow Past Periodic Hills. 345
Stephen Woodruff

Part V Bridging Methods

Partially-Averaged Navier-Stokes (PANS) Simulations of Lid-Driven Cavity Flow—Part I: Comparison with URANS and LES. 359
Bhanesh Akula, Pratanu Roy, Pooyan Razi, Steven Anderson and Sharath Girimaji

C.-Y. Chang, S. Jakirlic, B. Basara and C. Tropea

Predictive Capability Assessment of the PANS-ζ-f Model of Turbulence. Part II: Application to Swirling and Tumble/Mean-Compression Flows. 385
C.-Y. Chang, S. Jakirlic, B. Basara and C. Tropea

Status of PANS for Bluff Body Aerodynamics of Engineering Relevance. 399
Siniša Krajnović and Guglielmo Minelli

Simulation of Smooth Surface Separation Using the Partially Averaged Navier-Stokes Method. 411
Pooyan Razi and Sharath S. Girimaji

Partially-Averaged Navier-Stokes (PANS) Simulations of Lid-Driven Cavity Flow—Part II: Flow Structures. 421
Pooyan Razi, Vishnu Venugopal, Shriram Jagannathan and Sharath Girimaji

Part VI Applications

Evaluation of Scale-Adaptive Simulations for Transonic Cavity Flows. 433
S.V. Babu, G. Zografakis and G.N. Barakos
Challenges in Variable Resolution Simulations of Separated Flow Over Delta Wings ................................................. 445
Jacob M. Cooper and Sharath S. Girimaji

LES and DES of Swirling Flow with Rotor-Stator Interaction .... 457
Ardalan Javadi and Håkan Nilsson

Experimental and Numerical Studies of Flow in a Duct with a Diaphragm ......................................................... 469
A. Prieto, P. Spalart, M. Shur, M. Strelets and A. Travin

Scale-Resolving Simulations of Wall-Bounded Flows with an Unstructured Compressible Flow Solver ................. 481
Axel Probst and Silvia Reuß

Noise Generated by an Airfoil Located in the Wake of a Circular Cylinder .......................................................... 493
Man Zhang and Abdelkader Frendi
Progress in Hybrid RANS–LES Modelling
Papers Contributed to the 5th Symposium on Hybrid
RANS–LES Methods, 19–21 March 2014, College Station,
A&M University, Texas, USA
2015, XI, 501 p. 291 illus., 192 illus. in color., Hardcover
ISBN: 978-3-319-15140-3