European Drag Reduction and Flow Control Meeting

Bad Herrenalb (Karlsruhe)
March 26-29 2019

Scientific Program
EDRFCM covers a number of subjects related to drag reduction and flow noise control, including: riblets and surface roughness, compliant walls, polymer surfactant additives, synthetic jets, super-hydrophobic and coated surfaces, flexible structures, wall oscillations, traveling waves, flow separation control, plasma flow control and electro-magnetic control.

The organisers of the 2019 edition are Dr. Davide Gatti (Karlsruhe Institute of Technology), Prof. Bettina Frohnapfel (Karlsruhe Institute of Technology) and Kwing-So Choi (University of Nottingham). The meeting takes place at Haus der Kirche in Bad Herrenalb, a health resort grown up around a Cistercian monastery founded in 1148 and immersed in the northern Black Forest.

Selected contributions from this meeting will be invited to submit a manuscript to FTaC (Springer), after following the standard review process.

The picture below shows the recommended path to reach Haus der Kirche (the conference venue) from the station of Bad Herrenalb.
Programme

Tuesday 26 March

10:00 Registration and welcome breakfast

12:30 Lunch

13:45 Introductory Remarks

Session 1.1 (14:00-15:30): Plasma Actuators
Chairman: J. Kriegseis

14:00 J. H. Ng, Y. D. Cui & B. C. Khoo: Feasibility Study of Supersonic Flow Control Using Multi-pulse Nanosecond Dielectric Barrier Discharge Plasma Actuators

14:18 Z. Guo & M. J. Kloker: Control of Crossflow-vortex-induced Transition by Unsteady UFD Plasma Actuation


14:54 I. Moralev, I. Selivonin & D. Tatarenkova: DBD Plasma Actuators at Low Voltage Amplitudes

15:12 I. Moralev & I. Selivonin: Mechanisms of Turbulence Generation in sDBD Plasma Actuators

Coffee Break

Session 1.2 (16:00-17:48): Rough and nonplanar surfaces
Chairman: P. Luchini
16:00  S. Pasche, U. Lacis, S. Bagheri & Y. Sudhakar: *New Effective Boundary Condition for Rough Surfaces*

16:18  Y. Kametani & Y. Hasegawa: *Adjoint-based Shape Optimization for complex heat transfer surfaces in turbulent flows*

16:36  A. Sharma & R. García-Mayoral: *Turbulent Flows over Sparse Canopies*

16:54  J. H. Ng & B. C. Khoo: *Effects of Shallow Dimples: a Vorticity Perspective*


17:30  P.-Y. Passaggia, U. Ehrenstein, N. Mazellier & A. Kourta: *Adjoint-based Control of a Separated Boundary-layer Flow over a Bump*

Dinner
Wednesday 27 March

Breakfast

Session 2.1 (8:42-10:30): Separation and bluff body control

Chairman: G. Cafiero

8:42 S. Edwige, P. Gilotte & I. Mortazavi: Numerical Simulation and Flow Control over a Ramp

9:00 G. Pironti & P. Ricco: Separation Drag Reduction in a Rough Channel via a Spanwise Oscillating Pressure Gradient


9:54 A.-M. Schreyer: Coherent Structures in Separation Control with Microramp Vortex Generators in Hypersonic Flow


Coffee Break

Session 2.2 (11:00-12:30): Wall forcing

Chairman: M. Leschziner

11:00 D. Xiao & G. Papadakis: Nonlinear Optimal Control of Bypass Transition Due to a Pair of Vortical Disturbances Using a Receding Horizon Approach
11:18 O. A. Mahfoze, A. Wynn, S. Laizet, A. Moody & R. D. Whalley: *A Bayesian Optimisation of Wall Blowing to Control Energy and Skin-friction in a Turbulent Boundary Layer*

11:36 M. Albers, P.S. Meysonnat & W. Schröder: *New Insights into Drag Reduction by Spanwise Traveling Transversal Surface Waves*


12:12 A. J. Kaithakkal, Y. Kametani & Y. Hasegawa: *Effects of Phase-Speed and Wavelength of Traveling Wave-like Wall Blowing and Suction on Dissimilar Heat Transfer Enhancement*

**Lunch Break**

**Session 2.3 (14:00-15:30): (Spanwise) wall forcing**

Chairman: Y. Hasegawa

14:00 G. Voropaev & Ia. Zagumennyi: *Boundary Layer Structure Control by Actuating Local Surface Oscillations*

14:18 A. Chiarini, M. Quadrio & D. Gatti: *Skin-friction Drag Reduction Described via the Anisotropic Generalised Kolmogorov Equations*

14:36 J. Banchetti & M. Quadrio: *Turbulent Drag Reduction for a Wall with a Bump*

14:54 M. T. Hehner, D. Gatti & Y. Kriegseis: *Plasma-induced Oscillatory Forces as a Concept for Small-scale Turbulence Control*

15:12 N. Benard, K.D. Bayoda, J.P. Bonnet & E. Moreau: *Non Homogeneous Streamwise Wall Forcing by Surface Plasma Actuator*
Coffee Break

Session 2.4 (16:00-17:30): Rough and nonplanar surfaces

Chairman: N. Hutchins

16:00 D. Bakhui, R. Ezeta, P. Berghout, P.A. Bullee, D. Tai, D. Lohse, S. Huisman, D. Chung, R. Verzicco & C. Sun: Control-
ing the Secondary Flow in Taylor-Couette Turbulence through Spanwise-Varying Roughness


16:36 Y. Wu & U. Rist: Flow Control with Embedded Rotating Cylindrical Elements


17:12 K. Takroui & M. Seddighi: Turbulent Drag Reduction Using Backswimmer Textured Surfaces for Channel Flow

Dinner
Thursday 28 March

Breakfast

Session 3.1 (9:00-10:12): Foundations
Chairman: B. Frohnapfel

9:00 M. Klein & H. Schmid: Investigating the Skin Friction Drag across Electrolytes and Electrical Fields Using One-dimensional Turbulence Modeling


9:54 A. A. Sheikh Al-Shabab & M. A. Savill: Simulation of Deterministic Turbulence

Coffee Break

Session 3.2 (11:00-12:30): Transition and transient growth
Chairman: Y. Kachanov

11:00 G. Axtmann & U. Rist: exploration of New Kinds of Roughness Elements and Their Effect on Transitional Flow

11:18 V.I. Borodulin, A.V. Ivanov & Y.S. Kachanov: Suppression and Enhancement of Traveling CF-instability Modes by a Distributed Vortex-roughness Receptivity Mechanism

11:36 V. Vedeneev & J. Zayko: On the Absolute Instability of Submerged Jets
11:54 Y. X. Wang, K.-S. Choi, M. Gaster, C. Atkin, Y. Kachanov & V. Borodulin: *Deterministic Transitional Boundary Layer Flow and Control*

12:12 J. Zayko, A. Reshmin, V. Trifonov, L. Gareev & V. Vedeneev: *Experimental Study of Perturbation Growth in the Submerged Jet with Long Laminar Region*

**Lunch Break**

**Session 3.3 (14:00-15:12): Wings and aerodynamic flows**

Chairman: K.-S. Choi

14:00 M. Atzori, R. Vinuesa, P. Schlatter, D. Gatti, A. Stroh & B. Frohnapfel: *Effects of Uniform Blowing and Suction on Turbulent Wing Boundary Layers*

14:18 G. Fahland, D. Gatti, B. Frohnapfel, A. Stroh, M. Atzori, R. Vinuesa & P. Schlatter: *RANS Investigation of Blowing and Suction for Turbulent Flow Control on a Wing Section*

14:26 M. G. C. Garland, M. S. Santer & J. F. Morrison: *Cellular separation control with Adaptive Surface Structures*


**Coffee Break**

**Social program**

**Conference Dinner**
Friday 29 March

Breakfast

Session 4.1 (9:00-10:30): Compliant, permeable and superhydrophobic surfaces + polymers
Chairman: P.S. Virk

9:00  P. T. Nagy & G. Paál: *Stabilization of the Blasius Boundary Layer by Passive Elements*

9:18  G. Gómez-de-Segura & R. García-Mayoral: *Predictions from DNS for the Drag Reduction by Anisotropic Permeable Substrates*

9:36  A. Roccon, F. Zonta & A. Soldati: *Turbulent Drag Reduction by Compliant Lubricating Layer*

9:54  M. Castagna, N. Mazellier & A. Kourta: *Effect of the Interface Curvature on the Flow on Super-hydrophobic Surfaces*

10:12 P.S. Virk: *Evidence that Turbulent Drag Reduction by Polyethylenoxde U309 Evolves from Type A after Onset to Type B beyond Falloff*

Coffee Break

Session 4.2 (11:00-12:30): Foundations and high-
Chairman: D. Gatti

11:00 J. I. Ibrahim & R. García-Mayoral: *Turbulent Drag-reduction in a Virtual-origin Framework*

11:18 P. Luchini & M. Quadrio: *A Model for Fluctuations of the Spatial Mean in a Turbulent Channel Flow*
11:36 Z. Ruan, W.-J. Baars, N. Hutchins & I. Marusic: Role of Large-scales on Turbulence Skin-friction in High-Reynolds-number Turbulent Boundary Layers

11:54 S. Chernyshenko & C. Zhang: Effect of Large-scale Motions on Skin-friction Reduction from the Viewpoint of the QSQH Theory

12:12 V. O. Bondarev, O.O. Ivanov & V.M. Kulik: Numerical Study of Error Sources in Skin Friction Measurements by Floating Element

12:30 Concluding discussion

Lunch Break

Time for discussions

Farewell Coffee