

**UK Turbulence
Consortium
Annual Review
&
UKFN SIG MUMATUR
Meeting**

09-10 September 2019

Imperial College London

**Book of
Abstracts**

UK Turbulence Consortium Annual Review 2019 & 3rd UKFN SIG MUMATUR meeting

9th - 10th September 2019, City and Guilds Building 300,
South Kensington Campus,
Imperial College London

Monday 9th September

09.00-10.30 UKTC Management / Advisory Committee meeting (room CAGB349)

10.00-10.45 Arrival, Registration, Coffee **City and Guilds Building concourse level 2**

10.45-11.15 Welcome / UKTC report (Laizet)

11.15-12.30 Session 1 (Sherwin)

11.15 Nicolas Cerulus **Global Modal and Non-Modal Instability Analysis of Supersonic and Hypersonic Flows**

11.30 Anton Burtsev **Global stability of low Re flow past a cantilevered wing**

11.45 Faron Hesse **Simulation of Wake Bimodality**

12.00 Ahmed A. Sheikh Al-Shabab **Numerical Investigation of Deterministic Turbulence and its Potential for Flow Control**

12.15 Jean-Paul Mollicone **Turbulence dynamics in separated flows: the generalised Kolmogorov equation for inhomogeneous anisotropic conditions**

12.30-13.30 Lunch and Poster Viewing

POSTERS

1- David Lusher **Laminar shockwave/boundary-layer interactions in rectangular ducts**

2- Andrea Cassinelli **Prediction of Reynolds number effects on a low pressure turbine cascade using spectral/hp element methods**

3- Yongmann Chung **Uniform momentum zones in a turbulent pipe flow**

4- Castiglioni Giacomo **Shock-wave boundary layer interactions in an engine intake with a spectral/hp element method**

5- Andrew Mole **Hybrid RANS-LES of Turbulent Boundary Layers**

6- Felipe Alves Portela **Predicting fully rough conditions through hybrid DNS/URANS simulations**

7- Khaled Takroui **A DNS study on drag reduction/increasing of a Backswimmer textured surface in channel flows**

8- Jacob Turner **Numerical investigation into the effect of flow separation and stall on aerofoil noise**

9- Mingyang Wang **Turbulent curved channel vegetation flow with rigid stems and straight channel flow with flexible vegetation stems**

10- Robert Spencer **Turbine trailing edge flow stability**

11- Yan Yan **Numerical investigation of leading-edge protuberances on the**

aerofoil and the vertical axis wind turbine

12- Hanxun Yao **Evolution of the second structure function in a transitional boundary layer**

13- Xutong Zhang **DDES and IDDES Simulation of Flow Past Generic Side Mirror**

13.30-14.25 Invited talk: Maria Vittoria Salvetti **Assessment of the reliability of LES results: difficulties, stochastic approaches and a puzzling example**

14.30-16.00 Session 2 (Wheeler)

14.30 Jian Fang **Large-Eddy Simulation of Boundary Layer Transition in a Compressor Cascade**

14.45 Yanfei Gao **Study of tip leakage vortex in turbomachinery using a direct numerical simulation model**

15.00 Lachlan Jardine **How does aerothermal coupling affect turbine performance?**

15.15 Pawel J. Przytarski **The interplay of turbulence production mechanisms in multi-stage compressors**

15.30 Markus Zauner **Direct and large-eddy simulations of transonic buffet**

15.45 Olaf Marxen **Instability of compressible boundary-layer flows for a dense gas**

16.00-16.30 Tea and Poster Viewing

16.30-18.00 Session 3 (Revell)

16.30 Johanna Mader **The influence of spatial boundary heat distribution on turbulent convection**

16.45 Brendan Ehimen Omozopia Iyamabo **Investigation of heat transfer of flow through a 90-deg pipe bend**

17.00 Stefano Rolfo **Transition around a heated cylinder working in mixed convection**

17.15 Yongxin Chen **Analysis of flow structures around stationary and oscillating square cylinders**

17.30 Zheng-Tong Xie **Peak-to-Mean Concentration Ratio and Fractal Scaling**

17.45 Zhong-Nan Wang **Large-Eddy Simulation of Installed Jet Flow and Noise**

19.00 Dinner at MK BAR & GRILL

Tuesday 10th September

09.00-09.55 Invited talk SIG: Heng Xiao **Turbulence Modelling in the Age of Data: Data Assimilation, Machine Learning, and Generative Models**

10.00-11.15 Session 4 (van Reeuwijk)

10.00 Charles Moulinec **Data Conversion from OpenFOAM to Code_Saturne & Taylor-Green Vortex Test Case at Re = 6, 400 using Code_Saturne**

10.15 Omar A. Mahfoze **Implicit Large Eddy Simulations of a zero pressure gradient turbulent boundary layer**

10.30 Alex Gillespie **Efficient Inflow Turbulence Generation for Parallelised Compressible CFD Problems**

10.45 Arash Hamzehloo [High-order finite-difference schemes for DNS of incompressible and compressible turbulent channel flows](#)

11.00 Ali Girayhan Özbay [Convolutional Neural Networks for the Solution of the 2D Poisson Equation with Arbitrary Dirichlet Boundary Conditions, Mesh Sizes and Grid Spacings](#)

11.15-11.45 Break and Poster Viewing

11.45-12.40 Invited talk: Vittorio Michelassi [High-Fidelity CFD Assisted Improvement of Turbomachinery](#)

12.45-13.30 Lunch and Poster Viewing

13.30-15.00 Session SIG Aeroacoustics (Sandham)

13.30 Paul Tucker [Hierarchical Modelling and Acoustics for Jet Engines](#)

14.00 Gary Page [A Coupled LES/High-Order Acoustic Method for Jet Noise](#)

14.30 Aldo Rona [Assessing broadband shock associated noise from time-resolved dual-stream jet simulations](#)

15.00-15.15 Awards and concluding remarks

15.15-16.00 UKTC Management / Advisory Committee meeting

Assessing broadband shock associated noise from time-resolved dual-stream jet simulations

Aldo Rona

School of Engineering, University of Leicester

The aerodynamic noise radiating from single and dual-stream jets is by acoustic analogy from time-resolved Computational Fluid Dynamic (CFD) simulations. For this purpose, two Ffowcs Williams and Hawkings (FW-H) solvers were developed, based on an advanced time formulation (AFW-H) and on a convective formulation (CFW-H). The methods are coded in Python and embedded in Antares, a CFD post-processor developed by Cerfacs, France. The new FW-H solvers were tested on a hierarchy of noise sources of increasing complexity. The radiating field from elementary acoustic sources was considered first, progressing then to single-stream and dual-stream jets. CFD results obtained at Cerfacs by Large Eddy Simulation and at the University of Leicester by Detached Eddy Simulation provided the input to the acoustic analogy to estimate the noise radiation from jets. The jet noise predictions are compared against acoustic results obtained numerically by the elsA software (ONERA, France) and against sound measurements taken at the Von Karman Institute for Fluid Dynamics, Belgium. The tool is then used to assess dual-stream under-expanded jet noise in a configuration by Airbus SAS, at flow conditions that differ from the ones explored in previous aeroacoustic literature. Flight effects on jet noise are tested by applying the CFW-H tool to a single-stream under-expanded jet in-flight. The acoustic predictions for both static and in-flight jets are found in good agreement with reference predictions and with measurements, building confidence in using the new FW-H solvers to extract the aerodynamic noise generated by unsteady shock-containing jets.



