UMich/NASA Symposium on
Advances in Turbulence Modeling

Venue: North Quad Room NQ 1255, *(UM School of Information), 105 S State St, Ann Arbor, MI*

Agenda

Day 1: Tuesday (July 11)

9:00 am *Welcome, info & overview* (Karthik Duraisamy, U. Michigan)
9:15 am *Conference goals & spirit* (Philippe Spalart, Boeing)

9:30 am *Keynote: Status of Industrial Turbulence Modeling* (Florian Menter, Ansys)

10:15am-10:30am Discussion

Session A) New ideas for turbulence modeling
10:30 am *A Structure-Based Model for the Transport of Scalars in Homogeneous Turbulent Flows* (Constantinos Panagiotou, U. Tokyo)
10:50 am *Reynolds Stress Closure for Non-equilibrium Effects in Turbulent Flows* (Peter Hamlington, U. Colorado)
11:10 am *One-point PDF closure model applied to attached and separated flows* (Michael Stoellinger, U. Wyoming)

11:30 am-11:50 am Discussion

11:50 am-1:15 pm Lunch

Session B) Reynolds Stress Transport Modeling
 1:15 pm *Plenary: Reynolds stress modeling of Turbulence* (Suad Jakirlic, TU Darmstadt)
 2:00 pm *Perspective on Turbulence Modeling using Reynolds Stress Models : General approach* (Bernhard Eisfeld, DLR)
 2:30 pm *Perspective on Turbulence Modeling using Reynolds Stress Models : Modification for pressure gradients* (Tobias Knopp, DLR)
 2:45 pm *Initial Efforts to Improve Reynolds Stress Model Predictions for Separated Flows* (Chris Rumsey, NASA Langley)

3:05pm-3:30pm Discussion

Session C) RANS or hybrid development
3:30 pm *Development of a One-Equation Eddy Viscosity Turbulence Model for Application to Complex Turbulent Flows* (Ramesh Agarwal, Washington Univ)

4:00 pm *RANS model development at LLNL for the prediction of turbulent mixing* (Brandon Morgan, LLNL)

4:20 pm *A Framework for Multicomponent, Reynolds-Averaged Navier–Stokes Modeling of Hydrodynamic Instability-Induced Turbulent Mixing* (Oleg Schilling, LLNL)

4:40 pm *Influence of a Quadratic Constitutive Relation on Detached Eddy Simulations* (Jim Coder, U Tennessee)

5:00pm-5:30pm Discussion

Day 2: Wednesday (July 12)

9:00 am *Plenary : Uncertainty Quantification in Turbulence Modeling* (Robert Moser, U. Texas)

9:45am-10:00am Discussion

Session D) Experiments

10:00 am *Plenary: Experiments to aid understanding and modeling of turbulence* (Alexander Smits, Princeton)

10:45 am *Quantitative Characterization of Pressure-related Turbulence Transport Terms using Simultaneous Nonintrusive Pressure and Velocity Measurement* (Xiaofeng Liu, SDSU)

11:05 am *Modern CFD Validation for Turbulent Flow Separation on Axisymmetric Afterbodies* (Kevin Disotell, NASA Langley)

11:25 am *Development of a benchmark problem for modeling transitional unsteady flows: a combined experimental/computational approach* (Todd Lowe, Virginia Tech)

11:45am-noon Discussion

noon-1:15pm Lunch

Session E) Data-driven methods

1:15 pm *Plenary: Data-driven Turbulence Modeling: Challenges and Progress* (Karthik Duraisamy, U. Michigan)

1:45 pm *Field Inversion and Machine Learning for Predictive Turbulence Modeling* (Anand Pratap Singh, U. Michigan)

2:05 pm *A Machine Learning Approach for Turbulent Scalar Mixing with Applications in Film Cooling* (Pedro Milani, Stanford)

2:25 pm *A Physics-based Machine learning approach for predictive turbulence modeling* (Heng Xiao, Virginia Tech)

2:45 pm *Data-driven turbulence modeling applied to separated flows* (Nicolo Fabbiane, ONERA)

3:05-3:30 Discussion

<u>Session F) Flow solution technologies for the future</u>

  3:30 pm *Plenary: Turbulent flow solvers – Perspectives on HPC and numerical methods* (Juan Alonso, Stanford)

  4:10 pm *Resolution Requirements for DG-LES* (Shervin Sammak, U. Pittsburgh)
  4:30 pm *A self-contained filtered density function* (Arash Nouri, U. Pittsburgh)

  4:50pm – 5:15 pm Discussion

Day 3: Thursday (July 13)

 9:00 am *Discussion : Philosophies / Trends / Glass ceiling in Turbulence Modeling* (Philippe Spalart, Boeing)

 <u>Session G) DNS/LES & Applications</u>

  9:45 am *DNS / LES of turbulent separated flows* (Ponnampalam Balakumar, NASA Langley)
  10:05 am *Novel uses of DNS with turbulent separation for RANS models* (Gary Coleman, NASA Langley)
  10:25 am *Challenges for RANS models in Turbomachinery flows* (Guoping Xia , UTRC)
  10:45 am *Appropriate differential Reynolds stress modeling for Turbomachinery flows* (Christian Morsbach, DLR)

11:05 am – 11:45 am Discussion

11:45 am - 1:15 pm Lunch

 1:15 pm: *RCA Workshop/ Vision 2030 discussion* (Chris Rumsey / Mujeeb Malik)
 2:00 pm: *Workshop summary, wrap up*
 3:00 pm: *Close*