

# *PROGRAM*

## *PRESENTATION OF RESEARCH ACCOMPLISHMENTS*

*14<sup>th</sup> Biennial Summer Program of the  
Center for Turbulence Research*

*Friday, July 20, 2012  
Braun Auditorium*



7:45 AM Breakfast at the Seeley Mudd Patio and Lawn (Braun Auditorium)

8:30 AM **Introduction: Parviz Moin**

8:50 AM **FUNDAMENTALS OF TRANSITION AND TURBULENCE**

**Overview: Peter Schmid**

**Presentation: Peter Schmid, Brian Farrell, Mihailo Jovanovi□**

### ***Transition to Turbulence***

*Peter Schmid, Taraneh Sayadi, Joseph Nichols*

Dynamic mode decomposition of H-type and K-type transition to turbulence

*Matteo Bernardini, Sergio Pirozzoli, Paolo Orlandi, Sanjiva Lele*

Compressible boundary layer transition induced by isolated roughness elements

*Kevin Nolan, Tamer Zaki, Sanjiva Lele*

Conditional sampling and statistical analysis of transitional flows

*Daniel Bodony, Mahesh Natarajan, Joseph Nichols*

Controller selection and placement in compressible turbulent flows

### ***Statistical Mean State Dynamics***

*Brian Farrell, Petros Ioannou, Mihailo Jovanovi□, Binh Lieu*

Statistical mean state dynamics of turbulent channel flows

*Dennice Gayme, Binh Lieu, Peter Schmid, Brian Farrell,*

*Petros Ioannou, Mihailo Jovanovi□*

Understanding large-scale momentum transfer mechanisms in turbulent Couette flow

### ***Drag Reduction by Polymers***

*Yves Dubief, Vincent Terrapon, Julio Soria, Ivan Bermejo-Moreno*

Analysis of transitional polymeric flows and elastic instabilities

*Mihailo Jovanovi□, Lieu Binh*

Analysis of drag reduction by polymers in turbulent wall-bounded shear flows

9:40 AM Further discussion

**9:55 AM LARGE EDDY SIMULATION (LES)**

**Overview: Julian Domaradzki**

**Presentation: Julian Domaradzki, Vincent Moureau,  
Guillaume Balarac**

***Large Eddy Simulation Fundamentals***

*François Cadieux, Taraneh Sayadi, Julian Domaradzki, Sanjeeb Bose*

LES of separated flows at moderate Reynolds numbers  
appropriate for turbine blades and unmanned aero-vehicles

*James Wallace, Ricardo Garcia-Mayoral, Brian Pierce*

LES boundary conditions using minimal flow unit information  
obtained from boundary layer DNS in transition

*Mohammad Saeedi, Bing-Chen Wang, Sanjeeb Bose, Curtis Hamman*

Advanced subgrid-scale modeling for LES of passive scalar  
dispersion in a turbulent boundary-layer

*Guillaume Balarac, Sanjeeb Bose*

Subgrid-scale modeling of SGS scalar flux: a regularization of  
the gradient model

***Applications of Large Eddy Simulation***

*Stefan Hickel, Emile Toubert, Johan Larsson, Julien Bodart*

Wall modeling for LES of supersonic flows at realistic Reynolds  
numbers

*Nicolas Maheu, Vincent Moureau, Pascale Domingo, Florent Duchaine,  
Guillaume Balarac, Ivan Bermejo Moreno, Julien Bodart*

Large-Eddy simulations of flow and heat transfer around a low-  
Mach turbine blade

*Jongwook Joo, Georgi Kalitzin, Goradz Medic*

Large Eddy simulation for turbomachinery blades

*Prem Venugopal, Lawrence Cheung, Giridhar Jothiprasad,  
Sanjiva Lele*

Large eddy simulation of self-noise from a wind turbine airfoil at  
high angle of attack

## ***Particle Methods for Turbulent Flows***

*Guillaume Balarac, Georges-Henri Cottet, Jean-Baptiste Lagaert*

Particle method: an efficient tool for direct numerical simulations of high Schmidt number passive scalar in turbulent flow

*Stefan Adami, Xiangyu Hu*

Simulating 3D turbulence with SPH

10:55AM Further discussion

11:10 AM Coffee break

**11:30 AM UNCERTAINTY QUANTIFICATION (UQ)**

**Overview: Gianluca Iaccarino**

**Presentation: Sophie Ricci, Qiqi Wang, Stéphane Moreau**

### ***Data Assimilation***

*Olaf Marxen, Gennaro Serino, Fabio Pinna, Catherine Gorle, Gianluca Iaccarino*

Statistical inverse analysis and stochastic modeling of transition

*Bénédicte Cuenot, Mélanie Rochoux, Sophie Ricci, Arnaud Trouvé*

Towards predictive simulations of wildfire spread using data assimilation and uncertainty quantification

### ***Algorithms***

*Pietro Congedo, Gianluca Geraci*

Adaptive strategy in multiresolution framework for uncertainty quantification

*Didier Lucor*

Adaptive uncertainty quantification approaches for stiff systems and multi-scale modes

*Patrick Blonigan, Rui Chen, Qiqi Wang*

Sensitivity analysis of mixing in separated turbulent flows

## *Applications*

*Toshijuki Arima, Hiroki Tachikawa*

Robust optimization for windmill airfoil design considering variation in wind conditions

*Julien Christophe, Stéphane Moreau*

Uncertainty quantification of low speed fan noise

*Jean-Christophe Giret, Stéphane Moreau*

Uncertainty quantification of the far-field noise from a Rod-Airfoil configuration using compressible LES simulations

12:25 PM Further discussion

12:40 PM Lunch at the Seeley Mudd Patio and Lawn (Braun Auditorium)

**1:45 PM REYNOLDS AVERAGED MODELING (RANS)**

**Overview: Christopher Rumsey**

**Presentation: Christopher Rumsey**

*Christopher Rumsey, Elbert Jeyapaul, Karthik Duraisamy*

EASM Modeling: Pressure strain modeling and near wall effects for separated flows

*Rene Peñik, John O'Sullivan, Stavros Kassinos,  
Hari Radhakrishnan, Fotos Stylianou, Karthik Duraisamy,  
Gianluca Iaccarino*

Apriori and inverse analysis of the algebraic structure-based model for flows with three dimensional effects

*John O'Sullivan, Stavros Kassinos, Gianluca Iaccarino*

Capturing near wall effects in Algebraic Structured Based Modeling (ASBM)

2:10 PM Further discussion

**2:25 PM**      **TWO-PHASE**  
**Overview: Marcus Herrmann**  
**Presentation: Marcus Herrmann, Mikhael Gorokhovski,**  
**Rodney Fox**

***Simulation of Turbulent Gas/Liquid Interface***

*Marcus Herrmann*

A Runge-Kutta discontinuous Galerkin conservative level set method

*Mikhael Gorokhovski, Andrey Ovsyannikov, Vladimir Sabel'nikov*

A new level set equation and its numerical assessments

***Fragmentation and Atomization Models***

*Mikhael Gorokhovski, Rémi Zamansky*

LES and stochastic primary atomization

*Nicolas Rimbert, François Doisneau, Damien Kah, Frédérique Laurent, Marc Massot*

Mesosopic model of secondary breakup

***Turbulent Disperse-Phase Flow Simulation***

*Guo-Wei He, Ali Mani, Hadi Pour Ansari*

A Germano-type identity for LES coupled with discrete particle dynamics

*Lucie Fréret, Olivier Thomine, Frédérique Laurent, Julien Réveillon, Marc Massot*

Direct Numerical Simulation of polydisperse evaporating sprays in 3D jet configuration

*Aymeric Vié, François Doisneau, Adam Larat, Enrica Masi, Olivier Simonin, Christophe Chalons, Rodney Fox, Frédérique Laurent, Joël Dupays, Marc Massot*

Fully Eulerian LES of dilute to dense polydisperse turbulent sprays

**3:15 PM**      Further discussion

**3:30 PM**      Coffee break

3:50 PM

## COMBUSTION

**Overview: Matthias Ihme**

**Presentation: Matthias Ihme, Luc Vervisch, and  
Thierry Poinsot**

### *Turbulent Combustion Modeling*

*Matthieu Boileau, Vincent Moureau, Thomas Schmitt, Denis Veynante*  
Analysis of dynamic models for turbulent premixed combustion

*Edward Richardson, Colleen Kaul, Ed Knudsen*  
Effects of scalar dissipation rate fluctuations on turbulent auto-  
ignition DNS analysis and modeling

*Wai Lee Chan, Yee Chee See, Matthias Ihme*  
Flame-stabilization and heat-transfer analysis of a jet-in-cross-  
flow

### *Pollution and Emissions*

*Antonio Attili, Fabrizio Bisetti, Michael Mueller*  
DNS of soot formation and growth in turbulent non-premixed flames:  
Damköhler number effects and Lagrangian statistics of soot transport

*Bénédicte Cuenot, Eléonore Riber, Arnaud Trouvé*  
Deposition of combustor-generated soot particles on cold wall  
surfaces

*Pascale Domingo, Guillaume Ribert, Luc Vervisch*  
A hybrid transported-tabulated strategy to downsize detailed  
chemistry for large eddy simulations

### *Flame Dynamics*

*Bénédicte Cuenot, Raphael Mari, Laurent Selle*  
*Stabilization mechanisms of supercritical hydrogen/oxygen flame*

*Emmanuel Motheau, Franck Nicoud, Laurent Selle*  
Thermo-acoustic instabilities in high-speed reacting flows:  
entropy-acoustic coupling and uncertainty quantification

*Franck Richecoeur, Layal Hakim, Laurent Zimmer*  
Dynamic mode decomposition for experimental investigation of  
combustion instabilities

*Thierry Poinsot, Jérôme Dombard, Vincent Moureau, Nicolas Savary, Gabriel Staffelbach, Virginel Bodoc*

Quantification of uncertainties in LES and RANS of swirled flows in gas turbine injection systems

4:50 PM Further discussion

5:00 PM Adjourn



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