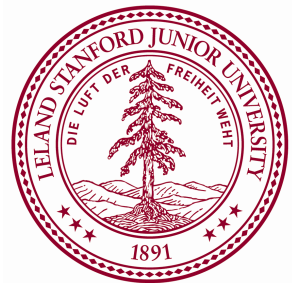# PROGRAM

PRESENTATION OF RESEARCH PLANS

17th Biennial Summer Program
Center for Turbulence Research

Monday, June 25, 2018
10:00 AM – 4:30 PM
Bishop Auditorium

10:00 AM   **Introduction: Parviz Moin**

10:20AM   **ANALYSIS AND MODELING OF WALL TURBULENCE**
Overview   **Adrian Lozano-Duran**

A multifractal model for the current density through an ion-selective membrane in the overlimiting regime
Xiang Yang and Haosen Xu
Pennsylvania State University, United States
Host(s): Karen Wang and Ali Mani

The origin of wall turbulence over complex surfaces
Akshath Sharma, Garazi Gomez de Segura, and Ricardo Garcia-Mayoral
University of Cambridge, United Kingdom
Host(s): Danah Park and Ali Mani

Three-dimensional transient channel flow due to a transverse pressure gradient
Shuisheng He and Jundi He
The University of Sheffield, United Kingdom
Host(s): Adrian Lozano-Duran and Minjeong Cho

Estimating logarithmic-layer turbulence from observations of the wall pressure
Javier Jimenez and Miguel Perez Encinar
Universidad Politecnica de Madrid, Spain
Host(s): Adrian Lozano-Duran

Exploiting the restricted nonlinear model to understand the laminarization mechanism and optimize control of turbulence
Brian Farrell, Petros Ioannou, and Marios-Andreas Nikolaidis
Harvard University, United States
National and Kapodistrian University of Athens, Greece
Host(s): Michael Karp, Javier Jimenez, and Adrian Lozano-Duran

Physics-based near-wall turbulence modeling in an enriched discontinuous Galerkin framework
Yu Lv
Mississippi State University, United States
Host(s): Matthias Ihme

Regularity diagnostics applied to turbulent boundary layers
Robert Kerr
University of Warwick, United Kingdom
Host(s): Perry Johnson and Jane Bae

Wall-modeled large-eddy simulation of massively separated aircraft wake
Oriol Lehmkuhl and George Ilhwan Park
Barcelona Supercomputing Center, Spain
University of Pennsylvania, United States
Host(s): Sanjeeb Bose and Parviz Moin

Impact of transverse shear on turbomachinery endwall flows
Jin Lee
United Technologies Research Center, United Sates
Host(s): Sanjeeb Bose

Single-point structure tensors in rough-wall, non-equilibrium turbulent boundary layers
Junlin Yuan and Giles Brereton
Michigan State University, United States
Host(s): Aashwin Mishra and Gianluca Iaccarino

11:20 AM **Further Discussion**

11:45 AM **MULTIPHYSICS DATA-DRIVEN STUDIES AND NUMERICAL METHODS**
Overview **Gianluca Iaccarino**

A novel framework for data-driven identification and analysis of intermittency and rare events in turbulent shear flows
Peter J. Schmid and Oliver T. Schmidt
Imperial College of London, United Kingdom
California Institute of Technology, United States
Host(s): Aaron Towne and Philipp Hack

Data-based estimates of adjoint operators for turbulent flow control
Daniel Bodony
University of Illinois at Urbana-Champaign, United States
Host(s): Aaron Towne and Philipp Hack

The suitability of hybrid meshes for LES
Stefan Domino
Sandia National Laboratories, United States
Host(s): Lluis Jofre

The influence of temperature non-uniformity on supersonic jet noise
Patrick Tamm
NAVAIR Internal Flow Team, United States
Host(s): Guillaume Bres, Aaron Towne, and Sanjiva Lele

Learning individual and collective strategies for flow navigation in unsteady flow environments
Vamsi Spandan Arza
University of Twente, Netherlands
Host(s): Lluis Jofre and Maxime Bassenne

Analysis of numerical dissipation in entropy-stable schemes for turbulent flows
Cory V. Frontin and Scott M. Murman
Massachusetts Institute of Technology, United States
NASA Ames Research Center, United States
Host(s): Lin Fu and Zhu Huang

Shadowing-based adjoint sensitivity analysis for LES of a turbulent jet
Patrick Joseph Blonigan
NASA Ames Research Center, United States
Host(s): Aaron Towne and Zhu Huang

Optimizing nozzle shapes for jet noise reduction
Zhong-Nan Wang, Qiqi Wang, Nisha Chandramoorthy, and Paul Tucker
Cambridge University, United Kingdom
Massachusetts Institute of Technology, United States
Host(s): Sanjeeb Bose and Aaron Towne

Large-scale definition for the variational multiscale method based on spectral eddy-viscosity analyses
Fabio Naddei, Marta de la Llave Plata, and Marc Massot
ONERA - The French Aerospace Lab, France
Ecole Polytechnique / Centre de Mathematiques Appliquees, France
Host(s): Eric Ching and Matthias Ihme

Passive scalar mixing through shock-turbulence interactions: DNS, statistical and geometric analysis
Ivan Bermejo-Moreno, Xiangyu Gao, and Jonas Buchmeier
University of Southern California, USA
Host(s): Lin Fu and Sanjiva Lele

On the calibration of turbulence models for a siloxane MDM in the non-ideal regime and application to the robust optimization of turbine cascades
Giulio Gori, Nassim Razaaly, and Pietro M. Congedo
Universite de Bordeaux, INRIA, France
Host(s): Aashwin Mishra and Gianluca Iaccarino

12:30 PM   **Further Discussion**

12:45 PM   **Lunch**

1:45 PM   **MULTIPHASE FLOWS**
Overview   **Ali Mani**

Interscale energy transfer of liquid phase turbulence in a homogenous swarm of air bubbles rising in a vertical channel
Chung Kei Chris Lai and Bruno Fraga
Los Alamos National Laboratory, United States
University of Birmingham, United Kingdom
Host(s): Michael Dodd and Ronald Chan

Towards an Euler-Lagrange high-speed multiphase flow model
Magnus Vartdal and Andreas Nygard Osnes
Norwegian Defence Research Establishment (FFI), Norway
University of Oslo, Norway
Host(s): Jeremy Horwitz and Ali Mani

Confinement, enhancement, extremes and inversions in the mixing and transport of particles by rotating turbulent flows
Andy Bragg and Rohit Dhariwal
Duke University, United States
Host(s): Jeremy Horwitz and Ali Mani

Direct numerical simulation of homogeneous shear turbulence with finite-size bubbles/droplets
Luca Brandt, Marco E. Rosti, and Anthony Ge
Royal Institute of Technology, Sweden
Linne FLOW Centre and SeRC, Sweden
Host(s): Michael Dodd and Suhas Suresh

A hybrid MVA-LES approach for turbulent flows in porous media: a priori DNS analysis and subgrid model development
Sourabh V. Apte
Oregon State University, United States
Host(s): Sadaf Sobhani and Matthias Ihme

Electric-field effects on turbophoresis in particle-laden turbulent channel flows
Mario Di Renzo
Politecnico di Bari, Italy
Host(s): Maxime Bassenne, Laura Villafañe, Perry Johnson, and Javier Urzay

A dual-scale subgrid closure for LES of phase interfaces in turbulent flows
Marcus Herrmann, Dominic Kedelty, and Thomas Ziegenhein
Arizona State University, United States
Host(s): Hanul Hwang

Multiphase transport and particle deposition of sand ingestion for high temperature turbine blades
Nishan Jain and Luis Bravo
University of Maryland, United States
US Army Research Laboratory, United States
Host(s): Dokyun Kim and Sanjeeb Bose

2:35 PM **Further Discussion**

2:50 PM **COMBUSTION**
Overview **Matthias Ihme**

Intrusive generalized chaos expansion on linearized Euler equations for uncertainty quantification of thermoacoustic instabilities
Camilo F. Silva and Per Petterson
Technische Universitat Munchen, Germany
Uni Research CIPR, Norway
Host(s): Gianluca Iaccarino and Matthias Ihme

A Bayesian approach for data assimilation and parameter estimation in combustion instabilities
Hans Yu, Matthew Juniper, and Luca Magri
University of Cambridge, United Kingdom
Host(s): Jeffrey Labahn, Aashwin Mishra, and Matthias Ihme

Exploration of the potential of deep learning for sub-grid scale flame surface estimation
Corentin Lapeyre
CERFACS, France
Host(s): Aashwin Mishra and Thomas Jaravel

Direct numerical simulation, analysis and advanced modeling of the evaporation of multiple fuel droplets in a hot turbulent flow
Christophe Duwig, Giandomenico Lupo, and Andrea Gruber
Royal Institute of Technology, Linne FLOW Centre, Sweden
SINTEF Energy Research, Norway
Host(s): Thomas Jaravel, Pavan Bharadwaj, and Michael Dodd

Effect of combustor liner wall angle on aerodynamics and convective heat transfer
Georgi Kalitzin and Kalyana Gottiparthi
United Technologies Research Center, United States
Oak Ridge National Laboratory, UT-Battelle LLC, United States
Host(s): Sanjeeb Bose, Matthias Ihme, and Javier Urzay

Scale dependence and modeling of heat release effects on subfilter turbulence in turbulent premixed combustion
Jonathan F. MacArt and Michael E. Mueller
Princeton University, United States
Host(s): Matthias Ihme and Javier Urzay

Characterization of scheme and model impacts on LES via DNS-assisted evaluation
Ayaboe K. Edoh and Timothy Gallagher
ERC, Inc. Edwards Air Force Base, United States
ISS, Inc. Air Force Research Lab, United States
Host(s): Qing Wang and Matthias Ihme

Simulation of reacting flows using observable Euler / Navier-Stokes equations
Kamran Mohseni and Bahman Aboulhasanzadeh
University of Florida at Gainesville, United States
Host(s): Ali Mani and Javier Urzay

3:40 PM   Further Discussion

4:00 PM   Adjourn
Coffee Break

List of Participants

Bahman Aboulhasanzadeh
bahman@ufl.edu

Sourabh V. Apte
sourabh.apte@oregonstate.edu

Vamsi Spandan Arza
vamsispandan@gmail.com

Ivan Bermejo-Moreno
bermejom@usc.edu

Patrick Joseph Blonigan
patrick.j.blonigan@nasa.gov

Daniel Bodony
bodony@illinois.edu

Andy Bragg
andrew.bragg@duke.edu

Luca Brandt
luca@mech.kth.se

Luis Bravo
luis.g.bravorobles.civ@mail.mil

Giles Brereton
brereton@egr.msu.edu

Jonas Buchmeier
jbuchmei@usc.edu

Nisha Chandramoorthy
nishac@mit.edu

Pietro M. Congedo
pietro.congedo@inria.fr

Marta de la Llave Plata
marta.de_la_llave_plata@onera.fr

Rohit Dhariwal
rohitdhariwal@duke.edu

Mario Di Renzo
rohitdhariwal@duke.edu

Stefan Domino
spdomin@sandia.gov

Christophe Duwig
duwig@kth.se

Ayaboe K. Edoh
ayaboe.edoh.ctr@us.af.mil

Miguel Perez Encinar
miguel@torroja.dmt.upm.es

Brian Farrell
farrell@seas.harvard.edu

Bruno Fraga
b.fraga@bham.ac.uk

Cory V. Frontin
cfrontin@mit.edu

Timothy Gallagher
timothy.gallagher.11.ctr@us.af.mil

Xiangyu Gao
xiangyug@usc.edu

Ricardo Garcia-Mayoral
r.gmayoral@eng.cam.ac.uk

Anthony Ge
zhoge@mech.kth.se

Garazi Gomez De Segura
gg406@cam.ac.uk

Giulio Gori
giulio.gori@inria.fr

Kalyana Gottiparthi
gottipkc@utrc.utc.com

Andrea Gruber
andrea.gruber@sintef.no

Jundi He
jhe21@sheffield.ac.uk

Shuisheng He
s.he@sheffield.ac.uk

Marcus Herrmann
marcus.herrmann@asu.edu

Petros Ioannou
petros.battleground@gmail.com

Nishan Jain
nishan.aero@gmail.com

Javier Jimenez
jjsendin@gmail.com

Matthew Juniper
mpj1001@cam.ac.uk

Georgi Kalitzin
kalitzg@utrc.utc.com

Dominic Kedelty
dkedelty@asu.edu

Robert Kerr
r.m.kerr@warwick.ac.uk

Chung Kei Chris Lai
chrislck@lanl.gov

Corentin Lapeyre
lapeyre@cerfacs.fr

Jin Lee
leejin@utrc.utc.com

Oriol Lehmkuhl
oriol.lehmkuhl@bsc.es

Giandomenico Lupo
gianlupo@mech.kth.se

Yu Lv
ylv@ae.msstate.edu

Jonathan F. MacArt
jmacart@princeton.edu

Luca Magri
lm547@cam.ac.uk

Marc Massot
marc.massot@polytechnique.edu

Kamran Mohseni
mohseni@ufl.edu

Michael E. Mueller
muellerm@princeton.edu

Scott M. Murman
scott.m.murman@nasa.gov

Fabio Naddei
fabio.naddei@onera.fr

Marios-Andreas Nikolaidis
macvirus1@hotmail.com

Andreas Nygard Osnes
a.n.osnes@its.uio.no

George Ilhwan Park
gipark@seas.upenn.edu

Per Pettersson
per.pettersson@uni.no

Nassim Razaaly
nassim.razaaly@inria.fr

Marco E. Rosti
merosti@mech.kth.se

Peter J. Schmid
peter.schmid@imperial.ac.uk

Oliver T. Schmidt
oschmidt@caltech.edu

Akshath Sharma
as2527@cam.ac.uk

Camilo F. Silva
camilo.f.silva.g@gmail.com

Patrick Tamm
patrick.tamm@navy.mil

Paul Tucker
pgt23@cam.ac.uk

Magnus Vartdal
magnus.vartdal@ffi.no

Qiqi Wang
qiqi.wang@gmail.com

Zhong-Nan Wang
znw22@cam.ac.uk

Haosen Xu
hzx25@psu.edu

Xiang Yang
xzy48@psu.edu

Hans Yu
hy313@cam.ac.uk

Junlin Yuan
junlin@egr.msu.edu

Thomas Ziegenhein
t.ziegenhein@hzdr.de

List of Hosts

Jane Bae
hjbae@stanford.edu

Maxime Bassenne
bassenne@stanford.edu

Pavan Bharadwaj
pavang@stanford.edu

Sanjeeb Bose
stbose@stanford.edu

Guillaume Bres
gbres@cascadetechnologies.com

Ronald Chan
whrchan@stanford.edu

Eric Ching
eching@stanford.edu

Minjeong Cho
minjeong@stanford.edu

Michael Dodd
doddm@stanford.edu

Lin Fu
linfu@stanford.edu

Philipp Hack
mjph@stanford.edu

Jeremy Horwitz
horwitz1@stanford.edu

Zhu Huang
hzlwtt88@stanford.edu

Hanul Hwang
hanul@stanford.edu

Gianluca Iaccarino
jops@stanford.edu

Matthias Ihme
mihme@stanford.edu

Thomas Jaravel
tjaravel@stanford.edu

Lluis Jofre
[jofre@stanford.edu

Perry Johnson
perryj@stanford.edu

Michael Karp
mkarp@stanford.edu

Dokyun Kim
dkkim@cascadetechnologies.com

Jeffrey Labahn
jwllabah@stanford.edu

Sanjiva Lele
lele@stanford.edu

Adrian Lozano-Duran
adrianld@stanford.edu

Ali Mani
alimani@stanford.edu

Aashwin Mishra
aashwin@stanford.edu

Parviz Moin
moin@stanford.edu

Danah Park
danah12@stanford.edu

Sadaf Sobhani
ssobhani@stanford.edu

Suhas Suresh
sjsuresh@stanford.edu

Aaron Towne
atowne@stanford.edu

Javier Urzay
jurzay@stanford.edu

Laura Villafañe
lvillafa@stanford.edu

Karen Wang
kmwang14@stanford.edu

Qing Wang
wangqing@stanford.edu

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STANFORD UNIVERSITY