

# 2023 Unsteady Aerodynamics Program Review

Dr. Gregg Abate | July 10-13, 2023 | Arlington, VA -hybrid

Basic Research Innovation Collaboration Center (BRICC)  
4100 N Fairfax Drive | Suite 450 | Arlington, VA 22203

## Agenda Day 1 | Monday, July 10, 2023

Time	Topic	Speaker
8:10	Zoom Room opens, test communications	
8:35	Intro & Welcome	Gregg Abate
Turbulence Studies, BL Transition, and Fluid-Surface Interaction		
8:45	Data-Driven Control of Unsteady Flows	Sam Taira - University of California Los Angeles, Steve Brunton - University of Washington
9:10	Populating the wall layer, one eddy at a time: Resolvent analysis for Wall-Modelled LES (virtual)	Ugo Piomelli - Queens University, Canada Beverley McKeon - Stanford University
9:35	A wavelet-based resolvent analysis for highly-unsteady transient flows	Jane Bae - California Institute of Technology, Scott Dawson - Illinois Institute of Technology
10:00	(EOARD) Non-equilibrium cascade and large-scale dynamics in wall turbulence (virtual)	Christos Vassilicos - Centre National de Recherche Scientifique, Lille FRANCE
10:25	Break/Open Discussion	
10:40	(MURI Introduction) Fluid-Metamaterial-Interaction to Revolutionize Passive Control of Aerodynamic Flows	Kathryn Matlack (Lead PI), Andres Goza, Theresa Saxton-Fox, Phillip Ansell - University of Illinois at Urbana-Champaign, Jane Bae - California Institute of Technology, Jordan Raney - California Institute of Technology, Harold Park - Boston University
11:05	(LRIR) Resonant Metamaterials for Laminar Flow Control	Abby Juhl - AFRL/RX Caleb Barnes, Albert Medina - AFRL/RQ
11:30	Passive Control of Non-Canonical Flows with Anisotropic Porous Materials	Lou Cattafesta - Illinois Institute of Technology, Rajat Mittal, Charles Meneveau - Johns Hopkins
11:55	Harnessing phononic materials for unsteady aerodynamic flow control	Andres Goza, Katie Matlack - University of Illinois at Urbana-Champaign
12:20	Lunch	
1:20	Transonic Flow Control over Engineered Elastoacoustic Subsurfaces via Generalized Impedance Boundary Conditions	Mostafa Nouh - The State University of New York at Buffalo, Carlo Scalo - Purdue University

<b>1:35</b>	<b>(EOARD)</b> A-SURF: Acoustically self-resonating surfaces for boundary layer flow control	<b>Woutijn Baars</b> - Technische Universiteit Delft, NETHERLANDS
<b>2:00</b>	Computational interpretation of limited and noisy measurements using CFD and machine learning <b>(virtual)</b>	<b>Tamer Zaki</b> - Johns Hopkins University
<b>2:25</b>	Data-enhanced Hybrid Modeling for Turbulent Aerodynamics	<b>Paul Durbin, Anupam Sharma</b> - Iowa State
<b>2:50</b>	<b>Break/Open Discussion</b>	
<b>3:05</b>	Passive flow control of bypass transition by roughness shielding	<b>David Goldstein</b> - University of Texas at Austin, <b>Ed White</b> - Texas A&M University, <b>Saikishan (Sai) Suryanarayanan</b> - University of Akron
<b>3:30</b>	<b>(YIP 20)</b> Resolvent-based estimation for control of turbulent aerodynamic flows	<b>Aaron Towne</b> - University of Michigan
<b>3:55</b>	A Variational Theory of Aerodynamics	<b>Haithem Taha</b> - University of California Irvine
<b>4:20</b>	<b>Break/Open Discussion</b>	
<b>4:35</b>	<b>Wrap-up, &amp; Adjourn</b>	

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## Agenda Day 2 | Tuesday, July 11, 2023

Time	Topic	Speaker
8:10	Zoom Room opens, test communications	
8:25	Intro & Welcome	Gregg Abate
Turbulence Studies, BL Transition, and Fluid-Surface Interaction		
8:30	(EOARD) Turbulent drag reduction by fibrous permeable substrates (virtual)	Ricardo Garcia-Mayoral - University of Cambridge, UNITED KINGDOM
8:55	(YIP 23) Stochastic modeling and analysis of random surface roughness	Armin Zare - University of Texas - Dallas
9:10	Transformative prognostic wall-turbulence models for realistic spatial heterogeneities: theory, experiments and direct- and large-eddy simulation	William Anderson- University of Texas – Dallas, Kenneth Christensen - Illinois Institute of Technology, Carlos Pantano - University of Southern California
9:35	(DEPSCoR) Cluster-based estimation and control of turbulent aeroelastic flows (virtual)	Aditya Nair, Floris van Breugel - University of Nevada - Reno
9:50	(YIP 23) Extrapolative, progressive machine learning for turbulence modeling	Xiang Yang - Pennsylvania State University
10:05	Break/Open Discussion	
10:20	(YIP 22) Efficient Stabilization of the Adjoint for Turbulent Separated Flows	James Coder - Penn State University
10:45	(AOARD) Development of ultra-miniature wall-shear-stress sensors for low-speed flow applications	Duvvuri Subrahmanyam (Subbu) - Indian Institute of Science, INDIA
11:10	(DEPSCoR) Understanding Vortex-Turbulent Boundary Layer Interactions to Mitigate Separation Using Textured Surfaces	Gokul Pathikonda - Arizona State University, Vrishank Raghav - Auburn University
11:25	(AOARD) Advancing the flow physics behind the drag of riblets	Daniel Chung, Nicholas Hutchins - University of Melbourne, AUSTRALIA
11:50	Technology Transfer and Transition (T3) Capabilities	Sunny Shahhaidar – VT-ARC
12:00	Lunch	
Flow Physics for Control		
1:00	(EOARD) Rough-wall turbulent boundary layer subjected to streamwise pressure gradients (virtual)	Bharath Ganapathisubramani - University of Southampton, UNITED KINGDOM
1:25	Birth and control of three-dimensional Lagrangian separation: Optimal control	Guus Jacobs - San Diego State University, Geoff Spedding - University of Southern

		California, <b>Maziar Hemati</b> - University of Minnesota
<b>1:50</b>	Active Flow Control of a Complex 3D Supersonic Multi-Stream Nozzle Flow	<b>Mark Glauser</b> , <b>Yiyang Sun</b> - University of Syracuse, <b>Datta Gaitonde</b> - Ohio State University
<b>2:15</b>	<b>Break/Open Discussion</b>	
<b>2:30</b>	Bispectral Mode Decomposition for discovery and modeling of nonlinear flow physics in open cavity flows	<b>Oliver Schmidt</b> - University of California San Diego
<b>2:55</b>	Joint experimental/computational study of control of jets in crossflow	<b>Krishnan Mahesh</b> - University of Michigan, <b>Ann Karagozian</b> - University of California Los Angeles
<b>3:20</b>	Learning to Fly - Using Distributed Pressure Sensing and Network Strategies	<b>David Rival</b> - Queens University, Canada, <b>Melissa Green</b> - University of Minnesota
<b>3:45</b>	<b>(DEPSCoR)</b> Mitigation of vortex-foil interactions through passive shape control	<b>Jennifer Franck</b> - University of Wisconsin, <b>Kenny Breuer</b> - Brown University
<b>4:00</b>	<b>Break/Open Discussion</b>	
<b>4:15</b>	<b>Wrap-up, &amp; Adjourn</b>	

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## Agenda Day 3 | Wednesday, July 12, 2023

Time	Topic	Speaker
8:10	Zoom Room opens, test communications	
8:25	Intro & Welcome	Gregg Abate
Flow Physics for Control		
8:35	Embedded Flow Control for High Work / Low Reynolds Turbines - BFCNTUR	Guillermo Paniagua - Purdue University
9:00	Rapid (on-Demand) Control of Shock-Dominated Flows by Filamentary Plasma	Sergey Leonov - Notre Dame, Jonathan Poggie - Purdue University
9:25	(LRIR) Separation inception in high-work turbine passages	Christopher Marks - AFRL/RQ
9:50	(HBCU/MSI) Numerical Investigation of Freestream Turbulence Effect on Endwall Flow in Low-Pressure Turbine Passage	Andreas Gross - New Mexico State University
10:15	Break/Open Discussion	
10:30	Flow Physics and Control of 3-D Separation on Finite Span, Tapered and Swept Wings (virtual)	Miki Amitay - Rensselaer Polytechnic University, Vasilis Theofilis - University of Liverpool, UK, Sam Taira - University of California Los Angeles
10:55	(LRIR) High-Fidelity Simulation of Complex Multi-Disciplinary Interactions in Air Vehicles	Dan Garmann, Caleb Barnes - AFRL/RQ
11:20	Dynamics and Control of Cargo Aircraft Wakes with Bays and Doors	Datta Gaitonde - Ohio State University, Farrukh Alvi - Florida State University
11:45	Lunch	
12:45	(LRIR) Towards a Generalized Understanding of Steady Jet/Boundary Layer Interaction to Inform Rapid Predictive Capability	Albert Medina, Aaron Altman - AFRL/RQ
1:10	(YIP 21) Towards Real-Time, 3D Coherent Structure Estimation for Flow Over Finite Wings	Frank Lagor - State University of New York - Buffalo
1:35	Dissecting the Flow Physics of Store-Induced Effects on Wing Aerodynamics and Limit-Cycle Oscillations in Transonic Flows	Rajat Mittal, Jung Hee Seo - Johns Hopkins University
2:00	Wall-bounded streamwise vortex destruction	Tyler Van Buren - University of Delaware

## Unsteady Aeromechanic Interactions

<b>2:45</b>	<b>Break/Open Discussion</b>	
<b>2:40</b>	Aerodynamically-adaptive wings using distributed bleed flow control	<b>Ari Glezer</b> - Georgia Tech, <b>Massimo Ruzzene</b> - University of Colorado Boulder
<b>3:05</b>	Flow Physics and Optimized Suppression of High-Speed Cavity Flow	<b>Larry Ukeiley</b> - University of Florida, <b>Lou Cattafesta</b> - Illinois Institute of Technology, <b>Sam Taira</b> - University of California Los Angeles
<b>3:30</b>	Dynamic Response of the Shear Layer to Cavity Door Operation at Supersonic	<b>Rajan Kumar</b> - Florida A&M University, <b>Farrukh Alvi</b> - Florida State University, <b>Kenneth Granlund</b> - North Carolina State University, <b>Datta Gaitonde</b> - Ohio State University
<b>3:55</b>	An experimental dynamical systems approach to aeroelastic instabilities of swept wings	<b>Kenny Breuer</b> - Brown University
<b>4:20</b>	<b>Break/Open Discussion</b>	
<b>4:45</b>	<b>Wrap-up, &amp; Adjourn</b>	

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## Agenda Day 4 | Thursday, July 13, 2023

Time	Topic	Speaker
8:10	Zoom Room opens, test communications	
8:15	Intro & Welcome	Gregg Abate
Unsteady Aeromechanic Interactions		
8:25	A coordinated experimental and computational study of global and convective gusts on swept wings	John Farnsworth, Ken Jansen - University of Colorado Boulder
8:50	Wing sweep, structural motion and their effect on separation and separation control – Simulations, wind tunnel and flight experiments	Hermann Fasel, Jesse Little - University of Arizona
9:15	A Passive Strategy for Improving Aero-Optics Through a Supersonic Shear Layer	Ed DeMauro - Rutgers University, Matthew Kemnetz - AFRL/RD
9:40	Onset and prediction of orbital motions of streamwise vortices	Justin Jaworski - Lehigh University
10:05	Break/Open Discussion	
10:20	High-Angle-of-Attack Translating and Pitching Wings Interacting with Finite Obstacles	Matt Ringuette - State University of New York Buffalo
10:45	Three-Dimensional Gust Control with Morphing Wings	Samik Bhattacharya - University of Central Florida
11:10	(SOARD) Coherent structure assessment in high-speed crossflow jets (virtual)	Guillermo Araya - University of Texas San Antonio, Ken Jansen - CU Boulder
11:35	Vortex interactions on multi-swept wing configurations	Mehdi Ghoreyshi, Juergen Seidel, Casey Fagley - United States Air Force Academy
12:00	Break/Open Discussion	
12:15	Wrap-up, & Adjourn	