DEPARTMENT OF MECHANICAL ENGINEERING COLLOQUIUM

UNIVERSITY OF CALIFORNIA
UC RIVERSIDE

The Department of Mechanical Engineering

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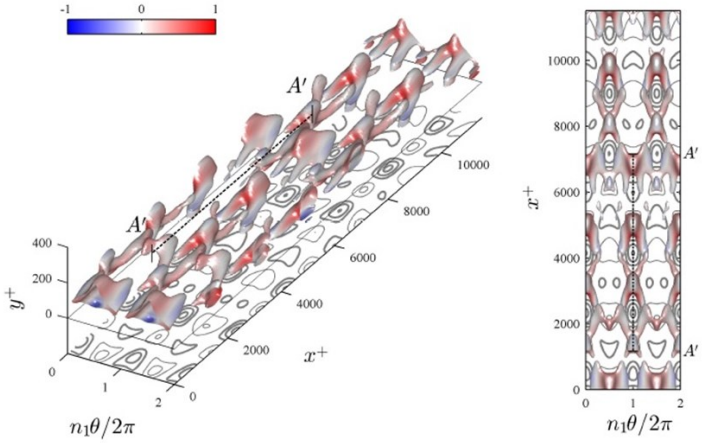
Bourns Hall A265
11:10AM-12:00PM

Modeling and control of wall turbulence using resolvent analysis

Abstract:
The financial and environmental cost of turbulence is staggering: manage to quell turbulence in the thin boundary layers on the surface of a commercial airliner and you could almost halve the total aerodynamic drag, dramatically cutting fuel burn, emissions and cost of operation. Yet systems-level tools to model scale interactions or control turbulence remain relatively under-developed. The resolvent analysis for turbulent flow proposed by McKeon & Sharma (J. Fluid Mech, 2010) provides a simple, but rigorous, approach by which to deconstruct the full turbulence field into a linear combination of (interacting) modes. After a brief review of dominant features of wall turbulence and some key results that can be obtained by analysis of the linear resolvent operator, I will describe some of our recent progress towards using the analysis as an extremely efficient and cheap design tool for control of turbulent systems.



About the Speaker:
Beverley McKeon is Theodore von Karman Professor of Aeronautics at the Graduate Aerospace Laboratories at Caltech (GALCIT). Her research interests include interdisciplinary approaches to manipulation of boundary layer flows using morphing surfaces, fundamental investigations of wall turbulence at high Reynolds number, the development of resolvent analysis for modeling turbulent flows, and assimilation of experimental data for efficient low-order flow modeling. She was the recipient of a Vannevar Bush Faculty Fellowship from the DoD in 2017, the Presidential Early Career Award (PECASE) in 2009 and an NSF CAREER Award in 2008, and is an APS Fellow and AIAA Associate Fellow. She is the past editor-in-chief of Experimental Thermal and Fluid Science and currently serves as an associate editor of Physical Review Fluids, and on the editorial boards of the AIAA J., Annual Review of Fluid Mechanics and Experiments in Fluids. She is the APS representative and Vice Chair Elect of the US National Committee on Theoretical and Applied Mechanics.