



## SPRING 2020 CEAFM SEMINAR SERIES

### ***“Dynamics and Models of Turbulent Boundary Layers, with Application to the Distortion of Optical Beams”***

Our group performs targeted experiments to expand understanding of turbulent boundary layer dynamics and uses the results to inform reduced-order models of the boundary layer. In this talk, we consider particle image velocimetry data from a heated, incompressible turbulent boundary layer at Reynolds number  $Re_{\tau} = 910$  and use an aero-optic sensor to identify large temperature gradients in the flow. Multiple interacting turbulent structures are identified as correlated to large temperature gradients using a projection-based conditional averaging approach. Reduced-order models of the structures and their interactions are created using a resolvent analysis of the Navier-Stokes equations. The sensitivity of the model to the amplitude of the component modes is analyzed and appropriate weights are identified to generate a highly-simplified turbulent model for aero-optic control applications.

Theresa Saxton-Fox  
University of Illinois  
at Urbana-Champaign



**Assistant Professor**  
Aerospace Engineering Department

**BIO:** Theresa Saxton-Fox is an Assistant Professor in the Aerospace Engineering Department at the University of Illinois at Urbana-Champaign. She received her PhD from Caltech and did her postdoctoral research at Princeton University, prior to starting at the University of Illinois in January of 2019. Her work focuses on the dynamics of wall-bounded turbulent flows towards improved modeling and design for efficient and maneuverable transportation technologies as well as Experimental Fluid Mechanics, Applied Aerodynamics, Flow Control, and Laser and Optical Diagnostics. She received the Centennial Prize for Best Thesis in Mechanical and Civil Engineering in 2018 from Caltech.

Friday, February 7, 2020  
3:00 PM, Hodson Hall 213