Boulder Fluid and Thermal Sciences Seminar Series

Tuesday, July 10, 2018
3:30pm-4:30pm (refreshments at 3:15pm)
ECCR 150 in the Engineering Center
University of Colorado, Boulder

Turbulent Flame Interactions and Applications to Bluff-Body Stabilized Flames

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Interactions between turbulent flames exist in many modern combustion devices, including land-based and aircraft gas turbine engines, jet augmenters, furnaces, and boilers. The interaction between adjacent flames can significantly alter the time-averaged structure and dynamical behavior of flames, including their heat release rate, consumption speed, thermoacoustic response, and blow-off and flash-back limits. In this presentation, we first discuss flame interaction in a realistic combustor configuration, like would be found on a power-generation gas turbine engine. Here, flame interaction can significantly alter the time-average structure of flames. Additionally, this experiment raises a number of important questions about the dynamic behavior of interacting flames. Two more fundamental experiments are discussed to address two critical issues regarding dynamic flame interaction: flow interaction and local flame area annihilation. A three bluff-body experiment is used to discuss the importance of flow interaction and hydrodynamic instability in understanding the dynamics of interacting flames. A two-burner, high-turbulence experiment is used to explore the dynamics of local flame interactions, which are the mechanism by which flame interaction drives changes in macro-level flame behavior. Finally, the presentation concludes with an outlook on future work for these experiments and what fundamental research questions need to be answered in order to predict interacting-flame behavior in real devices.

Biography: Dr. Jacqueline O'Connor is an Assistant Professor of Mechanical Engineering at The Pennsylvania State University where she directs the Reacting Flow Dynamics Laboratory. Her research focuses on unsteady combustion phenomena in power and propulsion technologies, including power generation gas turbines, aircraft engines, and diesel engines, using high-speed laser diagnostics. Previously, she was a post-doctoral researcher at Sandia National Laboratories in Livermore, California in the Engine Combustion Department. She received a BS from MIT in Aeronautics in 2006, and a MS and Ph.D. in Aerospace Engineering from Georgia Tech in 2009 and 2012. She is the recipient of the 2018 Dilip R. Ballal Early Career Award from the ASME International Gas Turbine Institute, the 2016 Irvin Glassman Young Investigator Award from the Eastern States Section of the Combustion Institute, and the 2015 John Johnson Award for Outstanding Research in Diesel Engines from the Society of Automotive Engineers.