Boulder Fluid Dynamics Seminar Series

Tuesday, July 28, 2015
3:30pm-4:30pm (refreshments at 3:15pm)
Bechtel Collaboratory in the Discovery Learning Center (DLC)
University of Colorado at Boulder

Sustainable Fuels for Vehicles of the Future: The vital role of Computational Fluid Dynamics and Chemical Kinetics

Greg Bogin, *Colorado School of Mines*

Due to an increase of fossil fuel usage and related emissions, there is growing motivation to develop more energy efficient engines as well as to identify suitable alternative fuels. Such efforts will require extensive modeling of the combustion of various fuels within the engine. Modeling efforts of internal combustion engines (ICEs) commonly use combustion models consisting of computational fluid dynamics (CFD) coupled with combustion kinetic models. Along with accurately capturing the spray physics and fluid dynamics, it is equally important for these combustion models to include validated chemical mechanisms for alternative fuels of interest. Such combinations allow for more efficient experimentation by identifying those conditions more likely to lead to engine control strategies for improved engine efficiency and reduced emissions.

The Minimal Flow Unit in Rotating Wall-Bounded Turbulence

Alan Hsieh, *University of Colorado, Boulder*

A direct numerical simulation of spanwise-rotating turbulent channel flow was conducted for three rotation numbers: Ro_b = 0, 0.2 and 0.5 at a Reynolds number of 8000 based on laminar centerline mean velocity. Minimal flow unit (MFU) simulations were compared to full simulations at equivalent rotation numbers for basic turbulence quantities and higher-order statistics for this complex turbulent flow. Good agreement was demonstrated between the full and MFU simulations in the pressure region. In the re-laminarized suction region, the MFU was unable to capture the intermittent high-amplitude fluctuations and large kurtosis levels resulting from the elimination of the turbulence sustenance cycle.