Boulder Fluid and Thermal Sciences Seminar Series

Tuesday, June 14, 2016, 3:30pm-4:30pm (refreshments at 3:15pm)
Bechtel Collaboratory in the Discovery Learning Center (DLC)
University of Colorado, Boulder

Recent findings on laser plasma formation and combustion ignition

Azer Yalin, *Colorado State University*

Laser induced plasmas can be formed from the focused output of high power pulsed sources. Depending on the wavelength and pulse duration, different mechanisms are responsible for the plasma generation. I will summarize our recent studies on laser plasma formation with ultraviolet and near-infrared nanosecond pulses. Measurements of energy absorption, optical luminosity, and Rayleigh scattering thermometry show different threshold behaviors for different pulse conditions. These types of laser plasmas are of practical interest for ignition of combustible mixtures, for example for reciprocating gas engines, aeroturbines, and rocket engines, with potential benefits including increased combustion efficiency, reduced pollutant emissions, and increased reliability. I will also present results of combustion ignition using nanosecond laser pulses including new dual-pulse and multi-wavelength schemes.

Methane emissions from United States natural gas midstream facilities: measurement campaign and development of a national emissions estimate

Anthony Marchese, *Colorado State University*

Facility-level methane emissions measurements were conducted using a new dual tracer gas technique at 130 natural gas gathering facilities and processing plants in 13 U.S. states. The results from the field campaign were combined with state and national facility databases in a Monte Carlo simulation to estimate methane emissions from U.S. natural gas gathering and processing operations. Total annual methane emissions of 2,421 (+245/-237) Gg were estimated for all U.S. gathering and processing operations, representing a methane loss rate of 0.47% (±0.05%) when normalized by 2012 CH_4 production. The largest source of methane emissions from gathering and processing operations were attributed to normal operation of gathering facilities (1,697 +189/-185 Gg) and these emissions were eight times that of previous EPA Greenhouse Gas Inventory (GHGI) estimates. The methane emissions from processing plants (506 +55/-52 Gg) were 40% lower than previous GHGI estimates but a factor of three higher than that reported under the EPA Greenhouse Gas Reporting Program (GHGRP). In April 2016, the EPA GHGI was updated based directly on the results of this study, which effectively added over 1500 Gg of annual methane emissions to the inventory. With these updates to the EPA GHGI, gathering operations are now estimated to account for 27% of all methane emissions from natural gas supply chain.