Fundamental and Applied Multi-Phase, Compressible, and Turbulent Reacting Transport

Research focuses on the experimental, analytical, and computational investigation of multi-phase, compressible, and turbulent reacting transport that encompasses the detailed chemistry to the species, energy, and momentum transport in a range of fundamental and applied systems. Systems of interest include multi-phase flows with gaseous oxidizers as well as fuels, compressible flows composed of subsonic to hypersonic flows and the various shock and non-equilibrium thermodynamics, and highly turbulent flows that are contain the aforementioned attributes. There are three primary research avenues: **(1) Power & Energy** (gas-phase, spray, and solid fuel combustion in air breathing and internal combustion engine environments); **(2) Fire Suppression** (liquid pool/spray fires, gas/aerosol/foam suppression agents); and **(3) Pollution Remediation** (characterization and enhancement of in situ burning of crude oil spills, wellhead blowout combustion). A wide range of laser-based and optical diagnostic methods are routinely used to measure chemical species and dynamics, temperature, flow behavior in reacting or combusting flows, including: coherent anti-Stokes Raman scattering (CARS) spectroscopy, spontaneous Raman scattering, phase Doppler anemometry (PDA), particle image velocimetry (PIV), multi-wavelength pyrometry, laser Doppler velocimetry (LDV), laser-induced fluorescence (LIF), tunable diode laser absorption spectroscopy (TDLAS), and emission spectroscopy. Labs are equipped with high-speed visible and infrared video cameras, FTIR spectrometers, Czerny-Turner spectrographs, holographic spectrographs, intensified CCD (iCCD) cameras, electron-multiplied CCD (EM-CCD) cameras, and photomultiplier tube (PMT) detectors. Full information about ongoing research in our section (Code 6185, Combustion & Reacting Transport) can be found at the following web address: https://www.nrl.navy.mil/chemistry/research/6180/6185.