Abstract Submitted
for the DFD16 Meeting of
The American Physical Society

Experimental Vortex Identification and Characterization in Reacting Jets in Crossflow VEDANTH NAIR, BEN EMERSON, TIMOTHY LIEUWEN, Georgia Inst of Tech — Reacting jets in crossflow (JICF) is an important canonical flow field in combustion problems where there is strong coupling between heat release and the evolution of vortical structures. We use vortex identification studies to experimentally characterize the spatial evolution of vortex dynamics in a reacting JICF. A vortex identification algorithm was designed to operate on particle image velocimetry (PIV) data and its raw Mie scattering images. The algorithm uses the velocity fields to obtain comparisons between the strain rate and the rotation rate. Additionally, the algorithm uses the raw Mie scattering data to identify regions where the high acceleration at vortex cores has centrifuged seeding particles out of the vortex cores. Together, these methods are used to estimate the vortex location and circulation. Analysis was done on 10 kHz PIV data from a reacting JICF experiment, and the resulting vortex trajectory, and growth rate statistics are presented. Results are compared between non-reacting JICF and reacting studies performed with different jet density ratios and different levels of acoustic forcing. We observed how the density ratio, the frequency and amplitude of the acoustic forcing affected the vortex characteristics and growth rate.

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Date submitted: 31 Jul 2016 Electronic form version 1.4