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Strain Rates and Scalar Dissipation Rates in Gaseous Transverse Jets[1] TAKESHI SHOJI, LEVON GEVORKYAN, ANDREA BESNARD, ANN KARAGOZIAN, University of California, Los Angeles — This experimental study quantifies local strain rates and scalar dissipation rates for the non-reactive gaseous jet in crossflow (JICF) using simultaneous acetone planar laser-induced fluorescence (PLIF) imaging and stereo particle image velocimetry (PIV). Flush nozzle and flush pipe injectors are used to create jets consisting of mixtures of He and N_2, with varying exit velocity profiles, jet-to-crossflow momentum flux ratios J, and density ratios S. Strain rates in the vicinity of windward and lee-side jet shear layers are quantified based both on scalar dissipation rates extracted from PLIF measurements within locally 1D layer-like structures and on vector fields extracted from PIV measurements. Strain rates from the simultaneous measurements are in very good qualitative agreement with one another on the jets' windward and lee sides, and are also consistent with flame ignition locations in comparable reactive JICF experiments. Quantitative differences in strain fields are most pronounced at lower J values, corresponding to absolutely unstable shear layers and high local strain fields, although these differences are affected by the PLIF spatial resolution for a range of flow conditions. Extraction of dominant mode structures via POD will also be presented.

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