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Flow field structure near the reaction zone in turbulent nonpremixed jet flames MIRKO GAMBA, Stanford University, NOEL T. CLEMENS, OFODIKE A. EZEKOYE, The University of Texas at Austin — Quasi-instantaneous pseudo-volumes of the 3D velocity field in the far field of turbulent nonpremixed jet flames are constructed from cinematographic kilohertz-rate stereoscopic PIV applying Taylor's hypothesis. Jet flames at jet exit Reynolds numbers of 8,000-15,000 were considered. The approach enable computation of all nine velocity gradients and the 3D kinematic quantities. 10 Hz OH PLIF imaging was also included to mark the reaction zone. Three-dimensional rendering of regions of intense vorticity and energy dissipation reveals their sheet-like nature and their tendency to exist near the OH layers. Contrary to nonreacting jets, this feature is believed to be a due to the stabilizing effect of heat release and the laminar shear caused by the flame. Single-point statistics of the velocity gradients indicate anisotropy in the flow with strong gradients predominantly in the radial direction. However, the 1D energy spectrum and single-point statistics of the principal strain and strain-vorticity alignment follow the known trends from incompressible turbulence.

Mirko Gamba
Stanford University

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