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Simultaneous krypton PLIF, LII and PIV measurements in a sooting non-premixed jet flame OLIVER BUXTON, ROSS BURNS, NOEL CLEMENS, The University of Texas at Austin — Simultaneous krypton planar laser induced fluorescence (PLIF), laser induced incandescence (LII) and stereoscopic PIV measurements are made in a sooting jet flame for the first time. Krypton is seeded into the jet stream to provide a conserved scalar marker from which mixture fraction can be inferred. 2% krypton is seeded into a non-premixed ethylene/nitrogen jet flame with a cold jet Reynolds number based on bulk velocity of 5100. An electronic transition is accessed through a two photon excitation using an incident 214.7 nm light sheet, producing fluorescence at 760 nm. This fluorescence is spectrally isolated from the flame's bulk luminescence and PAH fluorescence. The fluorescence signal can then be converted to mixture fraction by measuring the relative krypton quenching rates of the various species present in the flame core and making use of a flamelet-based chemical state relationship. This technique is used simultaneously with LII, which will provide the soot volume fraction, and stereoscopic PIV which will provide all three velocity components in a plane. It will thus be possible to observe the influence of the velocity field on the formation and transport of soot, and the evolution of mixture fraction, and its effect on soot formation, within the sooting jet flame.

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