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Simultaneous soot concentration and strain-rate measurements in turbulent jet flames VENKAT NARAYANASWAMY, Institute for Combustion Technology, RWTH Aachen, NOEL CLEMENS, The University of Texas at Austin, Austin, TX — Studies on soot formation are very important both from an environmental standpoint and from a technical perspective. The correlation between the instantaneous soot concentration fields and the corresponding instantaneous strain fields, which would provide important details on the fluid-dynamic aspects of soot formation, relevant for practical combustors, is not understood yet. To address this issue, experiments were performed in our laboratory to study the organization of 2-D soot concentration fields, obtained using LII, and its correlation with corresponding instantaneous 2D strain-rate fields, obtained simultaneously using PIV. The experiments were performed in a turbulent co-flowing jet facility, with an ethylene/N_2 mixture as the fuel. Different jet-exit Reynolds numbers were obtained by changing the jet-exit velocity, and the corresponding evolution of the soot and strain-field structures is investigated. Our preliminary results show that the instantaneous soot field topology is highly correlated with the instantaneous strain-rate topology. The regions of intense soot concentrations are mainly along the regions of intense strain-rate; furthermore, the soot concentration fields become increasingly convoluted and sparse with increasing Reynolds number.

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