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Measurements of local statistics in a premixed turbulent Bunsen flame YUE WENG, ADITYA POTNIS, VISHNU UNNI, ABHISHEK SAHA, University of California, San Diego — Interaction between propagating flames and surrounding flow turbulence is critical in controlling flame dynamics in engines widely used for power generation, transportation, and propulsion. In this study, we present an experimental investigation of flame-turbulence interaction in a newly constructed premixed Bunsen burner. For two different turbulence levels and two flame temperatures, the flow-field with and without the presence of the flame was characterized by High-speed Particle Image Velocimetry, while the flame edges were identified from the Mie-Scattering images. Several analyses have been performed to assess the effect of flame on the flow and vice-versa. A comparison between the local turbulence intensity adjacent to the flamefront and the cold flow measurements confirmed that the flame imposes a weakening effect on the turbulence, while the degree of such weakening inversely depends on Karlovitz number (Ka). Probability distribution functions of different components of stretch rate were analyzed to extract the effect of Ka, on the stretching and wrinkling of the flame segments. The joint probability distribution functions showed unique shapes, which were further analyzed to demonstrate that the three components of the stretch rates are pairwise linked.

Yue Weng
University of California, San Diego

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