Evaluation of Statistics and Spatial Correlations on Planar Distribution of Gaseous Mixing in a Turbulent Recirculation Flow Field

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A powerful flow visualization based on a laser-sheet and the quantification of the intensity of the light from Mie scattering had been introduced and successfully used to evaluate the statistics and spatial correlations of gas distribution injected into a two-dimensional turbulent recirculation airflow, utilizing a backstep configuration. In the experiment the free stream velocity was, U, = 10 m/s and the step height was, H = 20 mm. The study focussed on the _fluctuation and the gas distribution in the recirculation zone in order to elucidate the gas-air moving characteristics. The results show that the distribution of injected gas shows different trends depending on the location of injection. When the specific momentum of injection is increased the maximum fluctuation level of the gas concentration decreases. A reduction up to 30 % of the maximum RMS value of luminance intensity _fluctuation can be observed when increasing specific momentum ratio of injection from 0. 04 to 0.3. Spatial correlations suggested that mixing between injected gas and surrounding air was more rapid and better in case injection in the near reattachment point due to higher turbulence in the region.