

Abstract Submitted
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Effects of local extinction on mixture fraction and scalar dissipation statistics in turbulent nonpremixed flames ANTONIO ATTILI, FABRIZIO BISETTI, King Abdullah Univ of Sci & Tech (KAUST) — Passive scalar and scalar dissipation statistics are investigated in a set of flames achieving a Taylor's scale Reynolds number in the range $100 \leq \text{Re}_\lambda \leq 150$ [Attili *et al.* Comb. Flame 161, 2014; Attili *et al.* Proc. Comb. Inst. 35, 2015]. The three flames simulated show an increasing level of extinction due to the decrease of the Damköhler number. In the case of negligible extinction, the non-dimensional scalar dissipation is expected to be the same in the three cases. In the present case, the deviations from the aforementioned self-similarity manifests itself as a decrease of the non-dimensional scalar dissipation for increasing level of local extinction, in agreement with recent experiments [Karpetis and Barlow Proc. Comb. Inst. 30, 2005; Sutton and Driscoll Combust. Flame 160, 2013]. This is caused by the decrease of molecular diffusion due to the lower temperature in the low Damköhler number cases. Probability density functions of the scalar dissipation χ show rather strong deviations from the log-normal distribution. The left tail of the pdf scales as $\chi^{1/2}$ while the right tail scales as $e^{-c\chi^\alpha}$, in agreement with results for incompressible turbulence [Schumacher *et al.* J. Fluid Mech. 531, 2005].

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