Abstract Submitted
for the DFD17 Meeting of
The American Physical Society

DNS of cross sections of reacting jets with anisotropic turbulence forcing CHANDRU DHANDAPANI, JEFF RAH, GUILLAUME BLANQUART, Caltech — Direct numerical simulations (DNS) of high Karlovitz number flames have been performed extensively in an inflow/outflow configuration, but in the absence of mean shear. Without a mean shear to sustain turbulence, the turbulent kinetic energy decays in the domain. Hence, a linear turbulence forcing has been used in previous simulations to emulate the missing shear effects. The turbulence forcing utilised in the current study is physically and mathematically consistent with the mean flow of an axisymmetric turbulent jet and consequently anisotropic, as opposed to the isotropic linear forcing used by Lundgren et al. Previous simulations used constant values for the forcing, calculated at either the jet axis or the middle of the mixing layer. The current study improves upon it by focusing on a cross section of the jet, where the forcing matrix changes with radial distance, as the mean flow changes with radial distance. Both non-reacting and reacting flows are considered, and the velocity fluctuations are calculated and compared with that of experimental turbulent jets. The flame structure, speed and surface area are observed for the reacting case and compared with results from previous simulations and experiments of turbulent jet flames.

Chandru Dhandapani
Caltech

Date submitted: 01 Aug 2017 Electronic form version 1.4