Abstract Submitted
for the DFD17 Meeting of
The American Physical Society

Effect of inflow condition on near-field prediction of Large Eddy Simulations of isothermal and non-isothermal turbulent jets SASAN SALKHORDEH, MARK KIMBER, Texas AM Univ — In order to develop an experimentally validated computational model, turbulent round jets have been studied extensively under both isothermal and non-isothermal conditions using Large Eddy Simulation (LES) methodology. Capturing the near-field physics of a turbulent jet has been a challenge when utilizing LES. To address this concern, the effect of inlet flow profile and turbulent fluctuations on the evolution of both type of jets has been analyzed in detail by performing separate large eddy simulations of the flow in the nozzle upstream of the jet inlet to accurately determine the inlet turbulent spectra. From the precursor simulations, the accurate turbulence fluctuations at the jet nozzle can be sampled and then implement to the inlet boundary of the main jet simulation. Properly specifying the turbulent fluctuations at the jet inlet was found to play a vital role in order to accurately predict key characteristics throughout the computational domain. For isothermal jets, the experimental measurements of Hussein et al. (Journal of Fluid Mechanics. 1994 Jan;258:31-75) has been simulated computationally using LES. The experimental measurement of Mi et al. (Journal of Fluid Mechanics. 2001 Apr;432:91-125) has been chosen for performing LES for a non-isothermal jet at the same Reynolds number and identical temperature difference. The LES results show good agreement for first and higher order statistics of velocities and temperatures in both near field and far-field data.

Mark Kimber
Texas A
M Univ

Date submitted: 01 Aug 2017 Electronic form version 1.4