Abstract Submitted
for the DFD16 Meeting of
The American Physical Society

Effects of Exit Variability on Near-Field Statistics for Turbulent Buoyant Jets NICHOLAS WIMER, CAELAN LAPOINTE, TORREY HAYDEN, JASON CHRISTOPHER, GREGORY RIEKER, PETER HAMLINGTON, Univ of Colorado - Boulder — Many engineering systems involve the use of high-temperature jets to heat nearby objects or surfaces. In such instances, proximity to the jet exit means that specific properties of the exit velocity and temperature can be of substantial importance in determining conditions at the heated object or surface. Moreover, compared to non-heated jets, the flow field complexity of high-temperature jets is subtantially increased due to the presence of buoyant forcing. In this talk, we examine the effects of variability in exit velocity and temperature on near-field flow statistics of a high-temperature turbulent buoyant jet. The analysis is based on large eddy simulations (LES) of turbulent buoyant jets for a variety of velocity and temperature exit distributions, including uniform, pseudo-random, and Gaussian distributions with different means and standard deviations. The resulting near-field turbulent statistics are compared to properties of the exit distributions, with a specific focus on predicting spatial and temporal spectral exponents for velocity and temperature in the near-field. The importance of these results for the prediction and understanding of engineering applications involving high-temperature jets is outlined.

Nicholas Wimer
Univ of Colorado - Boulder

Date submitted: 01 Aug 2016 Electronic form version 1.4