Abstract Submitted
for the DFD15 Meeting of
The American Physical Society

Space-Time Correlations in a Turbulent Gas-Phase Jet MICHAEL PAPAGEORGE, JEFFREY SUTTON, Ohio State Univ - Columbus — G.I. Taylor first hypothesized that the primary relationship between space and time was linear and arises from the convection of small eddies past a fixed point in space at velocity <U>. Recently it has been shown using DNS calculations in homogenous shear flows that a second-order Taylor's expansion of the space-time correlation function provides a better estimate of the relationship between space and time for velocity correlations [Zhao and He (Phys. Rev. E 2009)]. The second-order expansion leads to an elliptical relationship between space and time correlations. In this work, scalar field measurements, with both high resolution and dynamic range in space and time, from a round turbulent gas-phase jet were collected to examine if the proposed elliptical relationship holds for scalar fluctuations in a free-shear flow. Furthermore, the space-time correlations and the "elliptical model" of Zhao and He are used to understand the physical mechanisms by which scalar fluctuations decorrelate. This work is expected to lead to a better understanding of the relationship between space and time and the physical processes governing the decorrelation of scalar fluctuations in gas-phase turbulent jets.

Michael Papageorge
Ohio State Univ - Columbus

Date submitted: 01 Aug 2015 Electronic form version 1.4