Abstract Submitted
for the DFD16 Meeting of
The American Physical Society

Eulerian and Lagrangian accelerations in the intermediate field of turbulent circular jets. JIN-TAE KIM, University of Illinois at Urbana-Champaign, ALEX LIBERZON, Tel Aviv University, LEONARDO P. CHAMORRO, University of Illinois at Urbana-Champaign — Particle tracking velocimetry is used to study the structure of various acceleration components, vorticity, and strain within the intermediate field of a circular jet at Re =6000. The total acceleration is decomposed into three sets: a) streamwise-radial; b) tangential-normal; and c) local-convective components. Probability density function (PDF) and joint PDFs of each set are characterized at various radial locations within a streamwise band contained within 16 and 17 pipe diameters. Results show that the acceleration components are described by two distributions; one of them exhibits symmetry and heavy tails, while the other is best fitted by a power-law type. The PDF tails are heavier with increasing the radial distance. The growing departure from the Gaussian distribution is a result of the comparatively increase in turbulence promoted by the mean shear of the jet. The variation of third and fourth moments between the streamwise-tangential and the radial-normal accelerations indicates the anisotropy of the jet. Although joint PDFs show distinctive distribution and depend on the distance from the jet core, the relative angles between the Lagrangian acceleration with velocity, vorticity and strain show similar PDF across radial distances.

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Date submitted: 28 Jul 2016 Electronic form version 1.4