Abstract Submitted
for the DFD09 Meeting of
The American Physical Society

Velocity statistics in superfluid and classical turbulence K.R. SREENIVASAN, International Centre for Theoretical Physics, D.A. DONZIS, University of Maryland and Texas A&M, M.E. FISHER, D.P. LATHROP, M.S. PAOLETTI, University of Maryland, P.K. YOUNG, Georgia Institute of Technology —
Past work, summarized in part by Vinen & Niemela (*J. Low Temp. Phys.* **129**, 213 (2002)) and by Walmsley *et al. Phys. Rev. Lett.* **99**, 265302 (2007)), suggests that similarities exist between superfluid and classical turbulence. Conversely, the more recent work of Paoletti *et al.* (*Phys. Rev. Lett.* **101**, 154501 (2008)) has highlighted differences: in particular, the probability density function (PDF) of the turbulent superfluid velocity, measured by tracking the trajectories of small hydrogen particles, is strongly non-Gaussian with power-law tails, in contrast to classical homogeneous and isotropic turbulence for which the PDF is nearly Gaussian. Here, we explore this dichotomy. Since the observed power-law exponent of -3 in the superfluid case can be traced to the reconnection of quantized vortices, it is natural to explore the role of vortex reconnection in the classical case. We surmise that the latter, if it is significant at all, must involve vortices of high intensity. Using direct numerical solutions of homogeneous and isotropic turbulence on a grid of linear size 4096, we condition the velocity statistics on the magnitude of vorticity and find that the resulting conditional PDFs, if normalized on their own standard deviation, remain Gaussian for all vorticity magnitudes.

Daniel Lathrop
University of Maryland

Date submitted: 10 Aug 2009 Electronic form version 1.4