Abstract Submitted
for the DFD11 Meeting of
The American Physical Society

PDF Equation Approach to the Lagrangian Velocity Increment Statistics of Fully Developed Turbulence MICHAEL WILCZEK, Institute for Theoretical Physics, University of Muenster, HAITAO XU, Max Planck Institute for Dynamics and Self-Organization, NICHOLAS T. OUELLETTE, Department of Mechanical Engineering and Materials Science, Yale University, EBERHARD BODENSCHATZ, Max Planck Institute for Dynamics and Self-Organization — The Lagrangian velocity increment statistics of fully developed three-dimensional turbulence is known to be highly intermittent, i.e., the probability density functions (PDFs) undergo a transition from a nearly Gaussian shape for large time lags to a highly non-Gaussian shape with pronounced tails for small time lags. We study this shape deformation across scale in the framework of the corresponding PDF equation, which is readily derived from the Lagrangian equations of motion. Here, the conditional acceleration plays a key role. The unclosed acceleration term is determined from experimental and direct numerical simulation data and is investigated with respect to the possibility of a simple mechanism for the origin of Lagrangian intermittency.

Michael Wilczek
Institute for Theoretical Physics, University of Muenster

Date submitted: 01 Aug 2011 Electronic form version 1.4