Abstract Submitted
for the DFD07 Meeting of
The American Physical Society

Lagrangian Investigation of Two-dimensional Decaying Turbulence MICHAEL WILCZEK, OLIVER KAMPS, RUDOLF FRIEDRICH, Institute for Theoretical Physics, University of Muenster — We present a numerical investigation of two-dimensional decaying turbulence in the Lagrangian picture. Focusing on single particle statistics, we investigate Lagrangian trajectories in a freely evolving turbulent velocity field. The dynamical evolution of the tracer particles is strongly dominated by the emergence and evolution of coherent structures. For a statistical analysis we focus on the Lagrangian acceleration as a central quantity. We find that the time-resolved acceleration pdf has a highly non-Gaussian functional form with pronounced tails. When normalized by its standard deviation the pdf's of this quantity collapse over a wide temporal range of the decay process, indicating that a self-similar scaling regime can also be found in the Lagrangian frame of reference. In addition to that a decomposition of the acceleration into components parallel and perpendicular to the velocity gives further information about the impact of coherent vortices on the Lagrangian dynamics.

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Date submitted: 26 Jul 2007 Electronic form version 1.4