Abstract Submitted
for the DFD15 Meeting of
The American Physical Society

Correlational signatures of time-reversal symmetry breaking in two-dimensional flow CHARLIE HOGG, NICHOLAS OUELLETTE, Stanford University — Classical turbulence theories posit that broken spatial symmetries should be (statistically) restored at small scales. But since turbulent flows are inherently dissipative, time reversal symmetry is expected to remain broken throughout the cascade. However, the precise dynamical signature of this broken symmetry is not well understood. Recent work has shed new light on this fundamental question by considering the Lagrangian structure functions of power. Here, we take a somewhat different approach by studying the Lagrangian correlation functions of velocity and acceleration. We measured these correlations using particle tracking velocimetry in a quasi-two-dimensional electromagnetically driven flow that displayed net inverse energy transfer. We show that the correlation functions of the velocity and acceleration magnitudes are not symmetric in time, and that the degree of asymmetry can be related to the flux of energy between scales, suggesting that the asymmetry has a dynamical origin.

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Date submitted: 30 Jul 2015 Electronic form version 1.4