Abstract Submitted for the DFD15 Meeting of The American Physical Society

An experimental Lagrangian study of inhomgeneous turbulence NICKOLAS STELZENMULLER, NICOLAS MORDANT, Laboratoire des Ecoulements Gophysiques et Industriels (LEGI) — We investigate experimentally the Lagrangian properties of inhomogeneous turbulence in the general scope of dispersion studies in natural and industrial flows. Lagrangian studies of homogeneous turbulence are becoming common, but very little Lagrangian experimental data exists for inhomogeneous turbulence despite the vast range of applications. Particle tracking velocimetry using a very high speed camera in a fully developed turbulent channel flow in water is achieved at $Re_H = 33,000$. This technique provides Lagrangian velocity and acceleration statistics fully resolved at the smallest turbulent scales near the wall. These statistics, conditioned by the distance to the wall, allow the the investigation of the inhomogeneity of the statistical properties of this flow. Autocorrelations of velocity and acceleration show increasing Lagrangian turbulent scales as distance from the wall increases, as well as decreasing anisotropy. PDF's and moments of Lagrangian quantities are presented by showing the evolution of structure functions across the boundary layer. These results are compared to direct numerical simulation results from a similar flow, and their implications for stochastic models of inhomogeneous flows are discussed.

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Date submitted: 23 Jul 2015

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