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Experimental Three Dimensional Lagrangian Coherent Structures of Inertial Particles in Flows SAMUEL RABEN, SHANE ROSS, PAVLOS VLACHOS, Virginia Tech — Finite Time Lyapunov Exponents (FTLE) are a powerful and increasingly popular tool for describing mixing and transport in both turbulent and laminar flow fields. FTLEs provide a measure of the exponential rate of divergence or convergence of Lagrangian particle trajectories and can be used both experimentally and numerically to describe a flow field, which may have a high degree of spatiotemporal complexity. While primarily used to describe single-phase flow behavior some works have attempted to account for inertial particles by modeling the particles' motion through simulations. This procedure can provide insight, but does not provide direct information about the true observable inertial particle trajectories. This work provides a method to more directly determine FTLEs from experimental data for inertial particles through the use of particle tracking velocimetry (PTV) without any a-priori assumptions about particle motion. We show, in a turbulent 3D flow field, how FTLE for various particles sizes can be computed with out numerical integration and how separating the particles effects the resulting FLTE field. This work can provide future insight into multiphase flow research and the study of inertial particle motion.

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