

Abstract Submitted
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Particle focusing in Lagrangian Coherent Structures GUSTAAF

JACOBS, San Diego State University — We discuss the relation between finite sized, inertial particle dispersion and Lagrangian Coherent Structures identified with recent Lagrangian visualization techniques. We consider the flow over a rectangular cylinder that features a vortex-dominated wake. Fluid particle transport barriers that attract fluid particles are visualized through contours of the Finite Time Lyapunov Exponent (FTLE) that measures the stretching of the fluid. Combinations of the transport barriers form Lagrangian Coherent Structures that are typically visualized through dye in experiments. Inertial particles closely follow these attracting transport barriers, as visualized by maxima in the FTLE field determined in backward time, for Stokes numbers smaller than unity. With increasing Stokes number the particles increasingly align with the transport barriers. At unity Stokes number when particles are well-known to exhibit particle focusing, large parts of a sharp particle streak are exactly aligned with the transport barrier in the FTLE field. The attracting transport barriers in the wake are hence excellent predictors of the location where particles focus. The inertial particles are shown to depart from the fluid particle transport barrier when criteria based on the stress tensor are met.

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