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Lagrangian coherent structures and the dynamics of inertial particles SUDHARSAN MADHAVAN, STEVEN BRUNTON, JAMES RILEY, University of Washington — In this work we investigate the dynamics of inertial particles using the finite-time Lyapunov exponent (FTLE). In particular, we analyze preferential concentration of particles with nonzero Stokes number, St, and varying density ratio, R, for the double gyre vector field. We find that heavy particles (aerosols) tend to accumulate strongly onto negative-time (attracting) FTLE ridges of the non-inertial fluid particles, while lighter particles (bubbles) tend to repel from these ridges and accumulate at vortex cores. The transition of the negative-time FTLE ridges from attractors to repellers, based on the value of R, partially explains the preferential concentration of inertial particles. We also investigate the inertial finite-time Lyapunov exponent (iFTLE) based on the trajectories of inertial particles. The iFTLE is used to quantify the effect of St and R on particle stirring, and we present preliminary results establishing a connection between iFTLE and the two-point dispersion. Finally, we analyze the low-pass filtering effect of Stokes number on particle trajectories.

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