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**Inertial objects in complex flows**[1] RAYHAN SYED, GEORGE HO, SAMUEL CAVAS, JIALUN BAO, PHILIP YECKO, Cooper Union — Chaotic Advection and Finite Time Lyapunov Exponents both describe stirring and transport in complex and time-dependent flows, but FTLE analysis has been largely limited to either purely kinematic flow models or high Reynolds number flow field data. The neglect of dynamic effects in FTLE and Lagrangian Coherent Structure studies has stymied detailed information about the role of pressure, Coriolis effects and object inertia. We present results of laboratory and numerical experiments on time-dependent and multi-gyre Stokes flows. In the lab, a time-dependent effectively two-dimensional low Re flow is used to distinguish transport properties of passive tracer from those of small paramagnetic spheres. Companion results of FTLE calculations for inertial particles in a time-dependent multi-gyre flow are presented, illustrating the critical roles of density, Stokes number and Coriolis forces on their transport. Results of Direct Numerical Simulations of fully resolved inertial objects (spheroids) immersed in a three dimensional (ABC) flow show the role of shape and finite size in inertial transport at small finite Re.

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