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Flow primitives to manipulate the dynamics of inertial particles SENBAGARAMAN SUDARSANAM, PHANINDRA TALLAPRAGADA, Clemson University — The nonlinear dynamics of inertial particles in many microfluidic settings occurs in flows whose main feature is cell-like structures created due to specific distributions of vorticity. Examples include Dean vortices, Taylor-Couette vortices and streaming vortex cells. To obtain insights into the motion of inertial particles in such complex flows, in possibly confined domains, we develop certain flow primitives generated by point-vortex like structures. We model the the motion of spherical inertial particles by the Maxey-Riley equation. With this governing equation the inertial particles demonstrate sensitive dependence on size and initial conditions in the fluid flow generated by the flow primitives. Size based particle segregation, trapping particles at the centers of vortex cores or on limit cycles is shown to be possible. We demonstrate some of these phenomena using Lagrangian coherent structures (LCS).

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