

Abstract Submitted
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Study of the Motion of Particles in Closed Streamlines¹ HAMED HADDADI, KEVIN CONNINGTON, Levich Institute, City College of New York, SHAHAB SHOJAEI-ZADEH, Rutgers University, JEFFREY MORRIS, Levich Institute, City College of New York — The behavior of neutrally-buoyant particles in the closed-streamline flows formed behind bluff bodies of various shapes is studied; the Reynolds numbers studied generate extended closed-streamline wakes but are below the transition to an unsteady wake. Experimental observations have demonstrated that the wake is depleted or completely devoid of particles. Using lattice-Boltzmann simulations, the trajectory of a single particle (small relative to the bluff body) is analyzed and shown to form a limit cycle inside the wake. With increase of the number of particles in the wake, trajectories are distorted due to interactions and particles are pushed out of the wake. Calculation of the fluid pathlines indicates that the presence of particles breaks the steadiness of the wake which results in a particle (and fluid) transfer between the wake and the free stream. The particle trajectories have also been analyzed by simulation of the flow of dilute suspensions over the circular cylindrical, square and thin rectangular (“blade”) shaped posts, for which different levels of particle depletion in the wake are seen experimentally, in order to determine the particle transfer pattern between the wake and the free stream.

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