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Inertial bifurcation of the equilibrium position of a neutrally-buoyant circular cylinder in shear flow between parallel walls ANDREW FOX, JAMES SCHNEIDER, ADITYA KHAIR, Carnegie Mellon University — The dynamics of a neutrally-buoyant, rigid circular cylinder in shear flow between planar, parallel walls are quantified at various particle Reynolds numbers Re_p and confinement ratios κ via lattice Boltzmann simulations. An inertial lift force acting transverse to the ambient shear flow has a single zero crossing at the center of the channel below a critical Re_p, corresponding to a single stable transverse equilibrium position. Above the critical Re_p, the equilibrium position bifurcates, with a unstable equilibrium position at the center and two additional stable equilibria equidistant off-center. Trajectories of a force- and torque-free particle confirm the equilibrium position bifurcation, showing the cylinder reaches the center equilibrium position below the critical Re_p and the off-center equilibria above; the stable equilibrium position is independent of the initial cylinder position, with the lone exception of the aforementioned unstable equilibrium. The critical Re_p dependent on the confinement ratio, and thus particle size, and occurs below the transition to unsteady flow.

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