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Near-wall and collision dynamics of particles at a stagnation point on a wall[1] QING LI, MICHELINE ABBAS, Laboratoire de Génie Chimique, Toulouse, France, JEFFREY F. MORRIS, Levich institute, City College of New York, ERIC CLIMENT, Institut de Mcanique des Fluides de Toulouse, France, JACQUES MAGNAUDET, (Institut de Mcanique des Fluides de Toulouse, France — We present highly resolved immersed boundary simulations of neutrally-buoyant sphere (radius a) motion in axisymmetric stagnation (Hiemenz) flow at a wall.Far from the wall, the particle behaves as a tracer, decelerated by the ambient pressure of the Hiemenz flow. Near the wall, slip velocity and 'excess' hydrodynamic force (in addition to ambient pressure), F_h, play a role. Inertia is characterized by a/δ for boundary layer thickness, δ; F_h transitions at $a/\delta \approx 2$ to a form increasing strongly at the wall due to lubrication. The particle reaches $O(10^{-4})a$ separations with $O(1)$ velocity, motivating a model for contact and rebound. Flow and collision are studied for one and two particles, with single particle motion dominated by lubrication pressure and hydrodynamic drag (latter toward the wall). For two identical particles on the axis, certain separations lead to particle collision before the lower (closer to wall) particle hits the wall; the resulting momentum exchange leads to larger impact velocity than for one particle. Dynamics of the colliding pair includes rebound without contact with the wall for the lower of two particles, due to sheltering by the upper particle from drag allowing the pressure force to dominate.

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