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Disruption and Recovery of Tubular Pinch Effect in Transitional Particle-Laden Pipe Flow[1] SAGNIK PAUL, ELLEN LONGMIRE, University of Minnesota — In laminar pipe flow, neutrally buoyant particles concentrate at a specific radius near the wall. This Tubular Pinch Effect, first studied by Segre and Silberberg, is related to migration induced by inertia. The critical Reynolds number and radius of peak concentration are dependent on the ratio of pipe to particle diameter (D/d), and the volume fraction of the particles (ϕ). During laminar to turbulent transition, this accumulation of particles is disturbed by puffs. In the current study, we examine the behavior of polystyrene beads in a 20% glycerol-water solution (ρ =1046 kg-m^{-3}) as they interact with isolated puffs. Experiments are performed with D/d =43 & 129 and ϕ =0.005 & 0.01. Planar imaging is employed with a backlit LED panel and a DSLR camera. PTV is used to determine the velocities of the particles. For D/d=43 and ϕ =0.005, we find the radial peak concentration at 0.85R. We also find that the local accumulation of particles is disrupted, and radial velocities become significant with the puff. Puff effects on temporal and radial variations of particle concentration, along with the effects on particle velocities will be discussed. We will also discuss the time required for particles to recover to their undisturbed annular arrangement.

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