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Effect of turbulent puffs on the Segré-Silberberg effect in particulate pipe flow[1] SAGNIK PAUL, ELLEN LONGMIRE, University of Minnesota — Particles in laminar pipe flow tend to accumulate at a certain radius close to the wall. When the flow becomes unstable such that turbulent puffs occur, the puffs can disturb the accumulation of particles. In the current work, we investigate the behavior of polystyrene beads in a neutrally buoyant liquid (ρ =1046 kg-m-3) over pipe Reynolds numbers in the laminar and transitional range. In our setup, we observe discrete puffs between Re=2100 and 2600 and study the distribution of particles versus radius. The transition Reynolds number and particle distribution are expected to be dependent on the ratio of the particle diameter (d) to pipe diameter (D), and the particle volume fraction (ϕ). Particle distributions and motions are observed in planes aligned parallel and perpendicular to the pipe axis using both LED and laser sheet imaging. Images are analyzed to quantify particle position distributions. In laminar flow with D/d=43 and ϕ =0.005, the maximum concentration of particles occurs at 0.44D. In transitional flow at higher Re, the puffs exhibit strong disturbances near the walls that disrupt the local particle accumulation. The effect and relative importance of these disturbances on particle concentration and velocity will be discussed.

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