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Numerical study of equilibrium radial position of neutrally buoyant balls in tube flows TSORNG-WHAY PAN, ANG LI, ROLAND GLOWINSKI, University of Houston — Segre and Silberberg (1962) observed that neutrally buoyant particles of dilute suspensions accumulate at about 0.6 of the pipe radius from the center line. This Segre-Silberberg effect has had a large influence on fluid mechanics studies of particle migration. To understand such effect at higher Reynolds numbers (Re), Matas et al. (2004) obtained that the equilibrium position moves towards the wall for higher Re as predicted by Asmolov (1999). They also found that particle migrates to an inner equilibrium position for Re ¿ 600 in tube flows. We have studied this effect in tube flows via direct numerical simulation. For one ball case, it takes place at low Re as expected. At higher Re, the ball moves to one of two equilibrium positions. At even higher Re, the ball is pinched to an inner position. These one ball results are similar to the one obtained by Nakayama et al. (2019). For a train of two neutrally buoyant balls placed on the line parallel with the tube axis initially, the train formation is stable and its center moves to an equilibrium position at low Re like the motion of a neutrally buoyant ball. At higher Re, the averaged train position moves to the inner equilibrium position and two balls oscillate periodically with respect to such position in an alternative way.

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