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The effect of collision, Stokes and Reynolds numbers on turbophoresis[1] MAHDI ESMAILY-MOGHADAM, ALI MANI, Stanford University — Migration of inertial particles toward solid boundaries in turbulent flows is known as turbophoresis. In this study, we investigate the effect of various parameters on turbophoresis through direct numerical simulations of turbulent flow laden with Lagrangian point-particles. We consider a flow of air in a square duct at a bulk Reynolds number of 5,000 to 20,000 dispersed with nickel particles ranging in size from 4 to 16 micron in diameter. We examine the effect of the Stokes and Reynolds numbers on the near-wall particle concentration and its relationship to the turbophoretic velocity. Our results are consistent with the previously published results pertaining to the saturation of the turbophoretic velocity for Stokes numbers larger than 10. Adopting a hard sphere collision model, we examine the role of collisions on the near wall concentration and demonstrate the sensitivity of the results to the restitution coefficient. Our findings show that while reducing the restitution coefficient leads to a higher degree of turbophoresis; collision can decrease the near wall concentration by orders of magnitude for a global particle volume fraction of $O(10^{-5})$.

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