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Slow axial drift in three dimensional tumblers ZAFIR ZAMAN, Northwestern University, UMBERTO D'ORTONA, Universite d Aix-Marseille, PAUL UMBANHOWAR, JULIO M. OTTINO, RICHARD M. LUEPTOW, Northwestern University — We recently demonstrated the existence of coherent axial drift of monodisperse particles in partially filled spherical tumblers from DEM simulations and experiments. This motion occurs solely in the flowing layer: particles move gradually toward the pole at the top of the flowing layer and toward the equator at the bottom of the flowing layer. The drift is small relative to streamwise displacements, thus particles require many passes through the flowing layer to progress from the equator to the pole and back. Since axial drift is negligible in cylindrical containers except near the endwalls, this suggests that axial variation in tumbler diameter is required for axial drift. To understand how axial variations in flowing layer length, L, determines drift, we conducted new experiments and simulations of partially filled double cone tumblers of varying wall slope. Axial drift remains present in the conical geometry, and the drift speed increases with the equator diameter for fixed tumbler length. Results from both the double cone and the spherical tumbler reveal that the axial drift velocity depends on L and the axial position. Funded by NSF Grant CMMI-1000469.

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