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Axial transport of bidisperse granular mixtures in a rotating drum ZEINA KHAN, STEPHEN MORRIS, University of Toronto — Bidisperse granular mixtures rapidly size segregate when tumbled in a partially filled, horizontal drum. The smaller component moves radially toward the axis of rotation and forms a buried core. On a longer time scale, axial modulations of the core may develop and grow into a series of bands along the drum, which become visible upon breaking the surface. Using a narrow pulse of the smaller component as the intitial condition, we observe that the axial transport of the radial core is a subdiffusive front advancement process. The front motion is subdiffusive in the sense that the radially integrated concentration forms a self-similar, compact axial pulse whose width grows as t^{α}, with $\alpha \sim 1/3 < 1/2$, and hence it spreads much more slowly than by diffusion in a mixture which does not exhibit axial banding. By coloring some of the larger grains, we find that the mixing and axial transport of the larger grains is similarly subdiffusive. We report on the effects of changing relative grain size and drum diameter on the axial transport of grains. We find that mixing occurs in the radial core, and axial band formation is enhaced in these cases.

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