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Characterizing the banded state of granular material in a rotating drum.[1] MICHAEL NEWEY, University of Maryland, KENNETH DESMOND, Rochester Institute of Technology, WOLFGANG LOSERT, University of Maryland — Why do particles of different size segregate axially in a horizontal rotating tumbler? We aim to understand the microscopic mechanisms for axial segregation through direct measurements of the motion of individual particles. Imaging the surface of the flowing layer, we extract flow angles, velocities, drift and diffusion for different particle types and mixtures of particles. Surprisingly, the direction of surface drift and steepest flow angle do not coincide and that surface drift cannot explain the axial segregation in our mixtures. On the other hand, particles in small particle bands flow significantly faster then particles in large particle bands, and this can be observed before visible band formation. We discuss the possible role of velocity differences in the axial segregation process. We characterize the fluidity of the flowing layer from its response to gentle sideways forcing.

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