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**High-speed measurement of axial grain transport in a rotating drum**[1] FRANK VAN BUSSEL, Max Planck Institute for Dynamics and Self-Organization, ZEINA KHAN, Chemical Engineering, Texas Tech University, MARC SCHABER, RALF SEEMANN, Experimental Physics, Saarland University, MARIO SCHEEL, MARCO DIMICHIEL, European Synchrotron Radiation Facility — Over short timescales granular mixtures separate by size when tumbled in a partially filled horizontal drum. The smaller grains move toward the axis of rotation to form a central core; undulations in this core gradually increase in amplitude until they grow into axial bands. Using non-invasive high-speed synchrotron x-ray particle tracking, we investigate the axial transport properties of tracer particles traveling amongst glass spheres. This new technique allows us to gather data on time scales not previously possible. When the tracers are present in larger proportions the mixtures we used should have different tendencies to segregate axially according to size ratio; one of our findings, however, is that when the tracer concentration is low the single-particle dynamics of these mixtures do not depend on the relative particle sizes in any appreciable way. This implies that the potential for a mixture to axially segregate cannot be inferred from the microscopic dynamics of individual small particles. A second finding is that while the slope of the mean-squared displacement is close to that expected from diffusive transport, as determined from the single-particle dynamics, more detailed analyses indicate anomalous transport.

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