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Flowing layer thickness in a granular tumbler RICHARD M. LUEPTOW, FLORENT PIGNATEL, Northwestern University, CAROLINE ASSELIN, LUCAS KRIEGER, French Air Force Academy, JULIO M. OTTINO, Northwestern University — The thickness of the flowing layer in a tumbler varies substantially depending on flow conditions, but no predictive approach is available. We have studied monodisperse granular flows in air, water, and glycerine in a quasi-2D tumbler, focusing on the rolling regime to highlight common features and differences between dry and wet granular flows. For dry granular flows, the flowing layer thickness measured in units of particle diameter scales with a dimensionless flow rate based on the tumbler rotational speed and radius as well as the particle diameter. Using appropriate characteristic time scales, the data for the dry and liquid experiments also collapse fairly well. The Stokes number is a key dimensionless parameter to characterize the flow of granular material in liquids.

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