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Shear banding of slowly sheared granular packings in an annular geometry J.C. TSAI, University of Pennsylvania, J.P. GOLLUB, Haverford College — We investigate experimentally a quasi-static flow of glass beads packed and sheared in an annular channel under a constant normal load. The experiments utilize techniques of refractive-index-matched fluorescent imaging to determine the motion of individual particles inside the sheared packing.[1] The measured steady-state velocity fields have a dynamical range of five decades; parameters such as packing size and particle size are varied systematically. We demonstrate that crystalline ordering has a significant impact on the spatial gradient of grain velocity. Changing particle size does not influence the gradient of particle velocity significantly; the characteristic length for velocity decay does not show a direct scaling with particle size. Instead, the characteristic length for velocity decay decreases as the channel width is narrowed. By analyzing the measurements in this and other experimental systems of granular shear flows, we argue that the spatial scale for the decay of grain velocity should be geometry-specific; a heuristic model is proposed to explain the shear banding in this geometry. Supported by NSF-DMR-0405187 [1] Phys.Rev.E 70, 031303 (2004)

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