Abstract Submitted
for the DFD05 Meeting of
The American Physical Society

Core Precession and Erosion in a Tumbler Under Variable g-Levels RICHARD M. LUEPTOW, Northwestern University, TIM ARNDT, ANTJE BRUCKS, ZARM, University of Bremen, JULIO M. OTTINO, Northwestern University — The precession and erosion of a core of granular material in a rotating tumbler that is more than half full provides a measure of the slow granular motion that occurs beneath the flowing surface layer. Since the effect of gravity on the subsurface flow has not been explored, experiments were performed in a 63% to 83% full tumbler apparatus mounted in a large centrifuge that can provide very high g-levels. Two colors of 0.5 mm glass beads were filled side by side to mark a vertical line in the 45mm radius quasi-two dimensional tumbler. The rotation of the core with respect to the tumbler and size of the core was monitored over 250 tumbler revolutions at accelerations between 1g and 12g. The degree of core precession increases with the g-level, while the core erosion depends less on g-level. The flowing layer thickness is essentially independent of the g-level for identical Froude numbers, suggesting that the shear rate in the flowing layer must increase with increasing g-level.

Richard Lueptow

Date submitted: 05 Aug 2005 Electronic form version 1.4