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Lateral stripe state in rapid granular flow on an inclined plane

ROBERT ECKE, Los Alamos National Laboratory, TAMAS BORZSONYI, Hungarian Academy of Sciences — Recently longitudinal vortices were reported in a rapid, dilute flow of sand down a rough inclined plane [1]. We present experimental results, showing that a robust stripe state develops at moderate plane inclinations in denser flows, with a structure substantially different from the one observed in dilute flows. We characterize this new type of stripes by measuring velocity profiles, height profiles, light transmission, and average density of the flow. As opposed to the stripes observed in the dilute regime, here the fast moving region corresponds to the maximum of the height profile. The stripe state is detected in the flow of various materials such as sand of different sizes, glass beads of different sizes, and copper particles of various shapes. We show that by increasing plane inclination we get back the dilute regime and the previously reported stripe structure. For sand particles with the diameter of $d=0.4$ mm the flow properties were extensively measured at six downstream locations. For this case we find an explicit correspondence between the accelerating nature of the flow and the formation of stripes in the dense regime.

[1] Y. Forterre and O. Pouliquen, Phys. Rev. Lett. 86, 5886 (2001).

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