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Clustering in a Dense, Freely-Falling Granular Stream[1] JOHN R. ROYER, SCOTT R. WAITUKAITIS, James Franck Institute, University of Chicago, DANIEL J. EVANS, HEINRICH M. JAEGER, James Franck Institute, University of Chicago — We investigate the breakup of a freely-falling granular stream into discrete, compact clusters of grains. This breakup, occurring for grain diameters less than about 200 microns falling out of a hopper opening, is reminiscent of the breakup of a liquid stream, though granular materials are generally thought of as lacking a surface tension. Our experiments employ high-speed video imaging in the co-moving frame, which allows us to track the onset of clustering and the subsequent cluster evolution in detail. Varying the material, size, roughness, and wetting properties of the grains as well as the surrounding gas pressure and the hopper opening diameter, we investigate the role of capillary, electrostatic and van der Waals forces in the clustering process. We find that the clustering provides a window to observe very weak cohesive forces between the grains which are masked in other experiments.

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