

Super-spreading of charged granular matter

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Abstract:

I will speak on the vertical spreading of a monolayer of glass particles on a plastic (polypropylene/polystyrene) surface driven by an orbital shaker. The interactions in the system evolve in time through the progressive triboelectric charging of the surfaces involved. The particles spread initially through splashing and sticking onto the cylinder's surface forming an amorphous monolayer. Continued driving initiates a collective motion, i.e., 'super spreading', of this monolayer, first forming wavy stripes - spatially periodic density modulations, and then ejecting narrow particle jets, hundreds-of-particle-diameter-long and few diameters wide, from the tips of the stripes. The jets eventually coalesce laterally to form a homogeneous spreading front, layered along the spreading direction. This remarkable growth patterns are related to the spatially inhomogeneous and temporally intermittent frictional drag between the moving charged glass particles and the much-less-mobile counter-charges on the plastic container.