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Electrical charging in shaken granular media[1] FREJA NORDSIEK, DANIEL LATHROP, University of Maryland College Park — Collisional electrification of granular particles and the resulting electric fields are seen but poorly understood in sand storms, volcanic ash clouds, thunderstorms, and thundersnow. We present results on the electrical charging of granular media (100 micron to 1 mm in size) shaken between two conducting plates. The voltage between the plates was measured. We saw particle electrification through capacitive coupling with the plates and electrical discharges for a diverse class of materials: polystyrene (polymer), soda-lime glass (glass), 69%:31% ZrO_2:SiO_2 (ceramic), and aluminum (metal). We found 1) a monotonic increase in charging with shaking strength, 2) a threshold in the number of particles to see charging of about the number of particles needed to form a monolayer on the plate, 3) material and diameter differences causing an order of magnitude spread in measured signal but little difference between mono-material sets with one size range and bi-material and/or bi-size range set combinations, and 4) long time scale transients. We argue that while two-body collisions and the physical properties of the particles (material and size) are relevant, collective phenomena are a necessary part of explaining natural charging of granular flows.

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