Electrostatic precursors to granular slip events

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***Abstract*—It has been known for over a century that electrical signals are produced by material failure, for example during crack formation of crystals and glasses, or stick-slip motion of liquid mercury on glass. We describe here new experiments revealing that slip events in cohesive powders also produce electrical signals - of hundreds of volts - and remarkably these signals can appear significantly in advance of slip events. We have confirmed this effect in two different experimental systems and using two common powdered materials, and in a third experiment we have demonstrated that similar voltage signals are produced by crack-like defects in several powdered materials**