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A nonlocal enhancement to granular elasto-plasticity KEN KAMRIN, MIT, GEORG KOVAL — A general, three-dimensional law to predict granular flow in an arbitrary geometry has been an elusive goal for decades. Recently, an elasto-plastic continuum model has shown the ability to approximate steady flow and stress profiles in multiple inhomogeneous flow environments. However, the model does not capture some of the characteristic phenomena observed in the slow, creeping flow regime. As normalized flow-rate decreases, granular stresses are observed to become largely rate-independent and a dominating length-scale emerges in the mechanics. This talk attempts to account for these effects with a nonlocal correction term that modifies the continuum law when the inertial number drops below a critical value. The correction depends on stress and strain-rate gradients and brings in a natural dependence on the particle diameter. We implement the modified law in multiple geometries and validate its predictions against discrete particle simulations.

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