Abstract Submitted
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A non-local plasticity theory for slow granular flows PRABHU R NOTT, Indian Institute of Science — Recent studies on dense granular materials have shown evidence of non-locality in the mechanical response, wherein the motion of an intruder is aided by shearing the material far from it. This behaviour is not explained by classical plasticity theories, which also have other serious failings. Non-local theories proposed earlier are either of phenomenological origin, or based on the introduction of an additional field variable whose mechanical origin is debatable. Here we present a non-local plasticity theory whose mechanical origin is easy to comprehend, involves no additional field variables, and captures rather simply the physical picture of plastic events in a spatial point influencing its neighbourhood. Most crucially, the theory is able to predict the kinematics of simple shear flows, in particular the exponentially decaying velocity profile in simple shear, and shear-induced dilatancy. Finally, our non-local theory plasticity theory is Hadamard well-posed, a significant improvement over the local theories.

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