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**Granular flows and Reynolds Dilatancy** ALEXANDRE KABLA, LAKSHMINARAYANAN MAHADEVAN, DEAS - Harvard University, TOMASO ASTE, TIM SENDEN, Dep. of Applied Mathematics - The Australian National University — The quasi-static rheology of granular matter is a stubborn problem. In this regime, the structure of the pack controls the mechanical response but also depends on the whole plastic history, leading to singular behaviours such as flow localization or memory effects. The coupling between structure and flow is often associated with the Reynolds dilatancy principle, which states that the density of a random pack decreases with increasing strain. In order to obtain a quantitative description of grain packing dilatancy, we use real time X-Ray digital imaging, associated with a specific image processing algorithm. Our technique allows local and time resolved measures of grain displacement fields and density variations. We observe clear correlations between the shear history and the local density, leading to a phenomenological relationship between them.

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