Abstract Submitted
for the MAR05 Meeting of
The American Physical Society

**Non-linear stress transmission in granular materials** YAEL ROICHMAN, New York University, DOV LEVINE, Technion- Israel Institute of Technology — The force chain model uses the highly singular lines along which stress propagates in granular materials (termed *force chains*) to describe stress transmission in granular materials. In this work we solve the full force chain model both in the mesoscopic and the macroscopic limit and define the two corresponding characteristic lengths. We calculate the macroscopic constitutive relation for granular materials and show that the average response of an ensemble of granular materials changes in a non-linear way with the applied force. In addition, we explain the measured deviations of granular materials from elastic-like behavior buy calculating the stress transmission in textured piles and the response to tilted forces. Finally, we demonstrate the effect of the non-linear behavior of granular materials by calculating the difference between the response to two forces applied simultaneously in close proximity and the superposition of the response to each force applied separately.

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Date submitted: 01 Dec 2004 Electronic form version 1.4