Abstract Submitted
for the DFD13 Meeting of
The American Physical Society

Impact in dense granular suspensions: crucial role of dilatancy and pore pressure feedback[1] YOEL FORTERRE, IUSTI CNRS Aix-Marseille University, J. JOHN SOUNDAR JEROME, NICOLAS VANDENBERGHE, LAURENT DUCHEMIN, IRPHE CNRS Aix-Marseille University — We investigate the impact of a rigid sphere onto a granular paste made of non-buoyant glass beads mixed with a liquid under gravity. We show that the initial volume fraction of the granular packing has a critical influence on the impact behavior. For loose packing, the ball sinks in the granular medium as in a liquid, giving rise to a collapsing cavity and a central jet as observed with fine powders in air. By contrast, for dense packing, the ball stops as soon as it hits the surface and its kinetic energy is almost instantly dissipated. We interpret this "liquid-solid" transition as the volume fraction change by a coupling between dilatancy effects and the liquid pore pressure during the impact. Dynamic pore pressure measurements and a simple diphasic model taking into account dilatancy support this mechanism. Our results show that "shear-thickening-like" phenomena in granular suspensions can arise from transient diphasic coupling rather than from the intrinsic rheology of the material.

[1]This work was supported by ANR through the program No. ANR-11-JS09-005-01.

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Date submitted: 02 Aug 2013 Electronic form version 1.4