Abstract Submitted
for the DFD12 Meeting of
The American Physical Society

Microstructure and Rheology of Particle Suspension in a Yield Stress Fluid STEPHANIE DEBOEUF, LUCIE DUCLOUÉ, NICOLAS LENOIR, GUILLAUME OVARLEZ, Laboratoire Navier (Ecole des Ponts ParisTech, IFSTTAR, CNRS UMR8205) — Numerous industrial and natural fluids, such as fresh concrete or debris flows, are made of particles suspended in a yield stress fluid. Such suspensions exhibit complex rheological behaviours: elasto-plasticity, strain hardening, shear-thinning (non constant viscosity), normal stress difference, ... In the light of results about shear-induced microstructure in concentrated suspensions of spheres in Newtonian fluids [Parsi & Gadala-Maria 1987, Brady 1997, Morris 2009, Blanc et al 2011], we experimentally addressed the role of the particle microstructure in this complex rheology. Our model system is made of non-Brownian spherical hard particles suspended in a concentrated emulsion. We associate rheological measurements to microtomography X imaging techniques allowing for high resolution pair distribution functions in three dimensions. We characterize this microstructure for various shear histories (squeeze flow and rotational flow, transient and steady state, various low and high shear rates) and we relate it to their elastic and plastic properties.

Stephanie Deboeuf
Laboratoire Navier (Ecole des Ponts ParisTech,
IFSTTAR, CNRS UMR8205)

Date submitted: 09 Aug 2012 Electronic form version 1.4