

Abstract Submitted  
for the DFD05 Meeting of  
The American Physical Society

**Fully-resolved numerical simulation of 1024 sedimenting spheres<sup>1</sup>**

ANDREA PROSPERETTI, ZHONGZHEN ZHANG, LORENZO BOTTO, Johns Hopkins University — The dynamics of a suspension of finite-size particles settling under gravity in a Newtonian fluid is simulated. The “Physalis” numerical method is used to fully resolve the flow around the spheres at finite particle Reynolds number, with an elastic-collision model. Of interest in the investigation is the self-organization of the disperse phase and its effect on the sedimenting behavior. Particle clustering and anisotropy are found to be prominent features of the system. The suspension displays preferential orientation at scales comparable to the particle dimension. Fluctuations in the mean particle settling velocity are shown to be intimately linked to the anisotropy of the microstructure. The particle Lagrangian time scale in the direction gravity is larger than in the orthogonal directions and, as a consequence, a similar difference is found between the vertical and horizontal self-diffusion coefficients.

<sup>1</sup>Supported by DOE and NSF

Andrea Prosperetti  
Johns Hopkins University

Date submitted: 10 Aug 2005

Electronic form version 1.4