Abstract Submitted
for the DFD17 Meeting of
The American Physical Society

Local Lubrication Model for Spherical Particles within an Incompressible Navier-Stokes Flow BAPTISTE LAMBERT, MICHEL BERGMANN, LISL WEYNANS, Univ of Bordeaux — In particle laden flow, hydrodynamic effects due to close interacting particles play an essential role in the suspension phenomenon. For Stokes flow, the lubrication theory indicates that the dominant order of the lubrication between two spherical particles evolves as a function of the inverse of the separation distance. The divergent behaviour of the lubrication force challenges the accuracy of numerical simulations when the particles are almost in contact. Lubrication is classically modelled using the dominant order of the force given by the lubrication theory. However, these results are rigorously valid only for Stokes flows and spherical particles. We aim at extending the lubrication theory to inertial fluids and more complex particle geometries. We are proposing a subgrid lubrication model for Navier-Stokes flows of particles. In our approach, corrections of the lubrication are made locally at the particle surfaces when there is not enough grid cells between interacting particles to properly compute the hydrodynamic effects. Hence the validity of the correction depends only on the particle curvature and the flow properties near the contact point. Thereby, the method can be generalized any particles with a convex surface, for instance.

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Date submitted: 27 Jul 2017 Electronic form version 1.4