Abstract Submitted
for the DFD12 Meeting of
The American Physical Society

On the direct numerical simulation of moderate-Stokes-number turbulent particulate flows using algebraic-closure-based and kinetic-based moments methods AYMERIC VIE, EM2C/Ecole Centrale Paris, ENRICA MASI, OLIVIER SIMONIN, IMFT, MARC MASSOT, EM2C/Ecole Centrale Paris, EM2C/ECOLE CENTRALE PARIS TEAM, IMFT TEAM — To simulate particulate flows, a convenient formalism for HPC is to use Eulerian moment methods, which describe the evolution of velocity moments instead of tracking directly the number density function (NDF) of the droplets. By using a conditional PDF approach, the Mesoscopic Eulerian Formalism (MEF) of Février et al. 2005 offers a solution for the direct numerical simulation of turbulent particulate flows, even at relatively high Stokes number. Here, we propose to compare to existing approaches used to solved for this formalism: the Algebraic-Closure-Based Moment method (Kaufmann et al. 2008, Masi et al. 2011), and the Kinetic-Based Moment Method (Yuan et al. 2010, Chalons et al. 2010, Vié et al. 2012). Therefore, the goal of the current work is to evaluate both strategies in turbulent test cases. For the ACBMM, viscosity-type and non-linear closures are envisaged, whereas for the KBMM, isotropic and anisotropic closures are investigated. A main aspect of the current methodology for the comparison is that the same numerical methods are used for both approaches. Results show that the new non-linear closure and the Anisotropic Gaussian closures are both accurate in shear flows, whereas viscosity-type and isotropic closures lead to wrong results.

Aymeric Vie
EM2C/Ecole Centrale Paris

Date submitted: 03 Aug 2012 Electronic form version 1.4