Abstract Submitted
for the DFD10 Meeting of
The American Physical Society

A multi-Gaussian quadrature method of moments for gas-particle flows[1] RODNEY FOX, Iowa State University, CHRISTOPHE CHALONS, CEA, MARC MASSOT, Ecole Centrale de Paris — Gas-particle flows with finite Stokes number can be modeled at the mesoscopic level using a kinetic description for the particle velocity. In the context of large-eddy simulation (LES), the filtered kinetic equation contains a velocity diffusion term and a spatial flux term that depend on the sub-grid-scale (SGS) gas-phase velocity fluctuations. In very dilute (i.e. non-collisional) flows, the SGS terms drive the particle velocity distribution function towards a Gaussian form. On the other hand, particle trajectory crossing of inertial particles lead to highly non-Gaussian distributions. In the context of moment methods for solving the kinetic equation, the latter can be successfully modeled using quadrature-based moment methods. In this work, such methods are extended to allow for a continuous transition between a delta-function representation of the quadrature nodes and a multi-Gaussian representation. Examples with 1D and 2D velocity phase spaces are presented to illustrate the advantages of multi-Gaussian quadrature. In particular, the representation of the spatial fluxes is considerably improved for cases where the velocity distribution is close to Gaussian.

[1]Work partially supported by the 2010 CTR Summer Program.

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Date submitted: 04 Aug 2010 Electronic form version 1.4