Abstract Submitted
for the DFD19 Meeting of
The American Physical Society

Two-way coupled Euler-Lagrange simulations with particles and mesh spacing of arbitrary sizes BEREND VAN WACHEM, FABIAN DENNER, FABIEN EVRARD, Otto-von-Guericke University Magdeburg — The Euler-Lagrange (EL) approach is widely used to simulate particulate flows, because of the relatively low computational cost and the straightforward modelling of particle-particle interactions. Since relying on an assumption of separation of scales between the general features of the flow (resolved on the underlying fluid mesh) and those at the scale of the particles (not resolved on the mesh), the EL method typically requires tracked particles to be much smaller than the grid cells in which the flow equations are solved, commonly referred to as the "particle-in-cell" approach. For the cases that require high fluid mesh refinement, this can strongly limit the size of the particles that can be accurately tracked. In this work, we propose an EL approach that alleviates the particle size restrictions. It relies upon the filtering of the flow equations with a particle marker function; a process in which a length-scale is chosen. We also present a model for the reconstruction of the undisturbed flow velocity and volume fraction at the particle locations, based on the study of the flow through a regularised momentum source and/or a volume fraction dimple. The ability of the proposed framework to accurately track particles of arbitrary sizes is shown with an array of test-cases.

Fabien Evrard
Otto-von-Guericke University Magdeburg

Date submitted: 31 Jul 2019 Electronic form version 1.4