Advanced modelling of dispersed multiphase flows for Euler/Lagrange

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Euler/Lagrange simulations of dispersed multiphase flows are most favorable for many technical and industrial processes. Herewith it is easily possible to account for a possible particle size distribution and the modelling of particle scale transport phenomena can be done in a very descriptive way (Sommerfeld 2017). Hence, it is possible to account easily for many important elementary processes, such as wall collisions, inter-particle collisions and agglomeration, droplet coalescence and bubble oscillations.

In order to allow simulations of large-scale technical systems the particles first of all have to be treated as point-masses. Therefore, all the fluid dynamic forces acting on the particles have to be accounted for through appropriate correlations valid for higher particle Reynolds numbers (Sommerfeld et al. 2008). The fluid flow is calculated based on RANS with turbulence models or LES with simple sub-grid scale models. For simulating the discrete particle phase, a large number of computational particles (more than 500,000) are tracked through the flow field. In this hybrid approach special emphasis has to be put on the two-way coupling procedure and the convergence behaviour.

The basic concepts of the Euler/Lagrange approach will be introduced together with the convergence behaviour. Then application examples will be introduced for:

- pneumatic conveying with wall- and inter-particle collisions (Sommerfeld & Lain 2015)
- particle separation in a cyclone with agglomeration (Sgrott & Sommerfeld 2018)
- bubbly flows using a dynamic oscillation model (Sommerfeld et al. 2018)

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