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Lagrangian stochastic modelling in Large-Eddy Simulation of turbulent particle-laden flows SERGIO CHIBBARO, ALESSIO INNOCENTI, University Pierre et Marie Curie, CRISTIAN MARCHIOLI, University of Udine — Large-Eddy Simulation (LES) in Eulerian-Lagrangian studies of particle-laden flows is one of the most promising and viable approaches when Direct Numerical Simulation (DNS) is not affordable. However applicability of LES to particle-laden flows is limited by the modeling of the Sub-Grid Scale (SGS) turbulence effects on particle dynamics. These effects may be taken into account through a stochastic SGS model for the Equations of Particle Motion (EPM) that extends the Velocity Filtered Density Function method originally developed for reactive flows, to two-phase flows. The underlying filtered density function is simulated through a Lagrangian Monte Carlo procedure, where a set of Stochastic Differential Equations (SDE) is solved along the trajectory of a particle. The resulting Lagrangian stochastic model has been tested for the reference case of turbulent channel flow. Tests with inertial particles have been performed focusing on particle preferential concentration and segregation in the near-wall region: upon comparison with DNS-based statistics, our results show improved accuracy with respect to LES with no SGS model in the EPM for different Stokes numbers. Furthermore, statistics of the particle velocity recover well DNS levels.

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