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Intrinsic filtering errors of Lagrangian particle tracking in LES flow fields CRISTIAN MARCHIOLI, University of Udine (Italy), FEDERICO BIANCO, SERGIO CHIBBARO, Pierre et Marie Curie University (France), MARIA VITTORIA SALVETTI, University of Pisa (Italy), ALFREDO SOLDATI, University of Udine (Italy) — Large-Eddy Simulations (LES) of two-phase turbulent flows exhibit quantitative differences in fluid and particle statistics if compared to Direct Numerical Simulations (DNS) which are considered here the exact reference case. Differences are due to filtering, a fundamental intrinsic feature of LES. In this paper, we quantify a lower bound for the filtering error using a DNS database of inertial particles dispersion in turbulent channel flow. Through ad hoc a-priori tests we single out the error purely due to filtering by removing error accumulation effects, which would lead to progressive divergence between DNS and LES particle trajectories. By applying filters of different type and width at varying particle inertia, we characterize the statistical properties of the filtering error. Results show that filtering error is stochastic and has a non-Gaussian distribution. In addition, the distribution of the filtering error depends strongly on the wall-normal coordinate being maximum in the buffer region. These findings provide insight on the effect of subgrid-scale velocity field on the force driving the particles, and establish the requirements which a LES model must satisfy to predict correctly particle segregation and preferential concentration.

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