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A fast Lagrangian tracking method capturing finite-size effects in particulate flows MINGQIU WU, Universidad Carlos III, Madrid, Spain, JULIEN FAVIER, ALFREDO PINELLI, CIEMAT, Madrid, Spain, MODELING AND NUMERICAL SIMULATION GROUP TEAM — We present a new method to capture the finite-size effects induced by particles transported by a fluid flow, with a low computational cost compared to available fully-resolved methods, thus allowing to tackle configurations with high volume fractions of particles. The basic idea consists in tracking a source/sink of momentum occurring within a compact support of the mesh, centered on the particle and taking the form of a mollified Dirac kernel, or blob. In the spirit of the immersed boundary method, the shape and the intensity of the kernel are found by imposing appropriate reproducing conditions on the blob (to model accurately a Dirac pulse) and spreading on the mesh cells a volume force determined by the desired boundary condition. The particles occupy a finite-size volume of fluid, therefore introducing a two-way coupled behavior, for the computational cost of only one Lagrangian point. To build the blobs, we will either spread a zero-velocity condition at the blob center, or spread a zero-velocity condition averaged on the fluid parcel enclosed within the support. Both methods are discussed and validated by comparing with free falling fully-resolved particles, in 2D and 3D.

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