THE SLIP MOTION OF LARGE FINITE-SIZE PARTICLES IN TURBULENT FLOWS

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Abstract The turbulent transport and dispersion of particles are involved in many natural and industrial phenomena. Under some assumptions, the dynamics of sufficiently small spherical particles can be completely described. However less is known in the case of particles with finite Reynolds numbers and whose sizes lie in the inertial range of the carrier turbulent flow. The key point to study their dynamics and their interactions with the surrounding fluid is to define the relative (slip) velocity of such particles. Using data from direct numerical simulations, we propose a definition of such a slip velocity based on the behavior of fluxes on different shells surrounding the particle [1]. This definition allows us to measure the average velocity profile around the particle and to define a particle Reynolds number. Also, we find that the particle influences the flow on distances at most of the order of its diameter. We then make an analogy between the particle boundary layer and what is known in wall flows. Dimensional arguments predict the presence of a logarithmic layer and the scaling of various physical quantities as a function of the particle size.

References

[1] Mamadou Cisse, Holger Homann, and Jérémie Bec. Slipping motion of large neutrally buoyant particles in turbulence. *Journal of Fluid Mechanics*, **735**:R1, 2013.