

RENORMALIZED TRANSPORT OF INERTIAL PARTICLES

Dr. Marco MARTINS AFONSO

Centro de Matemática (Faculdade de Ciências) da Universidade do Porto

Resumo

We study how an imposed fluid flow - laminar or turbulent - modifies the transport properties of inertial particles, namely their terminal velocity, effective diffusivity, and concentration following a point-source emission.

Such quantities are investigated by means of analytical and numerical computations, as functions of the control parameters of both flow and particle, i.e. density ratio, inertia, Brownian diffusivity, gravity (or other external forces), turbulence intensity, compressibility degree, space dimension, and geometric\temporal properties.

The complex interplay between these parameters leads to the following conclusion of interest in the realm of applications: any attempt to model dispersion and sedimentation processes (or, equivalently, the wind-driven surface transport of floaters) cannot avoid taking into account the full details of the flow field and of the inertial particle.

9/5/2018 - 14h30 - Sala de Reuniões do Departamento de Matemática

Palavras chave:

Fluid Dynamics; Inertial Particles; Transport Properties; Sedimentation-Diffusion-Dispersion.

Referências:

- [1] M.R. Maxey & J.J. Riley, Equation of motion for a small rigid sphere in a nonuniform flow, *Phys. Fluids* 26, 883 (1983)
- [2] R. Gatignol, The Faxén formulae for a rigid particle in an unsteady non-uniform Stokes flow, *J. Méc. Théor. Appl.* 1, 143 (1983)
- [3] M. Martins Afonso & A. Mazzino, Point-source inertial particle dispersion, *Geophys. Astrophys. Fluid Dyn.* 105, 553 (2011)
- [4] M. Martins Afonso & S.M.A. Gama, Settling velocity of quasi-neutrally-buoyant inertial particles, *C. R. Méc.* 346, 121 (2017)
- [5] M. Martins Afonso, P. Muratore-Ginanneschi, S.M.A. Gama & A. Mazzino, Eddy diffusivity of quasi-neutrally-buoyant inertial particles, *Phys. Rev. Fluids* 3, 044501 (2018)