Numerical simulation of particulate flows with applications to fluidized beds

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Lunedì 17 Febbraio 2014, ore 11.00
Sala Multimediale, Dipartimento di Matematica e Informatica

Abstract: The direct numerical simulation of resolved scale particulate flows is a widely spread research topic in the framework of computational fluid mechanics. The idea is to solve all the time and space scales of the flow interacting with moving particles in order to extract Lagrangian statistics or macroscopic flow quantities from the simulation results. These characteristic parameters are required to feed models at meso or macroscale such as the one used in Eulerian-Lagrangian or Eulerian-Eulerian approaches for simulating particulate flows at laboratory or industrial scale applications. In the present work, the fictitious domain approach is first presented for the representation of the fluid-particle interaction with a four-way coupling model. Then, several validation test problems are detailed and analyzed in order to estimate the convergence and accuracy of the CFD code. Finally, an experimental fluidized bed is simulated and discussed.

CV: Dr. Stephane Vincent is assistant professor at Ecole Nationale Supérieure de Chimie et de Physique de Bordeaux (ENSCPB) since 2001. Currently he is also invited professor at the Institut Jean Le Rond d’Alembert in Paris. His research focuses on the physical modelling and numerical simulation of turbulent multiphase flows. Dr. Vincent has served as Guest Editor for a special Issue of Computers and Fluids and organizer of conferences (Turbulence and Interactions) and Euromech colloquia (Small scale numerical simulation of multiphase flows), and has published around 90 papers in peer-reviewed journals and 20 contributions to conferences.