PIMS / AMI Seminar

Friday, October 7, 2016
3:00 p.m.
CAB 657

"Numerical modelling of particle-laden flows: multi-scale, arbitrary particle shape, heat transfer, non-Newtonian"

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Abstract

Particle-laden flows are ubiquitous in environmental, geophysical and engineering processes. The intricate dynamics of these two-phase flows is governed by momentum transfer between the continuous fluid phase and the dispersed particulate phase. When significant temperature differences exist between the fluid and particles and/or chemical reactions take place at the fluid/particle interfaces, the phases also exchange heat and/or mass, respectively. While some multi-phase processes may be successfully modelled at the continuum scale through closure approximations, an increasing number of applications require resolution across scales, e.g. dense suspensions, fluidized beds. Within a multi-scale micro/meso/macro-framework, we develop robust numerical models at the micro and meso scales, based on a Distributed Lagrange Multiplier/Fictitious Domain method and a two-way Euler/Lagrange method, respectively. Collisions between finite size particles are modeled with a Discrete Element Method. We discuss mathematical and computational issues associated to an accurate and reliable modelling of particle-laden flows at the micro and meso scales. We also broaden the scope of applications beyond momentum transfer of spherical particles in a Newtonian fluid towards arbitrary particle shape, heat transfer and particles suspended in a viscoplastic fluid. We also shortly address high performance computing issues related to our massively parallel numerical tools and discuss challenges to efficiently transfer knowledge from small scales to large scales.

Refreshments will be served in CAB 649 at 2:30 p.m.