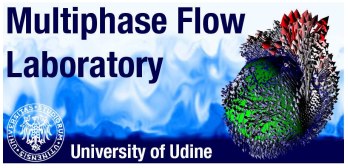
Opening for PhD Position

Multiphase Flow Laboratory
Department of Engineering and Architecture - University of Udine
Head: Prof. Cristian Marchioli



Multiphase Flow Laboratory - University of Udine

Turbulent multiphase flows: Simulations and Experiments

Description: The Multiphase Flow Lab of the University of Udine is looking for PhD candidates in the field of Computational and Experimental Multiphase Flow. The following research projects are available:

ID 1. Simulation of fully-resolved anisotropic particles in turbulence Turbulent dispersion of large anisotropic particles in boundary layers is a phenomenon with many transversal applications in sciences and technology, yet still poorly understood. Numerical simulations of such systems are challenging since they involve transient fluid flow with many immersed non-spherical solid objects subject to large displacements. Understanding the phenomena occuring on the particle length scale requires accurate numerical methodologies, typically based on Direct Numerical Simulation (DNS) of the flow. Aim of the project is to develop a DNS-based numerical tool for fully-resolved particle-level simulations.

ID 2. Simulation of flexible fibers in turbulence Turbulent dispersion of elongated flexible fibers in boundary layers is a phenomenon with many transversal applications in sciences and technology, yet still poorly understood. Numerical simulations of such systems are challenging since they involve transient fluid flow with many immersed non-spherical solid objects subject to large bending. Understanding the importance of fiber bending requires accurate simulations. Aim of the project is to extend the capabilities of an existing DNS-based code to perform massively-parallel simulations of flexible fibers in high-Reynolds-number turbulence.

ID 3. Numerical simulation of turbulent three-phase flow Aim of this project is to develop an innovative multiscale computational approach for three-phase turbulent flows that goes beyond classical RANS-based CFD methods and can be applied to flow configurations of industrial interest in a computationally efficient way. In particular, the approach must be able to take into account the effects of the different scales affecting the system. The three phases targeted are: small solid particles, large (deformable) liquid droplets and a liquid carrier fluid. We propose to study such a system via an Eulerian-Lagrangian methodology based on both direct numerical simulation (for benchmarking purposes) and large-eddy simulation (for application to industrial flows) of turbulence, coupled with an extended formulation of the Phase Field method to capture droplet-interface dynamics in the presence of droplet-to-fluid viscosity and density difference.

ID 4. Experimental characterization of polymer/fiber-induced drag reduction Aim of this project is to investigate experimentally polymer and/or fiber drag reduction in an industrial-scale loop equipped with standard centrifugal pumps. The effect of different polymer/fiber drag reducing agents (DRA) and the efficiency of polymers/fibers as drag reducers will be analysed for a range of concentrations and Reynolds numbers). Drag reduction data will be used to estimate the effect of polymer injection in industrial-size pipes, considering the effect of polymer degradation due to the injection system and/or to turbulence inside the flow.

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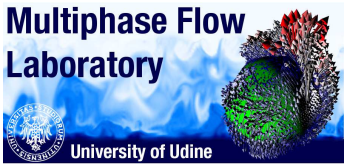

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All projects are sponsored by a University grant and will be carried out at the Multiphase Flow Laboratory (http://158.110.32.35/).

Eligibility criteria: Applicants must possess an outstanding master degree in any of the following disciplines: Aerospace, Mechanical Engineering, Chemical Engineering, Physics, Applied Mathematics or any related field.
The ideal candidate should possess previous experience in Computational and/or Experimental Fluid Mechanics. It will be advantageous to have good knowledge of any of following areas: Multiphase Flows, Numerical approaches to Turbulence (Direct and/or Large-Eddy Simulation), Experimental techniques.
The successful candidate will work in a research group with cutting-edge expertise in Multiphase Flow, which will support the proposed research by providing a conducive environment. Good analytical, mathematical, project management and communication skills, as well as good command of the English language are required.

Stipend: The successful candidate will be enrolled by the University of Udine with a 3-year fixed-term contract, full health and safety insurance coverage and a monthly net salary of 1000 €, sufficient to cover fully living expenses in Udine.

Selection: The application procedure is divided into two steps:
1. PRE-SCREENING: Applicants are FIRST required to contact the reference person, Prof. Cristian Marchioli (marchioli@uniud.it) with the subject line: "Application for PhD Studentship in Multiphase Flow - Project N" (where N is the ID number of the preferred research project: N=1, 2, 3 or 4).
Applicants must send their CV and a motivation letter to explain why they feel this project fits their own research interests.
2. FORMAL APPLICATION: Candidates who have passed the pre-screening step are then required to apply formally for the PhD position.
Formal applications must be made through the University's online application form (click to open).
Applications will open on June 1st, 2017 and will close on July 17, 2017.
Make sure to select "PhD in Environmental and Energy Engineering Science" as the programme of study.

Deadline for Written Application: Written applications should be sent no earlier than Monday, July 28, 2014 (10am local italian time) and no later than Tuesday, September 16, 2014 (4pm local italian time).
See also: PhD website (click to open).

Contact: Enquiries for further details can be sent to Dr. Cristian Marchioli (marchioli@uniud.it).