EUROPEAN MECHANICS SOCIETY

Colloquium Final Report Form

Please send this report in electronic form to the Secretary General of EUROMECH, within one month after your Colloquium. As an example, please consult the *Report of Colloquium 443* (available at www.euromech.org/colloquia/after.htm).

Title Small scale numerical methods for multi-phase flows ……

Colloquium No 555…….....
Dates and location 28-30 august 2013 Pessac France

Chairperson Stéphane VINCENT……

Co-Chairperson Ruben SCARDOVELLI, Martin SOMMERFELD.

Is there need of another Colloquium on the same or a related subject? Which year?

……
……

Full registration fee 300€……

What other funding was obtained? 1000€ from Ercoftac 5000€ from Labex CPU

What were the participants offered? Coffe break, lunch, USB key with conference materials, Wine bottle, publication in Computers and Fluids
……
……

Number of members of Euromech (reduced registration fee) 9……...

Number of non-members of Euromech (full registration fee) 28……...

Number of participants from each country:

Austria		United Kingdom		Slovakia	
Belgium		Greece		Slovenia	
Bosnia		Hungary		Spain	
Byelorussia		Ireland		Sweden	
Bulgaria		Italy	3	Switzerland	

EUROPEAN MECHANICS SOCIETY

Croatia		Latvia		Ukraine	
Czech Republic		Lithuania		Serbia	
Denmark		Netherlands		Montenegro	
Estonia		Norway		Turkey	2
Finland		Poland		USA	2
France	27	Portugal		Canada	1
Georgia		Romania			
Germany	5	Russia		Total	

List names of Applicants to EUROMECH
Eric ARQUIS, Hamza CHRAIBI, Romain DENEFLE, Vincent LOISEL, Jian WU, Thomas ABADIE, Sylvain GUILLOU, Dominique LEGENDRE, Philip YECKO …….....

Scientific Report
Please type your report on the following pages. Use additional pages if required. Put the date and your signature at the end.

www.euromech.org

PRESIDENT
GertJan van Heijst
G.J.F.v.Heijst@tue.nl

VICE PRESIDENT
Patrick Huerre
huerre@ladhyx.polytechnique.fr

SECRETARY GENERAL
Pierre Suquet
Laboratoire de Mécanique et d'Acoustique
31 chemin Joseph Aiguier
13402 Marseille Cedex 20
suquet@lma.cnrs-mrs.fr

TREASURER
Wolfgang Schröder
office@aia.rwth-aachen.de

EUROPEAN MECHANICS SOCIETY

Colloquium No 555 Scientific Report

Euromech colloquium 555

Small scale numerical methods for multiphase flows

Date: august 28-30th, 2013
Place: Pessac, France, Amphithéatre Larochefoucault, ENSAM
Organization: Stéphane VINCENT
Co-organization: Ruben SCARDOVELLI, Martin SOMMERFELD

The numerical simulation of multi-phase flows involving immiscible phases generally considers the interaction between an ambient fluid and another phase (solid particles, droplets, bubbles, films, sprays, jets). Either deformable grids, which are adapted to the interface, or fixed grids, with an independent representation of the interface, such as front-tracking, volume-of-fluid, level-set and phase-field, can be used to investigate these flows.

The goal of the colloquium was to provide an overview of the latest numerical methods and application field for the direct numerical simulation of multi-phase flows that were achieved with different mathematical models such as Navier-Stokes, Boltzmann, or Smooth-Particle Hydrodynamics. Different physical aspects of the multi-phase flow were emphasized, in particular concerning the numerical representation of the capillary forces with constant and variable surface tension, phase change, wettability and contact lines. More complex phenomena involving magnetic fields, liquid atomization by plasma or multi-fluid representation of three phase flows with air, water and vapour were also presented for the first time. Another important contribution of the the colloquium was the interest of the lecturers to turbulence modelling in multi-phase flows, with special attention given to direct numerical simulation, large-eddy simulation and also the multi-scale modelling of multi-phase flows.

Another important issue was the sharing of experiences between code developers in the field of numerical methods for the simulation of multi-phase flows at small scales. Interesting new developments were presented for interface tracking, immersed boundary methods and representation of mass and momentum preserving discretization. The validation test cases suitable to be simulated to be confident into numerical results were a common research interest present in most of the presentations. Notifications of stiff problems remaining to be addressed in the near future were also discussed such as the load balancing in mpi computations for adaptive mesh refinement techniques and mesh adaptation or coupling between various interface tracking methods (VOF-Level Set-Front Tracking).

The colloquium was structured into three main topics, i.e. interfacial flows, particulate flows and complex interfacial problems coming from real applications. In this way, various typical multi-phase flow problem and potential applications were treated in a wide spectrum including jet atomization in engines, chemical exchangers, energy production, environmental flows, plasma material manufacturing, microfluidics, …

Finally, the successful goal of this colloquium was to bring together developers and users of different models, numerical approaches and codes to share their experience in the development and validation of the algorithms and discuss the difficulties and limitations of the different methods and their pros and cons. The focus was mainly on fixed-grid methods. However adaptive and unstructured grids were present in several academic and industrial research works with the aim to compare and validate the different approaches. The three invited lectures were delivered by international speakers invited by the organizing committee in the field of numerical representation of interfaces in multi-phase flows (S. Zaleski), particulate flows (M. Sommerfeld) and coupling between particles and turbulence (S. Balachandar).

A selection of about ten contributions has been proposed for publication in a special issue of Computers and Fluids. A regular reviewing process is under progress to have a final publication of the special issue in 2014.