

# BIFD 2015

Sixth International Symposium on

**Bifurcations and Instabilities  
in Fluid Dynamics**

ESPCI PARIS • 15-17 July 2015



BOOK OF ABSTRACTS

## Welcome to BIFD 2015!

BIFD 2015 is the sixth edition of an international conference founded a decade ago to treat the topics of Bifurcations and Instabilities in Fluid Dynamics.

The scope of BIFD includes the classical hydrodynamic instabilities in shear, rotating and convective flows (Taylor-Couette, Rayleigh-Bénard, Kelvin-Helmholtz, Benard-Marangoni, Rayleigh-Taylor, Faraday) and related topics such as flow in thin films, transition to turbulence, magnetohydrodynamics, geophysical and astrophysical fluids, flow control, bi-locomotion and propulsion. Industrial, environmental and biomedical applications are welcome; experimental, theoretical and computational studies are all encouraged.

The organizing committee of BIFD 2015 is:

Laurette Tuckerman, CNRS and ESPCI (co-chair)  
José Eduardo Wesfreid, CNRS and ESPCI (co-chair)  
Jean-Christophe Robinet, ENSAM  
Maurice Rossi, CNRS and UPMC

The previous BIFD conferences were held in:

BIFD 2004 Madeira, Portugal  
BIFD 2006 Technical University of Denmark (DTU), Lyngby, Denmark  
BIFD 2009 University of Nottingham, United Kingdom  
BIFD 2011 Universitat Politècnica de Catalunya, Barcelona, Spain  
BIFD 2013 Technion – Israel Institute of Technology, Haifa, Israel  
Past organizers have been P. Bar-Yoseph, A. Oron, A. Gelfgat, M. Brøns, A. Cliffe, A. Meseguer, F. Marques, and I. Mercader.

The meeting has grown from 20 or so participants to the over 400 participants we welcome today in Paris, in six parallel sessions, held over three days.

We thank ESPCI (Ecole Supérieure de Physique et de Chimie Industrielle), UPMC (Université Pierre et Marie Curie), PSL (Paris Sciences et Lettres) Chaire Total de l'ESPCI, the Région Ile de France, PMMH (Physique et Mécanique des Milieux Hétérogènes), Fonds Charpak, and AFM (Association Française de Mécanique) for their support and the Ecole des Mines and the Institut Océanographique for hosting our conference.

We wish all of you a very productive and enjoyable conference!

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The BIFD international advisory committee is:

Pinhas Bar-Yoseph, Technion  
Morten Brøns, DTU  
Alexander Gelfgat, Tel-Aviv  
Alexander Oron, Technion  
Alvaro Meseguer, UPC

The Bifurcations and Instabilities in Fluid Dynamics Association is a non-profit organization devoted to promotion of research in instabilities and bifurcations in fluid mechanics, whose main objective is the realization of this bi-annual international scientific conference.



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## CHAOTIC SCATTERING AND PERIODIC DYNAMICS OF REGULAR CLUSTERS OF PARTICLES SEDIMENTING IN A VISCOUS FLUID

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Complex fluids, Stokesian dynamics, low-Reynolds-number regime.

Dynamics of a cluster of non-Brownian particles falling under gravity in a viscous fluid at low-Reynolds-number regime has been extensively studied in the literature both for small ([1],[2],[3]) and large ([4],[5]) number of particles and oscillating motions have been discovered.

In this work, we investigate dynamics of clusters of many non-Brownian particles in regular configurations settling under gravity in a viscous fluid. The point particle approximation is applied for the hydrodynamic interactions. We find out that a wide range of regular initial configurations of many particles leads to very long lifetime of the cluster with periodic and quasi-periodic relative motion of particles. We vary the relative distance between the particles and observe how does it affect the dynamics. Several types of periodic and quasi-periodic solutions are discovered. For broad range of initial configurations we show that a slight change of initial conditions has a large influence on the system lifetime - we observe chaotic scattering.

### References

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