Journal of Turbulence

ISSN: (Print) 1468-5248 (Online) Journal homepage: http://iom3.tandfonline.com/loi/tjot20

Foreword

Alessandra S. Lanotte , Federico Toschi & Luca Biferale

To cite this article: Alessandra S. Lanotte , Federico Toschi & Luca Biferale (2007) Foreword, Journal of Turbulence, 8, N35, DOI: 10.1080/14685240701576741

To link to this article: https://doi.org/10.1080/14685240701576741

Published online: 02 Nov 2009.

Journal of Turbulence
Volume 8, No. 35, 2007

Taylor & Francis
Taylor & Francis Group

Foreword

The aim of the workshop was to bring into contact scientists from theoretical and experimental physics, engineering and geophysics working with different perspectives on Lagrangian transport in turbulent flows, and possibly improve our comprehension of the subject.

The recent availability of well-resolved Lagrangian measurements of particle trajectories in turbulent flows has been a catalyst for new theoretical and modeling approaches to turbulence in simple and multiphase flows. As reported in the workshop, these efforts span a wide range of interesting issues, such as spatial distribution of heavy and light particles in ideal and real flows; interaction of particles with boundary layers (see paper by Picciotto et al.); growth of small droplets in warm clouds (see Seminara et al.); Lagrangian intermittency in isotropic flows (see Leveque et al. and Yeung et al.); statistics of particle dispersion; stochastic modeling of Lagrangian turbulence (see Naso et al); statistical properties of the geometry of Lagrangian trajectories (see Eckhardt et al.). The implications for applied sciences and engineering cover an even wider range of relevant problems.

It is of some interest to notice that the present situation is probably unique in the turbulence research field so far. Direct numerical simulations and laboratory experiments of Lagrangian particle tracking are performed at Reynolds numbers which now start to be comparable (see the review of Celani on frontiers of computing in turbulence). This is not of minor importance. Indeed the *new* possibility of thoroughly comparing results from experiments and numerical simulations encourages to perform extensive investigations at moderately large Reynolds numbers, rather than concentrating extreme efforts to reach larger and larger Re paying the price of limited statistics. We expect this new possibility to have a large impact on future research in the subject.

The work to be done is not clearly limited to the "Lagrangian" turbulent motion itself. Recent results, for example about particle clustering in turbulent flows, need new statistical tools to be fully understood (see paper by Cencini et al.). Similarly there is a need for new models capable of incorporating some of the recent observations available from experiments and numerical simulations. We think, for example, of Lagrangian acceleration, or inertial particle for clustering, or particle of sedimentation near walls.

As emerged in different contributions, the big challenge for future research is however to fully understand relations between the Lagrangian and Eulerian approaches not only in simple problems, but also in complex ones as in the case of inertial particles (see the review of Falkovich et al.). This is particularly important to bridge the gap between "field" and "particle" descriptions of many physical phenomena, especially when considering applied sciences.

Of the 38 researchers—from eight countries—who participated in the workshop, 16 have also contributed to this special issue. Their papers have gone through a full review process.

ESF Meeting—Challenging Turbulent Lagrangian Dynamics, September 1–4, 2005 Castel Gandolfo, Italy.

Journal of Turbulence
ISSN: 1468-5248 (online only) © 2007 Taylor & Francis
http://www.tandf.co.uk/journals
DOI: 10.1080/14685240701576741

We would like to thank all the authors for their efforts in preparing high-quality manuscripts and all the referees for their comments and suggestions to make the special issue a valuable contribution to current research in turbulence.

We also would like to specially thank the European Science Foundation, together with the Istituto Nazionale di Fisica Nucleare (INFN), the Istituto Nazionale di Fisica della Materia (INFM), the Office of Naval Research Global (ONRG), the University of Tor Vergata and the Institute for Atmospheric and Climate Sciences (ISAC-CNR) for contributing to the realization of the workshop.

Alessandra S. Lanotte
Federico Toschi
Luca Biferale