International Workshop on

VISUALIZATION OF HIGH-RESOLUTION 3D TURBULENT FLOWS

Ecole Normale Supérieure, Paris
Salle Dussane
45 rue d'Ulm, Paris 5
Metro RER-B, exit Luxembourg

Friday June 8th 2007

The goal is to address and discuss together the problems encountered when visualizing high-resolution 3D turbulent flows, either computed by direct numerical simulation (DNS), or measured by particle image velocimetry (PIV). Progress made recently by both techniques leads to the production of large datasets (typically 3D vector fields, up to 4096^3 for DNS and up to 128^3 for PIV at each time step). The analysis of such high-resolution 3D turbulent flows requires advanced visualization tools, in particular to study the formation and evolution of coherent structures which emerge from random fluctuations. We consider important that numerical experimentalists, using DNS, and laboratory experimentalists, using PIV, apply the same visualization tools and graphic representations in order to compare their results. This should enhance the mutual validation and interpretation of DNS and PIV results in order to better understand 3D turbulence.

The National Center for Atmospheric Research (NCAR, Boulder, USA) is presently developing a new graphic package, called VAPOR (***http://www.vapor.ucar.edu***). It is based on orthogonal wavelets which allow efficient visualization of high-resolution 3D flows on work stations. The authors of this package, John Clyne and Alan Norton, will present VAPOR and discuss with us the graphic needs of our community. The other invited speakers will address the visualization of different types of 3D turbulent flows encountered in fluid mechanics and astrophysics, together with the methods currently used for identifying coherent structures and understanding their dynamical properties.

The aim of this workshop is to assess the present state of the art and propose future developments for visualizing high-resolution 3D turbulent flows. You are cheerfully invited to participate.

Hoping to have the pleasure to meet you on June 8th!

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We can donwload the program from
http://wavelets.ens.fr

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PROGRAM

9h00 - 9h15 OPENING

9h15 - 10h
John Clyne, National Center for Atmospheric Research (NCAR), Boulder (USA)
The peril of the petascale: emerging challenges in large scale computational sciences

10h - 10h30
Alan Norton, National Center for Atmospheric Research (NCAR), Boulder (USA)
Visualization and analysis of massive turbulent data sets

10h30 - 11h COFFEE BREAK

11h - 11h30
Allan Sacha Brun, DAPNIA, Service d'Astrophysique, CEA, Saclay
Open questions in stellar MHD

11h30 - 11h45
Daniel Pomarède, DAPNIA, Service d'Astrophysique, CEA, Saclay
Interactive visualization of astrophysical plasma simulation with SDVision

11h45 - 12h00
Patrice Klein and Lien Hua, IFREMER, Brest
Numerical simulations of oceanic mesoscale turbulence on the Japanese Earth Simulator

12h00 - 12h30
Gerrit Elsinga, Laboratory of Aero and Hydrodynamics, Technical University Delft (Holland)
Quantitative visualization of coherent structures in 3D tomographic-PIV measurements

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12h 30 - 14h LUNCH BREAK
LMD-ENS, 8, rue Erasme, 5ième étage

14h00 - 14h15
Philippe Chatelain, Computational Sciences and Engineering Lab, ETH, Zürich (Switzerland)
Direct numerical simulation of vortical flows using vortex methods: simulation

14h15 - 14h30
Diego Rossinelli, Institute for Computational Sciences (ICOS), ETH, Zürich (Switzerland)
Direct numerical simulation of vortical flows using vortex methods: visualization

14h30 - 15h
Tino Weinkauf, Konrad Zuse Institut Berlin (ZIB), Berlin (Germany)
Ingredients for a Virtual Topology Lab: feature extraction and visualization of flow fields

15h - 15h15
Lionel Larchevêque, IUSTI, Université de Provence, Marseille
Visualizing vortices in turbulent flows: short review and practical considerations

15h15 - 15h30
Sébastien Depardon, PSA Peugeot-Citröen, Velizy, et Jacques Borée, LEA, ENSMA, Poitiers
Automated topology classification method for instantaneous velocity fields

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15h30 - 16h COFFEE BREAK

16h - 16h30
François Lusseyran, Nicolas Fauvet and Jean-Marc Vézien, LIMSI, Orsay
3D feature recognition of an unsteady flow: 2D PIV, direct simulation and Virtual Reality

16h30 - 16h45
Christophe Brun, Laboratoire de Mécanique et Energétique, Université d'Orléans
Sandrine Aubrun, Laboratoire d'Etudes Géophysiques et Industrielles (LEGI), Grenoble
Coherent structures in the separated shear layer on the side of a square cylinder

16h45 - 17h
Dwight Barkley, Mathematics Institute, University of Warwick (UK)
Interactive simulation and visualization for reaction-diffusion equations

17h – 17h 30
Patrick Hennebelle, Laboratoire de Radio-Astronomie, ENS, Paris
Numerical simulation of star formation

17h 30 - 18h OPEN DISCUSSION

We are very grateful for financial support to:
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CNRS-Formation Entreprises, ***Institut Pierre Simon Laplace (IPSL)***,
European GDR Mechanics of Numerical Fluids *and* ***GDR Dynamo***.