

Report

The 9th International Symposium on Fluid Control, Measurement and Visualization (FLUCOME 2007)

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Abstract : This paper is the report on the Ninth International Symposium on Fluid Control, Measurement and Visualization. The symposium was scheduled on September 17-19, 2007 in Florida State University Center, Tallahassee Florida, U.S.A. Topics for FLUCOME 2007 included fluid processes across a wide range of scales in multiple disciplines: from micro-scale fluid flows in micro biomechanical devices, small-scale machine flows to large-scale civil and environmental fluid flows, and global scale geophysical and meteorological fluid flows.

Keywords : Visualization, PIV, Standard, Internet, Popularization.

1. Introduction

The purpose of the FLUCOME conference is to provide a forum for researchers to exchange the latest information and technologies from large-scale phenomena to small scales in fluid control, measurement and visualization. FLUCOME is a series of well established international conferences since the first conference was held in Japan in 1985. The FLUCOME 2007 adapted the theme "Integrating Technologies for Advancement in Fluid Applications for Multiple Scale." FLUCOME 2007 was hosted by Florida A&M University and Florida State University College of Engineering located in Tallahassee, Florida and cosponsored by (1) American Society of Civil Engineers (ASCE), (2) American Society of Mechanical Engineers (ASME), (3) American Water Resources Association (AWRA), (4) International Association of Hydraulic Research (IAHR), (5) The Visualization Society of Japan (JOV), (6) Environmental Cooperative Science Center of Florida Department of Environmental Protection (ECSC) and (7) Northwest Florida Water Management District. With supports from the journal of Computers and Fluids as well as the Journal of Coastal Research, selected full papers are considered for the journal publication. A new theme, Computational Fluid Dynamics, has attracted over 45 papers. This is an excellent addition for the FLUCOME participants. The FLUCOME 2007 conference was organized by the College of Engineering, Florida A&M University-Florida State University with Ching-Jen Chen (chair), Wenrui Huang (local chair) and committee members Chiang Shih, Amy Chan-Hilton, David Edelson, Gary Eggebraaten, Braketta Ritzenthaler, and Chi-Fu Wu.

2. Technical Themes

The participants are researchers and engineers or scholars from multiple disciplines, such as mechanical engineering, civil engineering, electrical engineering, environmental engineering, oceanography, and meteorology and visualization arts. The presentations were made in either oral or poster format. FLUCOME 2007 Conference topics given below include fluid processes across wide range of scales: from micro-scale flows, small-scale machine flows to large-scale fluid flows and global-scale geophysical fluid flows: The presentations were grouped in three themes.

Theme A: Fluid Control includes: jet flow, flow in micro devices, micro-biological flow, Coastal and offshore flow, aerodynamics MEMS control, hydraulic structures, optimization in flow control and environmental pollution control.

Theme B: Fluid Measurement includes: Supersonic aerodynamic flows, multiphase flows, PIV and imaging, turbulent flows, acoustic/ electromagnetic flows, compressible flows, biomedical sensors, heat and mass transfer, environmental flows and remote sensing.

Theme C: Visualization and Computational Fluid Dynamics includes: combustion, two phase flows, meteorology, waves and storm surges, geophysical flows, estuarine and coastal waters, flow characterization, biological flows, environmental fluid flows, CFD applications meteorological flows. The FLUCOME 2007 added a new theme collaborating with N. Fujisawa for Journal of Visualization to focus on Visualization of Scientific Arts and the presentations were accepted in oral and poster formats.

3. Keynotes Lectures

Three distinguish scholars from three continents were invited to present keynote lecture in the three themes, (1) Fluids measurement, (2) Computational Fluid Dynamics and (3) Fluid Control. There were also six Invited Session Papers. Before the second Keynote lecture a moment of silence was observed for the chair of the 5th FLUCOME, Professor Kiichi Tsuchiya, who had deceased on 30th of June, 2006. The abstracts for three Keynote Lectures are as follow:

- (1) "Recent Development of Simultaneous Measurement and Visualization of Temperature and Velocity fields and their Application to Thermal Flow Phenomena." by Nobuyuki Fujisawa, Shunpei Funatani and Yoshie Watanabe, Niigata University, Niigata, Japan.

In this paper, recent development of experimental methods for simultaneously measuring and visualizing the temperature and velocity fields are described. The experimental methods for temperature measurement considered here are the thermo sensitive liquid-crystal tracer method and the laser induced fluorescence method. The former method is applicable to the thermal flow with relatively small temperature range and the latter method is for the flow with relatively large temperature range. These temperature measurements are combined with the PIV for simultaneous measurement of temperature and velocity. These methods are applied to the thermal flow phenomena, such as turbulent thermal convection of a horizontal fluid layer and turbulent buoyant plume. The physical mechanisms of transport phenomena of heat and fluid flow are discussed through the analysis of temperature and velocity field. An attention is placed on the statistical structure of thermal turbulence using the POD analysis.

- (2) "CFD Simulations of Wave-Current-Body Interactions Including Greenwater and Wet Deck Slamming," by Hamn-Ching Chen and Kai Yu. Texas A&M University, College Station, Texas.

A numerical method for the solution of unsteady Navier-Stokes equations has been employed in conjunction with an interface-preserving level-set method for the simulation of greenwater effect on offshore structures and ships. In this method, the free surface flows are modeled as immiscible air-water two-phase flows and the free surface itself is represented by the zero level-set function. The Navier-Stokes equations for both the water and air flows are formulated in moving curvilinear coordinate system and discretized using the finite-analytic method on a non-staggered multi-block grid system. Large eddy simulation (LES) approach is used with Smagorinsky model to account for the effects of turbulence induced by violent free surface motions. A chimera domain decomposition approach is implemented using overlapping, embedding, or matching grids to facilitate the simulation of complex flow around practical configurations. The overset grid system also greatly simplified the simulation of arbitrary translational and rotational motions among various computational blocks. Calculations were performed first for dam-breaking flow and free jet problems involving violent free surface motions. The level-set Navier-Stokes method was then employed for the simulation of slamming of a hemisphere, greenwater on offshore structure and ships, and wet deck slamming of an X-Craft in pitch and heave motions. The numerical results clearly demonstrated the capability of the level-set method to deal with violent free surface flows involving breaking waves, water droplets, trapped air bubbles, and wave-current body interactions. Keywords: wave-current-body interaction, chimera overset grids, greenwater, wet deck slamming.

- (3) "Plasma Assisted Aerodynamics: Approach and Problem of Measurements" by Sergey B. Leonov, Russian Academy of Sciences, Moscow, Russia

This paper considers several distinctive ideas of the "Plasma Aerodynamics". A general approach is based on the reveal of main physical mechanisms of electrical discharges interaction with a gas flow: heating, electro-dynamic, magneto-dynamic, and chemical activation. The results of model experiments are discussed: drag reduction by in-front-of-body plasma generation; supersonic flow structure control by near-surface discharge; boundary layer actuation by dielectric barrier discharge (DBD); high-speed combustion intensification. In each specific case the problem is arisen of suitable diagnostics application

4. FLUCOME

The previous and future FLUCOME meetings, places and organization are

- 1st (1985 September) Tokyo, Japan, Professor Nakayama Y. Tokai University
Participants: 300 | Countries Represented: 19 | Papers: 153
- 2nd (1988 September) Sheffield, UK Professor Boucher R. F. University of Sheffield
Participants: 180 | Countries Represented: 14 | Papers: 115
- 3rd (1991 August) San Francisco, U.S.A. Professor Woods R. L., University of Texas
Participants: 200+ | Countries Represented: 16 | Papers: 110
- 4th (1994 August) Toulouse, France, Dr. Hébrard P., ENSICA,
Participants: 336 | Countries Represented: (not available) | Papers: 188
- 5th (1997 September) Hayama, Japan Professor Tsuchiya K. Waseda University
Participants: 301 | Countries Represented: 17 | Papers: 165
- 6th (2000 August) Sherbrooke, Canada Professor Laneville, University of Sherbrooke
Participants: 144 | Countries Represented: 18 | Papers: 110
- 7th (2003 August) Sorrento, Italy Professor Carlomagno G. M. University of Naples
Participants: 300+ | Countries Represented: 20 | Papers: 237
- 8th (2005 September) Chengdu, China Professor Wei Q. D., Peking University
Participants: 161 | Countries Represented: 19 | Papers: 165
- 9th (2007 September) Tallahassee U.S.A., Professor Chen, C. J., College of Engineering,
Florida A&M University and Florida State University

Participants: 175 | Countries Represented: 23 | Papers: 148
 10th (2009 August-September), (representing the host) Professor Sergey B. Leonov, Institute of High Temperature, Russian Academy of Sciences, Moscow, Russia

5. International Committee and Meeting

The International Steering Committee of FLUCOME has established a FLUCOME Honor Board to commemorate the significant contributions of key members of the FLUCOME community. The FLUCOME 2007 honor memberships were awarded to Professors Carlomagno G.M (Italy), Wei Q, D. (China) and Boucher R. (UK). The committee also invited the host of the FLUCOME 2009, Russia representative, Dr. Sergey Leonov to present the plan. Moscow was selected as the site for FLUCOM 2009 with Russian Academy of Sciences as organizing party. The committee also discussed the need to have more structured organization and communication among the organizing committees from one conference to the next conference and a need of by-law. No definite decision was made.

The sites for FLUCOME 2011 and 2013 were discussed. Japan had accepted to host FLUCOM 2013. The site for FLUCOME 2011 was not decided pending communication from possible sponsoring organization and participant's preference.

6. Photo Gallery of FLUCOME 2007



FLUCOME Founder Professor and Mrs. Nakayama with Conference Chair Professor Chen and Keynote Speaker Professor Fujisawa.



Joyful Participants from Japan.



FSU VP Dr. Kemper and Professor Nakayama.



FLUCOME Participants in FSU University Center Grand Ballroom.



Boat Ride in Wakulla Spring.



International Participants.



Session Chair Professor Rathakrishnan.



Japanese Participants with Professor Aoki.



Professors Boucher and Tesar.



Professors Calromagno Presentation



Dr. Zheng Presentation.



International Committee Meeting.

Author Profile

Ching Jen Chen: Since 1992, he as the Dean of FAMU-FSU College of Engineering. He has been associated with teaching and research on turbulent flows and heat transfer, bioengineering, and flow visualization. He has supervised 38 doctoral dissertations. He was awarded the Alexander von Humboldt Senior United States Scientist Award in 1974 and is a Life Fellow of American Society of Mechanical Engineers and American Society of Civil Engineers. He authored over one hundred journal publications and authored and edited over ten books. He is also an inventor of four patents on blood cell separation.