

# THIRD INTERNATIONAL SYMPOSIUM ON ULTRASONIC DOPPLER METHODS FOR FLUID MECHANICS AND FLUID ENGINEERING (3<sup>RD</sup> ISUD)

EPFL, LAUSANNE, SWITZERLAND  
SEPTEMBER 9<sup>TH</sup> - 11<sup>TH</sup>, 2002

## Conference Report I

From 9<sup>th</sup> to 11<sup>th</sup> September 2002, the Third International Symposium on Ultrasonic Doppler Methods for Fluid Mechanics and Fluid Engineering (3<sup>rd</sup> ISUD) brought together, at the Swiss Federal Institute of Technology Lausanne (EPFL), Lausanne, Switzerland researchers and professionals from the whole world to discuss their results from the application of the ultrasonic Doppler methods. On this occasion, two PhD Students from the EPFL were distinguished as joint prize-winners of the "ISUD 2002 - Asahi Ryunetsu Student Paper Award".

After the first two editions of the ISUD, which were held in 1996 and 1999 at the Paul Scherrer Institute (PSI), Villigen, Switzerland, the Laboratory of Hydraulic Constructions (LCH) of the new School of Architecture, Civil and Environmental Engineering (ENAC) of the EPFL organized the third edition of the Symposium. In a certain sense, present Ultrasonic Doppler technique users came to the place where some of the basis of this technique were elaborated in the eighties in the medical domain at the instigation of Professor J.-J. Meister of the Laboratory of Biomechanics and Cellular Biophysics.

The ultrasonic Doppler method for velocity profile measurements has recently shown its potential in the fields of general fluid mechanics and fluid engineering. Its application has been broadened from fundamental research to industrial use. It is attracting increasing interest from physicists and fluid engineers for its use as a research tool and the number of users is growing. The purpose of the Symposium was to exchange information on applications of the ultrasonic Doppler method to a variety of flow configurations and liquids including industrial measurements. The Symposium also brought together researchers from all over the world to discuss the results of their applications of the ultrasonic Doppler method to fluid mechanics and fluid engineering research. Its goal was to present the latest results that are based on the ultrasonic Doppler technique.

Prof. Y. Takeda of Hokkaido University, Dr. G. King of the University of Warwick and Dr. G. De Cesare of the EPFL formed the Organizing Committee assisted by the ten member Scientific Committee.

Forty-three participants coming from eight different countries made the journey to Lausanne. The represented institutions were the

Technical Universities of Graz and Prague, the Universities of Gifu, Keio, Hokkaido and the Tokyo Institute of Technology in Japan, the University of Warwick in the United Kingdom, the University of Missouri-Rolla and the Ohio State University in the USA, two German research centers in Dresden and Karlsruhe, the Swedish Institute for Food and Biotechnology, the Engineering School of the Canton of Vaud, the PSI, the ETHZ, the EPFL, ACQIRIS SA, Bonnard & Gardel Consulting Engineers, Bühler AG and MET-FLOW SA in Switzerland, the Tokyo Electric Power Co. and Kanomax Japan Inc.

The submitted papers presented the latest results that are based on the ultrasonic Doppler technique. In recent years non-Doppler ultrasonic measurement methods have emerged for quantifying various physical parameters. A special section has been dedicated to these applications. The Symposium was held over three days, from Monday to Wednesday, September 9 - 11, 2002. The scientific program, divided into six short sessions, featured contributions in the form of 22 oral presentations of 20 minutes each, followed by a discussion at the end of the session. Emphasis was placed on discussions and exchange of experience.

Professor A. Schleiss, head of the hosting Laboratory of Hydraulic Constructions, opened the Symposium. He welcomed the forty-three participants and emphasized in his speech the importance of this measurement technique that has only recently been implemented in hydraulic laboratory research. Professor P. Carpenter held

Figure 1 (below):  
Group photograph of the  
3<sup>rd</sup> ISUD in front of EPFL  
main building.



# Conference Report I



Figure 2 (above):  
Student Paper Award  
Ceremony (Price-giving by  
Greg King, Chairman of the  
competition, to  
Daniel S. Hersberger (left)  
and Adhy Kurniawan  
(right)).

the opening keynote lecture entitled "Dolphin Hydrodynamics: Gray's Paradox Revisited" presenting and explaining the extraordinary laminar-flow capability of some dolphin species. The first Monday session included the following papers presented by N. Furuichi who explored "A Characteristic of the Flow Field on a Heated Rotating Disk" (Y. Miwa, N. Furuichi & M. Kumada), Y. Sato studied the "Signal Processing for Advanced Correlation Ultrasonic Velocity Profiler" (Y. Sato, M. Mori, Y. Takeda, K. Hishida & M. Maeda) and again N. Furuichi showed "An azimuthal-streamwise structure of an axisymmetric sudden expansion flow" (N. Furuichi, I. Yamashita, M. Kumada & Y. Takeda).

V. Bares investigated in the second Monday session the "Unsteady Free-surface Flow Analysis in Circular Tube using Ultrasonic Doppler Method" (V. Bares & J. Pollert), M. Cellino presented "Ultrasonic measurements of instantaneous velocity and suspended concentration in open-channel flow" (M. Cellino) and H. Knoblauch explored the "Ultrasonic velocity profile measurements in pipes and flumes in a hydraulic laboratory" (H. Knoblauch, R. Klasinc, T. Geisler & S. Breitenstein).

The third Monday session opening paper by A. Kurniawan entitled "Velocity and turbu-

lence measurements in a scour hole using an acoustic Doppler velocity profiler" (A. Kurniawan & M. S. Altinakar) was followed by V. Bares' presentation on the "Elbe River Model: UVP Flow Mapping" (V. Bares & V. Broza) and G. Yamana-ka's article on the "Study on the Development of Novel Velocity Profile Measuring Method using Ultrasound Time-Domain Cross-Correlation" (G. Yamana-ka, H. Kikura & M. Aritomi). It ended with D. S. Hersberger's investigation on the "Measurement of 3D flow field in a 90° bend with Ultrasonic Doppler Velocity Profiler" (D. S. Hersberger).

After the technical sessions, the participants had the opportunity to visit the experimental hydraulic laboratory of the EPFL with its state-of-the-art equipment that enables a vast range of scale model studies such as flood control structures, river training works, appurtenant structures of dams, spillways, bottom outlets, water intakes and restitution in rivers and reservoirs, sediment transport and mobile river bed processes.

On Tuesday, two sessions were held with an intermediate keynote lecture given by U. Lemmin entitled "High Resolution 3-D Acoustic Doppler Velocity and Sediment Flux Profiling in Laboratory and Environmental Studies: Potential and Limits" revealing the capabilities of the newly developed instrument system for boundary layer studies in the laboratory, rivers and lakes.

A. Tokuhiko opened the first Tuesday session giving "An Overview of Experimental Activities at the Thermal Fluid Sciences Laboratory, University of Missouri-Rolla, USA". J. Shaik showed "In-Line Ultrasound Based Rheometry Of Industrial And Model Suspensions Flowing Through Pipes" (J. Wiklund, M. Johansson, J. Shaik, P. Fischer, E. Windhab, M. Stading & A.-M. Hermansson), S. Eckert gave a presentation on the "Application of Ultrasound Doppler Velocimetry to flows of hot metallic melts" (S. Eckert, G. Gerbeth, V.I. Melnikov, C.-H. Lefhalm & J. Knebel) and finally B. Ouriev explored the "2D time averaged flow mapping of die entry in flow of highly concentrated shear-thinning and shear-thickening suspensions".

The second Tuesday session included presentations by D. Vuarnoz who used the "Ultrasonic velocity profiler UVP-XW for Ice-slurry flow characterization" (D. Vuarnoz, O. Sari, P.W. Egolf & H. Liardon), by H. Murakawa, show-



Figure 3 (below):  
Tuesday excursion to  
Chillon Castle on the shore  
of Lake Geneva.



ing the "Measurement of Reynolds Stress in Bubble Flow using Ultrasonic Doppler Method" (H. Murakawa, H. Kikura & M. Aritomi) and by T. Taishi investigating the "Applicability of Ultrasonic Cavitations Bubbles for Measurement of Ultrasonic Doppler Method" (T. Taishi, H. Kikura, M. Aritomi, Y. Koike & M. Mori).

Tuesday afternoon was dedicated to a boat trip on Lake Geneva from Lausanne to Montreux-Chillon followed by the visit of the world famous Chillon Castle with one English- and one Japanese-speaking guide. This immense fortress and its surroundings impressed not only Lord Byron in the 19th century but also all the participants of the Symposium. The "Met-Flow Symposium Dinner" was served in the Hotel Victoria high above Lake Geneva, accessed by a spectacular 4-minute funicular ride.

The last day's session started with K. Blanckaert's "Analysis of coherent flow structures in a bend based on instantaneous-velocity profiling" (K. Blanckaert), followed by M. Mori's presentation on "Industrial Application Experiences of New Type Flow-metering System based on Ultrasonic-Doppler Flow Velocity-Profile Measurement" (M. Mori, K. Tezuka, H. Tezuka, N. Furuichi, H. Kikura & Y. Takeda) and S. Wada's investigations on "Multiline Flow Rate Measurement using Ultrasonic Doppler Method" (S. Wada, H. Kikura, M. Aritomi, Y. Takeda & M. Mori). D. Andereck presented "Ultrasound Measurement of Temperature Profiles in Convecting Opaque Fluids" (C. D. Andereck, H. Xu & S. Fife). The session ended with the presentation of M. Motozawa on "Ultrasonic propagation properties in a magnetic fluid" (M. Motozawa & T. Sawada). A special workshop session was dedicated to "News and hands-on with Met-Flow UVP instrumentation" presented by O. Mariette.

The full proceedings, as well as each individual paper, is available on-line as pdf file on the post-Symposium Website (<http://lchwww.epfl.ch/3rd-ISUD>).

In order to promote student work in the field of ultrasonic Doppler methods for fluid mechanics and fluid engineering, the organizing committee awarded the "ISUD 2002 - Asahi Ryunetsu Student Paper Award" to two young PhD student for their outstanding contributions, which were selected among nine nominated papers by the international jury, presided by G. King. The total prize sum amounts to 1'000 Swiss

Francs. The two award-winners are D. S. Hersberger of the Laboratory of Hydraulic Construction (LCH) and A. Kurniawan of the Environmental Hydraulics Laboratory (LHE), both of the EPFL.

At this point we would like to acknowledge the contribution of all the authors, the invited keynote lecturers and the members of the ISUD Award Jury. Without them, there would have been neither a Symposium nor an Award. We also thank the joint efforts of the Organizing and Scientific Committees. Furthermore our gratitude goes to Met-Flow SA in Lausanne, Switzerland and Asahi Thermal and Fluid System Ltd in Nagoya, Japan. Without their support, the Symposium excursion, student paper award and the dinner would not have been possible.

The ISUD will maintain its community style even with a growing number of users and expanding application fields. The next ISUD will move out of Switzerland and will take place in Japan. The Fourth International Symposium on Ultrasonic Doppler Methods for Fluid Mechanics and Fluid Engineering (4th ISUD) will be held from 5 - 9 September 2004 in Sapporo, Japan. It will be embedded in the 2004 Annual Meeting of the Japanese Society of Mechanical Engineers (JSME).

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*Figure 4 (below):  
Visit of the experimental  
hydraulic laboratory  
of the EPFL.*

