Summer school on
"Measuring techniques for turbulent open-channel flows"

28th–30th July 2015, IST Alameda Campus, Lisboa, Portugal

Organized within the scope of project
SEDITRANS FP7-PEOPLE-2013-ITN-607394, funded by the European Commission,
7th Framework Programme for Research, Technological Development and Demonstration

	Day 1, 28th July 2015	
8^{:00}-8^{:15}	**Registration and Welcome**	
8^{:15}-9^{:00}	**Introduction to particle-based methods: key principles and hardware** Spatial and material flow description; challenges of turbulent flows; key PIV and PTV principles; tracer mechanics; necessary hardware	**Rui Ferreira and Rui Aleixo**
9^{:00}-9^{:45}	**PIV software: from images to velocity maps** Digital imaging; calibration; cross-correlation algorithms, moving/deformable IA; windowing and filtering; sub-pixel interpolation; validation techniques	**Kenneth Kiger**
9^{:45}-10^{:15}	**Coffee break**	
10^{:15}-10^{:45}	**PTV algorithms for fluid flow** Seeding density; image enhancement; particle detection; tracking algorithms	**Rui Aleixo**
10^{:45}-11^{:15}	**Particle tracking for sediment mechanics** Detection and tracking techniques for large bodies in viscous fluids	**Benoit Spinewine**
11^{:1}-12^{:00}	**Introduction to Acoustic Doppler techniques** Doppler principle and applications; probe configuration; signal optimization; turbulence from one-point flow description;	**Mário Franca**
12^{:00}-13^{:00}	**Lunch break**	

13:00-13:15	**Meeting the laboratory** Introducing methods, objectives, instrumentation and safety precautions for laboratory practice	**Rui Ferreira**
13:15-18:00	**Laboratory practice I. Experiments** ESRs, ERs and other participants organized in, at most, 5 groups of 4 elements; each group documents the experiments and collects data of high-speed video (HSV), PIV and ADV-Vectrino (the latter two in parallel). Sequence: HSV: G1, G2, G3, G4, G5 (50 -60 min all) PIV: G1, G2, G3, G4, G5 (30 min data collection each + 30 min data processing each) ADV: G2, G3, G4, G5, G1 (30 min data collection each)	

DINNER

	Day 2, 29th July 2015	
8:00-8:45	**PIV data treatment** Noise correction and despiking; database organization; calculation of turbulence and double-averaged variables from 2D maps of instantaneous velocities	**Ana Margarida Ricardo and Rui Ferreira**
8:45-9:30	**ADV data processing** Noise correction and despiking; calculation of turbulence variables from point measurements	**Rita F. Carvalho**
9:30-10:30	**Eulerian and Lagrangian flow description from particle velocimetry data** Basics of PTV software; open problems; data processing; calculation of statistics; upscaling	**Francesco Ballio**
10:30-11:00	**Coffee break**	
11:00-11:30	**Advanced issues on PIV** Stereo PIV, dual-plane PIV; scanning PIV; tomographic PIV.	**Kenneth Kiger**
11:30-12:15	**Applications** *Guest*: A particle counting apparatus. Application to bedload discharge measurement *Guest*: Hydrodynamics and morphodynamics of river confluences	**Luis Mendes** **Gökçen Bombar**
12:15-13:15	**Lunch break**	
13:15-18:00	**Laboratory practice II. Data processing** Groups will process PIV, ADV and high-speed video addressing the problem given as assignment	

Day 3, 30th July 2015	
9:30-10:00	**Presentation of Hytech project** Francesco Ballio
10:00-10:30	**Coffee break**
10:30-12:00	**Group presentations** G1 – PIV results, ADV results, PT results (10 + 8 min) G2 – PIV results, ADV results, PT results (10 + 8 min) G3 – PIV results, ADV results, PT results (10 + 8 min) G4 – PIV results, ADV results, PT results (10 + 8 min) G5 – PIV results, ADV results, PT results (10 + 8 min)
12:00-13:00	**Lunch break**
13:00-15:00	**Feed back** Groups will discuss instrumentation and data processing issues with SEDITRANS and invited researchers
15:00-15:30	**Awarding Diplomas and Closure**

Co-Sponsored by

IAHR - **International Association for Hydro-Environment Engineering and Research,** in the scope of activities of the Fluvial Hydraulics and Experimental Methods and Instrumentation Committees

and

APRH – Associação Portuguesa dos Recursos Hídricos, in the scope of the activities of the Specialized Commission for Fluvial Hydraulics (Comissão Especializada em Hidráulica Fluvial)

Registration and information
Federica Antico:: federica.antico@tecnico.ulisboa.pt
Teresa Paone:: teresa.paone@tecnico.ulisboa.pt
Rui Ferreira:: ruif@civil.ist.utl.pt
Instituto Superior Técnico, Av. Rovisco Pais 1049-001 Lisboa, Portugal
https://hydroevents2015lisbon.wordpress.com/

Registration fee: 100 euros
Fees apply only to non-SEDITRANS or non-Hytech members

Suggested accommodation
Hotel Turim Alameda
http://www.turimalameda.com/
Av. Rovisco Pais, 34, 1000-046 Lisboa, Portugal
Please send the reservation form by e-mail: groups@turimhoteis.com for
Ana Correia / Joana Paulo.