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Experimental hydraulics and the sustainable development goals

Hydrolink

EXPERIMENTAL HYDRAULICS AND THE SUSTAINABLE DEVELOPMENT GOALS

BY ALESSIO RADICE, RUI ALEIXO & RUI FERREIRA

Attaining the Sustainable Development Goals (SDGs) requires actions and measures that mostly depend on the political leadership at both the local and the national level. However, individuals and technical organizations can contribute to these goals by providing their expertise and facilitating the implementation of specific measures.

In this context, IHAR, through the Experimental Methods and Instrumentation (EMI) Committee, can contribute to wider use of new technology in the water sector, and can actively work on knowledge transfer and access to water-related data.

The mission of the IAHR Technical Committee on EMI is to foster international activities in the area of instruments, experimental methods, and data analysis software for both laboratory and field applications. The EMI committee is interdisciplinary and branches in all fields of experimental hydraulics. The EMI committee's mission is not limited to any specific process or product.

Experimental methods have been a key component of the scientific method, since theories and models are validated by means of carefully designed and executed experiments. Nowadays, hydraulic instrumentation and experimentation play a key role for understanding fundamental processes that affect the health of aquatic ecosystems and the safe use of water supply sources They are used in tests supporting the design of water infrastructure and more and more for real time monitoring.

A major recent initiative of the EMI Committee was the organization of HydroSenSoft 2017, International Symposium and Exhibition on Hydro-Environment Sensors and Software, in Madrid in March 2017 under the chairmanship of R. Aleixo, Á. L. Aldana and J. F. Sánchez. The aim of this event was to bring together users, researchers and developers interested in and working on software and sensors/instrumentation for acquiring, analyzing and using data for better understanding of the hydro-environment. (See also the article on HydroSensoft 2017 by Rui Aleixo included in this issue).

A random selection of papers from the proceedings of this symposium shows the vitality of research in this field and its relevance for different UN-SDGs, and illustrates the broad range of topics covered by EMI.

Several papers were related to the Water, Sanitation and Hygiene (WASH) objectives (SDG 6). For example, Climent et al. presented work on wastewater treatment applications using bioreactors [1]. A novel fluorescence-based method for continuous water quality analysis was proposed by Bridgeman & Zakharova [2], who described several potential uses of this technique, such as detecting organic and microbial matter in a range of water qualities (from sewage to drinking water), improving process efficiency in water treatment plants, and identifying potential contamination in service reservoirs and distribution systems. García-Rupérez et al. described a nanophotonics-based sensing technology capable of measuring the lowest concentrations of contaminants, with the possibility of deploying analysis platforms suitable for real-time on-site testing/monitoring [3]. A portable instrument for water quality analysis was presented by Ormaechea et al., who showed results from the measurement of several parameters such as pH, temperature, conductivity, and turbidity [4]. Sediment plays a significant role in aquatic environments, as fine suspended sediments degrade water quality; on the other hand, real-time measurement of suspended sediment is often complicated by adverse field conditions that may prevent physical sampling. Measurements of suspended sediment transport were presented by Guerrero et al. and Hoffman et al., discussing calibration of indirect methods and strategies for long-term sampling [5-6].

Innovative monitoring devices for observations in coastal waters and studies of nearshore hydrodynamics were presented by Cateura et al., who described the conceptual design and performance of a prototype buoy as a platform for efficient multi-variable observations, meeting requirements for robust observations with adequate coverage imposed by increasing pressure on coastal seas[7]. Brand et al.[8] studied the effect of offshore suspended sediment discharge on beach morphology in relation to simultaneous measurements of hydrodynamic conditions on a time meso-scale.

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Making it possible to get a fish's perspective on ecologically-relevant flows was the goal of new pressure-based devices proposed by Schletterer et al.[9] and Tuthan et al.[10], simulating the highly evolved sensing system of fishes (work supporting SDG 14).

Climate change is changing precipitation patterns, Increasing the need for improved early-warning and monitoring systems. Several problems in dealing with meteorological data were addressed at HydroSensoft 2017, including large scale monitoring (keynote paper by Natschke et al. [11]), the treatment of disdrometer data for drop size distribution during storm events [12] and monitoring-forecasting-warning [13] (supporting SDG 13).

The work of Braunschweig et al. dealt with the optimization of large irrigation systems, to effectively manage the exploitation of water resources in the Alqueva system, Portugal [14]. The topic is relevant to *achieving a sustainable use of water resources* (SDG 12), as well as for the agricultural sector and food production (SDG 2).

These are just some contributions without mentioning the important sector of discharge measurements, that are vital for water course monitoring. In this respect, efforts are currently being devoted to guarantee continuous measurements, low cost of operations using common devices, portability (as in the work presented by Yu et al. [15]) and integration between different types of sensors.

Standard or advanced hydraulic measurements are also related to the general objectives of *increase the share of renewable energy* by prototype investigation (SDG 7) or the *resource-use efficiency with clean and environmentally sound technologies* (SDG 9).

In conclusion, hydraulic experimentation positively contributes to the several SDGs, as shown in the examples of ongoing research. The EMI committee, through its leadership team, is an active contributor to the effort to achieve the SDGs. For this purpose, is planning to organize special sessions/activities related to the SDGs within the different events organized by EMI, such as HydroSenSoft. The success of the Committee depends on the momentum that it will generate to engage a large number of participants to its planned activities. Therefore, we deeply thank all our contributors and wish to keep on this track in the future. ■

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[12] Arciniega-Esparza, S., Pedrozo-Acuña, A., Breña-Naranjo, J. A., Chaac: A GUI for processing and visualizing optical laser disdrometer data
[13] Batanero, P., Martinez, E.: Early-warning and monitoring real-time systems in rural and urban catchments
[14] Braunschweig, F., Costa, S., Pinheiro, A. N., Carvalho, A.: Modelling and optimization of large irrigation systems
[15] Yu, K., Lee, N., Kang, T.: Surface Image velocimeter using an android smartphone

IAHR EVENTS CALENDAR

IAHR Specialist Events

IAHR Gerhard Jirka Summer School-Environmental Fluid Mechanics
8 - 16 January 2018 Campo Grande, Brazil
http://gjss-2018.weebly.com/

7th International Symposium on Hydraulic Structures
15 - 18 May 2018 Aachen, Germany
www.ishs2018.de

7th International Conference on the Application of Physical Modelling in Coastal and Port Engineering and Science (Coastlab18)
22 - 26 May 2018 Santander, Spain
http://coastlab2018.com/

2nd International Symposium on Hydraulic Modeling and Measuring Technology
30 May 2018 - 01 June 2018 Nanjing, China
http://ishmmt2018.iahr.org.cn/16?lang=en

24th IAHR International Symposium on Ice
04 - 09 June 2018 Vladivostok, Russia
https://iahr-ice2018.ru/

8th International Symposium on Environmental Hydraulics (ISEH 2018)
04 - 07 June 2018 University of Notre Dame, Indiana, USA
https://ceees.nd.edu/iseh2018

13th International Conference on Hydroscience & Engineering (ICHE)
18 - 22 June 2018 Chongqing, China
http://iche2018.iahr.org.cn/2?lang=en

13th International Conference on Hydroinformatics (HIC 2018)
01 - 06 July 2018 Palermo, Italy
https://www.hic2018.org/

12th International Symposium on Ecohydraulics
19 - 24 August 2018 Tokyo, Japan
www.ise2018.com

6th International Conference on Estuaries and Coasts (ICEC 2018)
20 - 23 August 2018 Caen, France
http://lusac.unicaen.fr/evenements/icec-2018/

9th International Conference on Fluvial Hydraulics (River Flow 2018)
03 - 07 September 2018 Lyon, France
https://riverflow2018.irstea.fr/

29th IAHR Symposium on Hydraulic Machinery and Systems
17 - 21 September 2018 Japan, Kyoto
http://www.iahrkyoto2018.org/

11th International Conference on Urban Drainage Modelling (UDM 2018)
23 - 26 September 2018 Palermo, Italy
https://www.udm2018.org/

8th International Conference on Fluid Mechanics (ICFM8)
25 - 28 September 2018 Sendai, Japan
https://icfm8.joomla.com/

8th IAHR International Groundwater Symposium: Water Security and Sustainability
17 - 20 October 2018 (to be confirmed). Nanjing, China

1st International Symposium on Cascade Reservoirs and Water System Operations (ISCRWSO 2018)
19 - 23 October 2018 Beijing, China
http://iswso2018.medmeeting.org/38?lang=en

4th Arabian Coast Congress
March 2019 (to be confirmed). Kuwait
Contact: Dr. Mohamed Al-Rashed, Kuwait Institute for Scientific Research (KISR)

2nd International Symposium and Exhibition on Hydro-environment Sensors and Software (HydroSenSoft 2019)
26 February 2019 - 01 March 2019 IFEMA Feria de Madrid, Spain
Contact: email by www.hydrosensoft.com

8th International Conference on Flood Management (ICFM)
23 June 2020 Iowa, USA
Contact: Marian Muste (marian-muste@uiowa.edu)

IAHR World Congress

38th IAHR World Congress "Water: Connecting the World"
01 - 06 September 2019 Panama City, Panama
http://www.iahrworldcongress.org/

IAHR Regional Division Congresses

5th IAHR Europe Congress
12 - 14 June 2018 Trento, Italy
http://events.unitn.it/en/iahr2018

21st Congress of the Asian Pacific Division of IAHR
02 - 05 September 2018 Yogyakarta, Indonesia
https://iahrapd2018.ugm.ac.id/

XXVIII Congreso Latinoamericano de Hidráulica
18 - 21 September 2018 Buenos Aires, Argentina
https://www.ina.gob.ar/congreso_hidraulica/