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Hydraulic Structures - ISHS2018 in Perspective

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ABSTRACT

Hydraulic structures continue to play a significant role in society's diverse and challenging dependence on water. Hydraulic structures influence water conveyance, flood protection, energy production, and environmental and ecological impacts. The 7th IAHR International Symposium on Hydraulic Structures (ISHS2018) provided a venue for exchanging knowledge and discussing key issues related to hydraulic structure research, performance, operations, maintenance, and community implications. This symposium series maintains a rich tradition of exploring advancements in the maximizing the benefits of hydraulic structure elements while working to reduce the associated challenges. Presentations and discussions were held on advanced tools and analysis, applications and case studies, and novel approaches to developing and implementing more effective, environmentally sound, and robust solutions. The goal of these ISHS2018 proceedings is to provide applicable state-of-the-art knowledge for use in hydraulic structure analysis and design by the engineering profession.

Keywords: *Hydraulic structures, hydraulics, society demands, engineering challenges*

1. SYMPOSIUM ORGANIZATION

The 7th International Symposium on Hydraulic Structures was held the 14th-18th of May, 2018 in the SuperC building in Aachen. A total of 108 individuals attended ISHS2018 representing 27 countries and 5 continents. Organization efforts were handled by two committees: the Local Organizing Committee and the International Scientific Committee. The Local Organizing Committee consisted of 4 individuals (see following page) who worked closely with the Hydraulic Structures Technical Committee of the International Association of Hydro-Environmental Engineering & Research (IAHR) to organize this event. The International Scientific Committee oversaw the technical program and publication of the proceedings. ISHS2018 took place over 3 days and was preceded by two additional technical events (a short course on Open Channel Flow Basics and a workshop on nonlinear weir design). The Symposium included two days of technical presentations and the concluding event was a technical field tour on the third day. Details are discussed in the following sections.

Local Organizing Committee ISHS2018

Daniel Bung
Chair



Mario Oertel
Vice Chair



Sebastien Erpicum
Member



Daniel Valero
Member



1.1. Short Course on Basics of Open Channel Flow

Professor Hubert Chanson provided a short course on the basic principles of open channel hydraulics which was attended by 28 individuals from 8 different countries representing: Africa, America, Europe and Asia.

The course offered an introduction to the hydraulics of open channel flows. The material was designed for undergraduate and postgraduate students in civil, environmental and hydraulic engineering, as well as young professionals and early-career researchers. It was assumed that the participants have had an introductory course in fluid mechanics and that they are familiar with the basic principles of fluid mechanics: continuity, momentum, energy and Bernoulli principles.

The course developed the basic principles of fluid mechanics with applications to open channels. Open channel flow calculations are more complicated than pipe flow calculations because the location of the free-surface is often unknown a priori (i.e. beforehand). The workshop was structured as follows:

1. Introduction to open channel flows
2. Basic principles of open channel flows
3. Application of the Bernoulli principle to open channel flows: short and smooth transitions
4. Application of the momentum principle to open channel flows: hydraulic jumps, flow resistance, uniform equilibrium flow
5. Gradually-varied steady open channel flow: hydraulic engineering of long channels and backwater calculations

1.2. Workshop on Hydraulics of Nonlinear Weir Spillways

A full-day workshop on the hydraulics of nonlinear weir spillways was organized and presented by Sebastien Erpicum, Brian Crookston, Blake Tullis, and Frederic Laugier (see Fig. 1). The room capacity was fully completed with 20 individuals attending this specialty workshop, which included summaries on labyrinth and piano key weir research, design techniques, implementation overviews, and challenge. Attendees were provided with a 120-page binder that included instructor slides (in color) and key references (provided in black and white).



Figure 1. Workshop session. Left: Presenting, Dr. Erpicum. Right: Laugier, Prof. Dr. Tullis, Prof. Dr. Crookston (from left to right).

1.3. Technical Presentations

Technical presentations (Fig. 2) were given Wednesday and Thursday, with two parallel tracks. Presentations were approximately 20 minutes in duration, including questions at the end. A total of 108 individuals attended this portion of the technical program. 14 technical sessions were held, each with one moderator. Session moderators included:

Moderators ISHS2018	
Prof. Dr. Fabian Bombardelli	Prof. Dr. Mario Oertel
Prof. Dr. Hubert Chanson	Prof. Dr. Stefano Pagliara
Prof. Dr. Brian Crookston	Dr. Michele Palermo
Prof. Dr. Tom de Mulder	Prof. Dr. Artur Radecki-Pawlik
Dr. Sébastien Erpicum	Prof. Dr. Anton Schleiss
Dr. Sherry Hunt	Dr. Carsten Thorenz
Dr. Sean Mulligan	Prof. Dr. Blake Tullis

Three invited **keynote lectures** were given:

- **Paul Schweiger**, Gannet Fleming Engineering (manager of dams hydraulics section) – Topic: Lesson-to-be-Learned from the Oroville Dam Spillway Incident.
- **Prof. Dr. Robert Boes**, ETH Zürich – Topic: Multi-phase flow at hydraulic structures: water-sediment, air-water, and water-structure-fish interaction.
- **Prof. Dr. Andreas Schmidt**, Federal Waterways Engineering and Research Institute (BAW-Director) – Topic: Modelling in Waterways Engineering-Expectations and Challenges.

Prof. Dr. Thanos Papanicolaou (University of Tennessee USA), Editor of the Journal of Hydraulic Engineering, gave a special lunch-time presentation on the state of the Journal presenting the latest news on the research publications output and performance indicators. Additionally, a Special Issue based on some outstanding works of ISHS2018 was announced.



Figure 2. From left to right: technical session from Moderator's desk; Paul Schweiger addressing Keynote 1; and Symposium dinner reception.

1.4. Field Tour

The final day of the symposium included a technical tour of Eupen Dam and Water Treatment Plant (Belgium) and the Coo Pump-Storage Plant (Belgium) (see Fig. 3). Approximately 60 individuals attended the tour. Eupen dam and water treatment plant, which includes nanofiltration, have been an important source of clean drinking water in the region since 1951. The Coo pump-storage plant was built between 1971 and 1979 to support the Tihange nuclear power plant located next to river Meuse. It has a generation capacity of 1,164 MW with 6 pump-turbine groups located in an underground cavern. Two upper reservoirs provide a combined storage capacity of 8.5 million m³ and are located 279 m above the lower reservoir. The plant is operated by ENGIE company and is a key component of the overall power production system in which intermittent renewable energy sources play a growing part.



Figure 3. Group picture in front of the Eupen dam alternating stepped spillway.

1.5. Awards

ISHS 2018 was the inaugural year of the Philip H. Burgi Best Paper Award, awarded to the best paper of the Symposium. The ISHS2018 Philip H. Burgi Best Paper award was given to Dr. Svenja Kemper. Schnabel Engineering (USA) donated an iPad to accompany the award.

The program also included a welcome reception and a closing ceremony and dinner. Announcement of the Best Paper award winner was part of the closing dinner program.

2. SYMPOSIUM PROCEEDINGS

2.1. Peer Review Process

All papers published in the Proceedings and have been thoroughly peer-reviewed for technical quality and presented at ISHS2018. The Proceedings were published by Utah State University and are available open access at <http://digitalcommons.usu.edu/ishs/2018/>. Each manuscript includes the ISBN of the Proceedings as well individual direct object identifiers (DOI). Each manuscript is indexed by Scopus and Compendex and available to users through the USU digital commons portal pursuant to a Creative Commons Attribution-NonCommercial CC BY 4.0 license. The ISHS2018 Scientific Committee was comprised of the following individuals:

International Scientific Committee ISHS2018

Chair: Blake P. Tullis, Vice-Chair: Daniel B. Bung

1	Markus Aufleger	18	Helge Fuchs	35	Mario Oertel
2	Antonio Amador	19	Rafael García- Bartual	36	Stefano Pagliara
3	Robert M. Boes	20	Nils Goseberg	37	Michele Palermo
4	Fabian Bombardelli	21	Carlo Gualtieri	38	Michael Pfister
5	Benoit Blancher	22	Sherry Hunt	39	Artur Radecki- Pawlik
6	Duncan Borman	23	Robert Janssen	40	Anton Schleiss
7	Didier Bousmar	24	Svenja Kemper	41	Andreas Schlenkhoff
8	José María Carrillo	25	Matthias Kramer	42	Lukas Schmocker
9	Rita F. de Carvalho	26	Joseph H.W. Lee	43	Frank Seidel
10	Luís Castillo	27	Eric Lesleighter	44	Sandra Soares- Frazao
11	Oscar Castro- Orgaz	28	Amparo López- Jiménez	45	Vallam Sundar
12	Giovanni de Cesare	29	Arturo Marcano	46	Carsten Thorzen
13	Hubert Chanson	30	Jorge Matos	47	Peter Troch
14	Benjamin Dewals	31	Tom de Mulder	48	Daniel Valero
15	Sébastien Erpicum	32	Sean Mulligan	49	Roman Weichert
16	Brian Crookston	33	Frederic Murzyn	50	Youichi Yasuda
17	Stefan Felder	34	Ioan Nistor	51	Jinhai Zheng

Under direction of the co-chairs, a formal and rigorous blind peer-review was conducted for each submitted manuscript by reviewers made up of the ISHS2018 International Scientific Committee. The International Scientific Committee was comprised of international experts in field of hydraulic structures.

The Call for Papers was issued in 2017; in response, 146 abstracts were received by 1 September 2017. All abstracts were reviewed; of those accepted, 89 full draft manuscripts were received. All received manuscripts were reviewed by a minimum of two reviewers. Special acknowledgements to Dr. Blake Tullis and Dr. Daniel Bung for their contributions to this effort.

Reviews were uploaded into the USU ISHS2018 repository through digital commons and made available to authors. The authors were sent instructions for access and requested to revise their manuscripts in accordance to the reviewers; comments and recommendations by the Scientific Committee Chair and Vice Chair. The final number of revised papers accepted for presentation was 77. However, one manuscript failed to be presented in Aachen during ISHS 2018 technical sessions; a requirement for publication in the Proceedings. As a result, only 76 manuscripts have been published and included in the Proceedings. In addition, extended abstracts by the three invited keynote lecturers have been included with the full manuscripts, to document their participation and important contribution to ISHS 2018. These 3 individuals were:

Mr. Paul Schweiger, Keynote Speaker
Prof. Dr. Robert M. Boes – Keynote Speaker
Prof. Dr. Andreas Schmidt – Keynote Speaker

The publication of the proceedings marked a significant contribution of this event, involving about 214 authors from countries and 5 continents. Furthermore, the event website (www.ishs2018.fh-aachen.de) to date, has received approximately 10,000 page views.

2.2. Proceedings Reference

The Proceedings were published by Utah State University and is available open access at <http://digitalcommons.usu.edu/ishs/2018/>. The full bibliographic reference for the ISHS2018 symposium proceedings is:

Tullis, B.P. and Bung, D.B. (Eds.) (2018). *Hydraulic Structures Symposium*. 7th IAHR International Symposium on Hydraulic Structures, Aachen, Germany, 14-18 May. (pp. i-731). ISBN 978-0-692-13277-7.

Each paper of the proceedings includes a cover sheet that includes the correct manuscript reference, such as:

Tullis B.P. and Bung, D.B. (2016). Hydraulic Structures Symposium-ISHS2018 in Perspective. In B.P. Tullis and D.B. Bung (Eds.), *Hydraulic Structures Symposium*. 7th IAHR International Symposium on Hydraulic Structures, Aachen, Germany, 14-18 June (pp. i-viii). doi: 10.15142/T3WH2B (ISBN 978-0-692-13277-7).

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4. ORGANIZING INSTITUTIONS, SPONSORS, AND SUPPORTING ORGANIZATIONS

4.1. Organizing Institutions



4.2. Supporting Organizations

The following organizations (listed alphabetically) provided support and assistance for ISHS2018.

FH Aachen University of Applied Sciences
FH Lübeck University of Applied Sciences
Université de Liège
University of Queensland
Utah State University
Utah Water Research Laboratory

4.3. Sponsors

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