

# **World Environmental and Water Resources Congress 2018**

## **Hydraulics and Waterways, Water Distribution Systems Analysis and Smart Water**

Selected Papers from the World Environmental and  
Water Resources Congress 2018

Minneapolis, Minnesota, USA  
3 – 7 June 2018

**Editor:**

**Sri Kamojjala**

ISBN: 978-1-5108-6506-8

**Printed from e-media with permission by:**

Curran Associates, Inc.  
57 Morehouse Lane  
Red Hook, NY 12571



**Some format issues inherent in the e-media version may also appear in this print version.**

Copyright© (2018) by American Society of Civil Engineers  
All rights reserved.

Printed by Curran Associates, Inc. (2018)

For permission requests, please contact American Society of Civil Engineers  
at the address below.

American Society of Civil Engineers  
1801 Alexander Bell Drive  
Reston, VA 20191  
USA

Phone: (800) 548-2723  
Fax: (703) 295-6333

[www.asce.org](http://www.asce.org)

**Additional copies of this publication are available from:**

Curran Associates, Inc.  
57 Morehouse Lane  
Red Hook, NY 12571 USA  
Phone: 845-758-0400  
Fax: 845-758-2633  
Email: [curran@proceedings.com](mailto:curran@proceedings.com)  
Web: [www.proceedings.com](http://www.proceedings.com)

# Contents

## *Hydraulics and Waterways*

<b>Geyser Episodes Created by the Release of a Sequence of Discrete Air Pockets in Vertical Shafts.....</b>	<b>1</b>
Jue Wang and Jose G. Vasconcelos	
<b>Hydraulic Transient Investigation of Power Plant Condensate Systems .....</b>	<b>11</b>
Periandros Samothrakis, Yifan Zheng, and Cagri Turan	
<b>Development and Verification of a Three-Dimensional Model for Flow Hydrodynamic and Sediment Transport Simulation .....</b>	<b>18</b>
Yong G. Lai	
<b>Multi-Beam Sonar Infrastructure Mapping Research.....</b>	<b>31</b>
Barritt Lovelace, Petronella DeWall, Nicole Bartelt, and Garrett Owens	
<b>An Empirical Approach to Estimate Total Suspended Sediment Using Observational Data in Fox River and Southern Green Bay, WI.....</b>	<b>42</b>
Bahram Khazaei, Azam Nabizadeh, and Sajad Ahmad Hamidi	
<b>Hydrodynamic Change Following Living Shoreline Restoration Based on a Before-After-Control-Impact Experiment .....</b>	<b>54</b>
David Spiering, Kelly M. Kibler, and Vasileios Kitsikoudis	
<b>Exploring CCHE2D and Its Sediment Modelling Capabilities .....</b>	<b>65</b>
Balbhadra Thakur, Ranjan Parajuli, Ajay Kalra, and Sajjad Ahmad	
<b>Air Injection for Scour Reduction.....</b>	<b>75</b>
Brian Barkdoll	
<b>Time-Based Estimation of Reservoir Sedimentation Impacts .....</b>	<b>82</b>
Jianchun Huang, Blair Greimann, and Sean Kimbrel	
<b>Application of 3D Printed Hardscape Features within Hydraulic Physical Models .....</b>	<b>94</b>
Jonathan G. Daldalian, Jerry R. Richardson, and Donald W. Baker	
<b>Comparison of Various Turbulence Models for Violent Geysers in Vertical Pipes.....</b>	<b>99</b>
Taher Chegini and Arturo S. Leon	
<b>A Mechanistic Model for Gas Ebullition in the Presence of NAPLs in Sediments .....</b>	<b>109</b>
Morvarid Khazraee Zamanpour and Karl J. Rockne	

<b>Assessment of Regime Equations for Predicting General Scour .....</b>	<b>119</b>
Dennis L. Richards	
<b>Revitalization of an Urban Stream in Terms of Water Quality and Recreational Usability: Assessment of Options through Hydrologic and Hydraulic Modeling.....</b>	<b>130</b>
Yeo H. Lim, Grant Neuharth, Jonathan Olson, Thomas Vidmar, and Daniel Fife	
<b>Assessment and Design Optimization of Retrofitting Dropshaft with Air Circulation Pipes for Downstream Depressurization .....</b>	<b>140</b>
Y. Ma, D. Z. Zhu, and J. Wei	
<b>Prediction of Location of Abutment and Contraction Scour Hole for Compound Channels .....</b>	<b>152</b>
Irfan Abid and Seung Ho Hong	
<b>Effect of Rheology for Flow past a Bottom Rack.....</b>	<b>160</b>
Rajkumari Kaurav and Pranab K. Mohapatra	
<b>Numerical Investigation of the Effect of River Modeling Parameters on Bed Shear Stress .....</b>	<b>169</b>
Fereshteh Noorbakhsh and Arthur C. Parola	
<b>Comparison of ADCIRC and SLOSH Model Simulations for Hurricanes Andrew and Irma near Miami, Florida.....</b>	<b>176</b>
C. K. Turan, Y. P. Kinfu, M. A. Samad, A. Farhadzadeh, and K. Ng	
<b>Automated Water Control Structures Flow Rating Using CFD Generated Data .....</b>	<b>188</b>
Jie Zeng, Matahel Ansar, John Raymond, Zubayed Rakib, and Liqiong Zhang	
<b>Probabilistic Shoreline Evolution Modeling in Response to Sea Level Changes.....</b>	<b>197</b>
Yan Ding, Sung-Chan Kim, and Ashley E. Frey	
<b>Applications of CFD for Flow Rating at Complex Water Control Structures.....</b>	<b>210</b>
Jie Zeng, Zubayed Rakib, Matahel Ansar, Tibebe Dessalegne, and Seyed Hajimirzaie	
<b>Experimental Investigation of Air-Water Interactions during Rapid Filling Process in an Urban Stormwater System Model .....</b>	<b>222</b>
Juliana Kaiber da Silva, Jose G. Vasconcelos, Rogerio Dornelles Maestri, and Ana Luiza de Oliveira Borges	

<b>Modeling Interconnected Reservoirs with HEC-ResSim</b> .....	233
Masoud Meshkat and Joan D. Klipsch	
<b>Measuring Bubble Shapes in the Long Straight Rectangular Pipe under Different Flow Conditions</b> .....	244
Weiyang Zhao	
<b>Modeling Soil Loss by Water Infiltration through Sewer Pipe Defects</b> .....	254
Yao Tang, David Z. Zhu, and Dave H. Chan	
<b>Numerical Simulation of Sediment Transport and Scouring around Hydraulic Structures on Rivers</b> .....	263
Van Thinh Nguyen and Carlos Serrano Moreno	
<b>River Bank Stabilization Utilizing Rock Vanes in Puerto Rico</b> .....	272
Rafael Rosa, Gregory L. Morris, and Pully A. Torres	
<b>Preliminary Research on Air Pocket Entrapments Caused by Shear-Flow Instabilities in Rapid-Filling Pipes</b> .....	285
Yasemin Eldayih and Jose G. Vasconcelos	
<b>Surge Modeling Using TAP Informs Rehabilitation and O&amp;M Decisions on the 60-Mile-Long Potomac Interceptor System</b> .....	293
Sri Gadiparthi, Essey Woldemariam, Jennifer Howells, and Chris Ranck	
<b>An Efficient Method to Analyze Mesoscale Hydrodynamic Processes Using a Coordinated Physical/Numerical Modeling Strategy</b> .....	305
Jerry R. Richardson, Donald W. Baker, and Jonathan G. Daldalian	
<b>The Economic Efficiency of Coordinated Physical/Numerical Hydrodynamic Modeling of Mesoscale Projects</b> .....	311
Donald W. Baker, Jerry R. Richardson, and Jonathan G. Daldalian	
<b>The Effects of Forested Riparian Zones on Stream Conditions</b> .....	318
Harley M. Wilkinson, Ben Spiller, Nathan Forbes, Sandra L. Ortega-Achury, and John J. Ramirez-Avila	
<b>Conjunctive Use Strategies to Compensate for Reservoir Sedimentation: Salinas, Puerto Rico</b> .....	327
Gregory L. Morris and Juan A. Portalatín	
<b>Reservoir Sediment Management: Case Studies from the United States</b> .....	335
Rollin H. Hotchkiss, Paul M. Boyd, John Shelley, and Stanford Gibson	

*Smart Water Symposium*

<b>Using a Micro-Test-Bed Water Network to Investigate Smart Meter Data Connections to Hydraulic Models .....</b>	<b>342</b>
Jiada Li, Seungyub Lee, Sangmin Shin, and Steven Burian	

<b>Low-Cost Multi-Channel Pressure Measurement Solution with Computer Vision Technology .....</b>	<b>351</b>
Qi Zhang and Jianbo Li	

*Water Distribution*

<b>Resilience Computations for Optimal Operation of Water Distribution Systems .....</b>	<b>357</b>
Puneet Khatavkar and Larry W. Mays	

<b>Measuring Topological and Operational Resilience and Recovery of Water Networks for Planning and Management .....</b>	<b>370</b>
Nazli Yonca Aydin	

<b>Optimal Placement and Operation of Booster Chlorination Stations Using an Advection-Dispersion Transport Model for Chlorine Decay in the Dead-End Pipes .....</b>	<b>380</b>
Ahmed A. Abokifa and Pratim Biswas	

<b>A Time Varying Minimum Volume Ellipsoid (MVE) Method for Water Distribution Systems Event Detection .....</b>	<b>390</b>
Jad Naamnih and Avi Ostfeld	

<b>Decomposing Water Distribution System into District Metered Areas for Leakage and Water Age Reduction .....</b>	<b>400</b>
Mohamad Zeidan, Pu Li, and Avi Ostfeld	

<b>Development of an Effective Hybrid Method to Detect Cyber-Physical Attack on Water Distribution Systems .....</b>	<b>410</b>
M. Fayzul K. Pasha	

<b>Generation of Virtual WDS to Complete Cadastral Information of Existing Systems .....</b>	<b>422</b>
Juliana Robles and Juan Saldarriaga	

<b>Assessment of Criteria to Make Topological Changes in Water Distribution Systems under Future Water Demand Scenarios .....</b>	<b>435</b>
Juan Saldarriaga and Laura C. Vega	

<b>Use of Hydraulic Criteria to Increase the Efficiency of Optimization Methods for Valve-Setting Problems in Water Distribution Systems .....</b>	<b>451</b>
Camilo Andrés Salcedo and Juan Saldarriaga	

<b>Financial Management of a Hypothetical Water Network Using System Dynamics .....</b>	<b>461</b>
Gaurang Mistry, Ajay Kalra, and Sajjad Ahmad	
<b>Feasibility of Using Tanks in Water Distribution Networks .....</b>	<b>472</b>
Bruna Rorato Rocha, Isabel Pastorello Suttile, Rebecca Moreira Dziedzic, and Maurício Dziedzic	