

<b>CONTENT</b>	<b>Page</b>
Committees	
Local Organising Committee .....	II
Advisory Board .....	III
Preface .....	IV
<b>SCOUR COUNTERMEASURES</b> .....	9
<b>Riprap and Cable-tied Block Performance as Scour Protection for Wing-wall Abutments Under Live Bed Conditions</b>	11
van Ballegooy, S., Meville, B.W., Coleman, S.E. (Civil and Environmental Engineering, The University of Auckland, New Zealand)	
<b>Parallel Walls As An Abutment Scour Countermeasure</b>	20
Hua Li, Brian D. Barkdoll (Michigan Tech University, Civil and Environmental Engineering Dept., USA), Roger Kuhnle (USDA-ARS National Sedimentation Laboratory)	
<b>Rock Plunge Pools: A Design Approach for Limiting Scour Extent</b>	32
George W. Annandale, D.ING., P.E. (Engineering & Hydrosystems Inc., Denver, Colorado, USA.)	
<b>Scouring Of A Root Reinforced Bed And Broader Applications</b>	44
C.J. Dorst and I.J.Zwemer (Ministry of Transport, Public Works and Water Management, the Civil Engineering Division, The Netherlands)	
<b>Stabilising Channel Beds and Banks Using Rock Chutes and Rip-rap</b>	54
Robert J. Keller (Cooperative Research Centre for Catchment Hydrology & Department of Civil Engineering, Monash University, Australia)	
<b>Laboratory Observations On The Use Of Geobags As Scour Countermeasure For Wingwall Abutments</b>	62
Recep Korkut, Robert Ettema (Department Of Civil And Environmental Engineering, IIHR Hydroscience & Engineering, The University Of Iowa, USA), Brian Barkdoll (Department Of Civil And Environmental Engineering, Michigan Tech University, USA)	
<b>Bed Form Deformation Due To Upstream Group Piles</b>	70
Tae Hoon Yoon (Department of Civil Engineering, Hanyang University, Seoul, Korea)	
<b>Using Seepage As An Auxilliary Method For Pier-Scour Countermeasure</b>	77
Yan Lu, Yee-Meng Chiew (School of CEE, Nanyang Technological University, Singapore)	

<b>Riprap and Cable-tied Block Protection for Spill-through Abutments</b> van Ballegooy, S., Meville, B.W., Coleman, S.E. (Civil and Environmental Engineering, The University of Auckland, New Zealand)	85
<b>Erosion Protection At Diversion Tunnel Outlets With Concrete Prisms</b> Soleyman Emami (Mahab Ghodss Consulting Engineering, Tehran, Iran), Anton J. Schleiss (Laboratory of Hydraulic Constructions, Swiss Federal Institute of Technology, Switzerland)	94
<b>Arizona State Government Bridge Scour Program – A Practitioner’s Perspective</b> Itty P. Itty (Bridge Group, Arizona Department of Transportation, USA), Jeff Blau (Parsons Brinckerhoff Quade & Douglas Inc., USA)	103
<b>Experimental Study on Effect of Protection for Local Scour at Piers with Tetrahedron Frame</b> Tang Hong-wu, Fang Shi-long, Zhou Yi-lin (College of Water Conservancy and Hydropower Engineering, Hohai University, China), Cai Kai-xi (Nanjing Jianghong Supervisory Company, China)	109
<b>SCOUR PREDICTIONS</b> .....	119
<b>Numerical Simulation of 3D Turbulent Flow structures around an Attracting Groin with Local Scour</b> Ichiro Kimura (Department of Civil and Environmental Engineering, Matsue National College of Technology, Japan), Taisuke Ishigaki (Disaster Prevention Research Institute, Kyoto University, Japan), Masanori Hiroe (West Japan Railway Company, Japan)	121
<b>Analysis Of Piled Bridge Pier Considering Hydraulic Pressure And Scour Depth</b> Jin-Hyung Lee, Jin-Oh Won, Sangseom Jeong (Dept. Of Civil Engineering, Yonsei University, Korea), Moonkyung Chung, Kiseok Kwak (Geotechnical Engineering Research Dept, Korea)	130
<b>The Rate Of Bank Erosion Of Meandering Rivers</b> Hamid Khorsandi, Gh. Ali Faghiri, Abdollah Asadzadeh (Lar Consulting Engineering, Tehran, Iran)	139
<b>Evaluating the Time Effect on Scour and Comparing the Different Experimental and Semi-experimental Formulas</b> S. Talebi (Mahab-Ghodss Consulting Engineers, Tehran, Iran), H.E. Minor, Ch. Ortmanns (Laboratory of Hydraulics Hydrology and Glaciology (VAW), Swiss Federal Institute of Technology Zürich (ETH), Switzerland)	146
<b>Estimation Of Suspended Sediment Concentration In Estuary</b> Zhiyao Song, Jun Kong, Weisheng Zhang, Yun Xing (College of Traffic and Ocean Engineering and Eco-environmental Modeling center, P.R.China)	154

<b>Probabilistic Evaluation Of Scouring Downstream Of Dams</b> A. Melih Yanmaz (Civil Engineering Department, Middle East Technical University, Turkey)	160
<b>Mapping Of River Bed – Methods For Hydraulic Modeling</b> Jurij Mlačnik, Staša Vošnjak (Institute for Hydraulic Research, Slovenia), Roman KLASINC (Graz University of Technology, Department of Hydraulic Structures and Water Resources Management, Austria)	168
<b>Prediction Of Total Sediment Discharge</b> Shu-Qing Yang (Maritime Research Center, Nanyang Technological University, Singapore), Soon-Keat Tan, Siow-Yong Lim (School of Civil and Environmental Engineering, Nanyang Technological University, Singapore)	175
<b>Prediction Of Scour Depth Around Pile Group Using Ann</b> A. Khosronejad, M. Ghodsian, R. Alihemmati (Department of civil of Engineering, Tarbiat Modarres University, Tehran, Iran)	184
<b>Effect Of The Initial Location On Sand And Gravel Mining Pit Migration</b> M. Shourian, S. Ali A. Salehi Neshabouri (Civil Engineering Department, University of Tarbiat Modarres, Tehran, Iran)	192
<b>Prediction Of Scour Depth Downstream Of Gabion Stepped Spillway</b> M.Shafai-Bajestan (College of Water Engrg., Shahid - Chamran University Ahwaz, Iran), Gh.Kazemi-Nasaban (Mahab Ghods Cons. Engrg. Tehran, Iran)	202
<b>LABORATORY STUDIES</b>	211
<b>Scour Downstream Of Block Ramps</b> Stefano Pagliara (Department of Civil Engineering, University of Pisa, Italy), Willi H. Hager (VAW, ETH-Zentrum, Switzerland)	213
<b>A Physical Model Study of Scouring Effects on Upstream/Downstream of the Bridge</b> Jihn-Sung Lai (Hydrotech Research Institute, National Taiwan University, Taiwan), Ho-Cheng Lien (National Center for High-Performance Computing, Taiwan), Jinn-Chuang Yang (Civil Engineering Dept., National Chiao Tung University, Taiwan)	221
<b>Scour At The Channel Contractions In The Gravel-Beds</b> Rajkumar V Raikar, Subhasish Dey (Department of Civil Engineering, Indian Institute of Technology, India)	227
<b>Effects Of Test Startup Conditions On Scour In Cohesionless Soils By Plane Turbulent Wall Jets</b> Niranjan P. Deshpande, Ram Balachandar (Department of Civil and Environmental Engineering, University of Windsor, Canada), Kerry A. Mazurek (Department of Civil and Geological Engineering, University of Saskatchewan, Canada)	236

<b>Laboratory Tests On Scour Around Bottom Vanes</b>	244
M.M. Hossain, Md. Rashedul Islam, Suman Saha, Sara Ferdousi (Bangladesh University of Engineering and Technology (BUET), Bangladesh), Boye Van Zwol, Robert Zijlstra, Erik Mosselman (Delft University of Technology, Delft, the Netherlands)	
<b>Laboratory Measurements Of Sediment Transport On Transverse Sloped Beds</b>	251
Jens-Uwe Wiesemann, Peter Mewis, Ulrich C.E. Zanke (Institute of Hydraulic and Water Resources Engineering, Darmstadt University of Technology, Germany)	
<b>Measurement Of The Mechanisms Of Stone Entrainment</b>	259
Rob Booij, Bas Hofland (Fluid Mechanics Section (Laboratory), Faculty of Civil Engineering and Geosciences, Delft University of Technology, The Netherlands)	
<b>Particle Saltation Down A Sloping Plane</b>	267
Kian Chun Qua, Zhi-Qian Wang, Nian-Sheng Cheng (School of Civil and Environmental Engineering, Nanyang Technological University, Singapore)	
<b>A Practical Method for Studying Hydraulics of Compound River Channels with High Erosion and Sedimentation Processes</b>	276
Sayyed Ali Ayyoubzadeh, Abdolreza Zahiri (Department Of Irrigation Hydraulic Structure Engineering, Tarbiat Modares University, Tehran, Iran)	
<b>Elastic Interpretation For Sediment Sheet Flows</b>	286
Nian-Sheng Cheng (School of Civil and Environmental Engineering, Nanyang Technological University, Singapore)	
<b>Local Scour Downstream Of An Apron Caused By Submerged Horizontal Jet</b>	292
Subhasish Dey, Arindam Sarkar (Department of Civil Engineering, Indian Institute of Technology, India)	
<b>Local Scour Induced By 3D Flow Around Attracting And Deflecting Groins</b>	300
Taisuke Ishigaki, Yasuyuki Baba (Disaster Prevention Research Institute, Kyoto University, Japan)	
<b>Transient Local Scour By Submerged Three-Dimensional Wall Jets: Effect Of Tailwater Depth</b>	308
M. A. A. Faruque, P. Sarathi, Ram Balachandar (Department of Civil and Environmental Engineering, University of Windsor, Canada)	
<b>Proposing A New Portable Device For Bridge Scour Inspection</b>	316
Kiseok Kwak, Jaehyeon Park, Juhyung Lee, Moonkyung Chung, Gyujin Bae (Geotech. Eng. Res. Dept., Korea Institute of Construction Technology, Korea)	
<b>Monitoring Bridge Scour by Fiber Bragg Grating Sensors</b>	323
Yung-Bin Lin (National Center for Research on Earthquake Engineering, Taiwan), Jin-Chong Chen, Kuo-Chun Chang (Department of Civil Engineering, National Taiwan University, Taiwan), Jihn-Sung Lai (Hydrotech Research Institute, National Taiwan University, Taiwan)	

<b>Mapping Of Bed Morphology For Lateral Overflow Using Digital Photogrammetry</b>	332
Burkhard Rosier, Jean-Louis Boillat, Anton Schleiss (Laboratory of Hydraulic Constructions (LCH), Swiss Federal Institute of Technology, Switzerland)	
<b>Influence Of Rock Scour Geometry On Dynamic Pressures Due To Jet Impact</b>	340
Pedro Manso, Erik Bollaert, Anton Schleiss (Laboratory of Hydraulic Constructions (LCH), Swiss Federal Institute of Technology Lausanne (EPFL), Switzerland)	
<b>Scour Induced By Hydraulic Jump: Preliminary Analysis</b>	348
Luca Solari (Department of Civil Engineering, University of Firenze, Italy)	
<b>PIV Analysis Of Sediment Kinematics In An Abutment Scour Hole</b>	357
Alessio Radice, Stefano Malavasi, Francesco Ballio (Politecnico di Milano, Dept. I.I.A.R., Italy)	
<b>Effect Of Using Dentate Ski Jump Spillways On Scouring Profile</b>	365
Farhad Golzari Rahatabad (Hydraulic Structures Section, Water Research Institute, Tehran, Iran)	
<b>Scour And Dynamic Pressure Of Impinging Jets With And Without Aeration: An Annotated Review</b>	373
Zhiyong Dong (Faculty of Civil Engineering and Architecture, Zhejiang University of Technology, P. R. China), Peilan Su (Faculty of Forestry, Shanxi Agricultural University, P. R. China.)	
<b>Scour Around a Spur Dike at a 90° Bend</b>	380
Masoud Ghodsian, S. Kamal Mousavi (Tarbiat Modarres University, Tehran, Iran)	
<b>GEOTECHNICAL APPLICATIONS</b> .....	387
<b>Dam Breach Modeling: Combining Geotechnical and Hydraulic Engineering Concepts</b>	389
George W. Annandale, D.Ing., P.E. (Engineering & Hydrosystems Inc., Denver, Colorado, USA), Ravi Murthy, P.E. (URS Corporation, Phoenix, Arizona, USA), George H. Beckwith, P.E. (Flood Control District of Maricopa County, Phoenix, Arizona, USA)	
<b>Erodibility Of Fractured Media: Case Studies</b>	400
Erik Bollaert (AquaVision Engineering Ltd., Switzerland)	
<b>Laboratory Simulation, The Best Method To Critical Granular Filter Design</b>	409
S. Shahab Yasrobi, Ali Azad (Civil Engineering Department, Tarbiat Modarres University, Tehran, Iran)	

<b>Fractal Features Characterized By Particle Size Distribution Of Eco-Material For Erosion Control Of Cutting Slope</b>	417
Ji-Ru Zhang (School of Civil Engineering, Wuhan University, China; School of Civil Engineering and Architecture, Wuhan University of Technology, China), Zai-Liang Hu (School of Civil Engineering and Architecture, Wuhan University of Technology, China), Zu-De Liu (School of Civil Engineering, Wuhan University, China)	
<b>Effects Of Scour And Hydraulic Gradient On The Stability Of Granular Soil Slope</b>	428
J. Chu, M. G. HO (School of Civil and Structural Engineering, Nanyang Technological University, Singapore), W. L. Loke (Supply Chain Solutions, Shenzhen ST-Anda Logistics Co. Ltd., China), W. K. Leong (Golder Associates (NZ) Ltd, New Zealand)	
<b>SCOUR AT COASTAL STRUCTURES</b>	441
<b>Marine Scour At Large Foundations</b>	443
Richard J. S. Whitehouse (HR Wallingford, Howbery Park, UK)	
<b>Mechanisms Of Scour Induced By Tsunami Runup</b>	451
Harry Yeh (Department of Civil Engineering, Oregon State University, USA), Susan Tonkin (Moffatt & Nichol, USA), Eric Heller (GeoEngineers, USA), Pedro Arduino (Department of Civil Engineering, University of Washington, USA), Fuminori Kato (National Institute for Land & Infrastructure Management, Japan), Shinji Sato (Department of Civil Engineering, University of Tokyo, Japan)	
<b>Tidal Scour Analysis - Willis Avenue Bridge, New York City, New York</b>	460
Serkan Mahmutoglu, Ryan M. Edison, P.E. (Earth Tech, USA)	
<b>Numerical And Physical Modelling Of Scour Development At The Malamocco Inlet</b>	468
A.P. Luijendijk, K.J. Bos (WL   Delft Hydraulics, The Netherlands), A. Venuti, E. Serafini (Proteco, S.r.L., Italy), G. Passacantando (Technital, S.p.A., Italy), M.T. Brotto (Consorzio Venezia Nuova, Italy)	
<b>Study Of Sedimentation &amp; Erosion in Astara Port Coastal Region (Iran, Caspian Sea)</b>	476
Dr. Hossein Morovvati, Mastaneh Mohandesi Namin (Physical Oceanography, Islamic Azad University (North Tehran Branch), IRAN)	
<b>Wave Scour Around A Vertical Circular Pile In Silt</b>	484
B. Mutlu Sumer, Figen Hatipoglu†, Jørgen Fredsøe (Technical University of Denmark, MEK, Coastal & River Engineering Section (formerly ISVA), Denmark)	
<b>The Hangzhou Bay Pipeline Crossing Project - Use Of Spoilers To Initiate Pipeline Self-Burial And Re-Initiate Future Re-Burial</b>	493
Xia Yu Fei (Sinopec Transportation and Storage), Gu Jian Ning (Sinopec Project Management Team), Ng Eng Bin (Subsea and Pipelines, Worley Pte Ltd), Janardanan Kizhikkilod, Tan Sin Le (Worley Pte Ltd), Daniel Zhao (Submarine Pipeline Spoilers (Asia))	

<b>Numerical Modelling of Current Induced Scour under Offshore Pipelines</b> Dongfang Liang , Liang Cheng, Kervin Yeow (School of Civil and Resource Engineering, The University of Western Australia, Australia)	505
<b>Scour Below Submarine Pipeline Due To Currents</b> Dariush Hosseini, Habib Hakimzadeh (Civil engineering faculty, Sahand University of Technology, Tabriz, Iran), Reza Ghiassi (Engineering faculty, Tehran University, Tehran, Iran)	513
<b>Author Index</b> .....	515