

Table of contents / Table des matières

Preface / Préface	xxv
Letter to invitation / Lettre d'invitation	xxvii
Theme 1 – INNOVATION	1
Recent advancements and techniques for investigations, design, construction, operation and maintenance of water or tailings dams and spillways.	
Thème 1 – INNOVATION	1
Avancées et techniques récentes pour l'investigation, la conception, la construction, l'exploitation et l'entretien de barrages hydrauliques, de barrages de résidus miniers et d'évacuateurs de crues.	
Hydraulic modeling / Modélisation hydraulique	1
Design improvement of Bawanur dam spillway preserving the safety requirements <i>D. Stematiu, N. Sirbu & R. Cojoc</i>	3
Research on flood discharge, energy dissipation, and operation mode of sluice gate for low-head and large-discharge hydropower stations <i>Huang Wei, Tu Chengyi & Zhou Renjie</i>	11
Research and application on numerical simulation of hydraulic transients in complex water conveyance system <i>G.H. Li, X.R. Chen, Y.M. Chen & T.C. Zhou</i>	21
Breach modelling: Why, when and how? <i>M. Hassan, M. Morris & C. Goff</i>	34
CFD modelling of near-field dam break flow <i>S. Esmaeeli Mohsenabadi, M. Mohammadian, I. Nistor & H. Kheirkhah Gildeh</i>	47
Canal embankment failure mechanism, breach parameters and outflow predictions <i>H. Kheirkhah Gildeh, P. Hosseini, H. Zhang, M. Riaz & M. Acharya</i>	61
Flood retention dams with full ecological passage – recent projects in Germany <i>H. Haufe</i>	75
Solving spillway geometry for three-dimensional flow <i>G.L. Coetsee & S.J. van Vuuren</i>	86
Investigating high flow measurements using compound gauging structures <i>A.A. Maritz, P. Wessels & S.J. van Vuuren</i>	99
Scouring analysis on flip bucket spillway of Cisokan Lower Dam using experimental investigation <i>J. Zulfan, S. Lestari & Y.E. Kumala</i>	111

Innovative approach to hydraulic design and analysis for Bluestone Dam primary spillway stilling basin <i>D. Moses & N. Koutsunis</i>	120
Design and construction of an auxiliary labyrinth spillway for an ageing dam <i>J. Simzer, T. Madden & B. Downing</i>	133
Preparation of the Mělčany dry reservoir project <i>P. Řehák, P. Holý, P. Fošumpaur, T. Kašpar, M. Králík & M. Zukal</i>	148
“Hydrothermal” and season based design of dual PKW - flap gate spillway at Gage Dam <i>F. Laugier</i>	156
Design, construction and operation of offshore and onshore flood control dams in Sweden and Switzerland <i>S.-P. Teodori, A. Hofgaard & H. Kaspar</i>	164
The redesign of a plunge pool slab for a temporary diversion due to dynamic pressures <i>R. Haselsteiner & A. Trifkovic</i>	178
Screening level analysis of Ilisu Dam first filling impacts at Mosul Dam <i>M. Wygonik Kinkley</i>	188
Minimizing the power swing incorporating the trifurcation system of the hydropower plant <i>J. Yun & K. Lim</i>	197
Hydraulic design of stepped spillway using CFD supported by physical modelling: Muskrat Falls hydroelectric generating facility <i>J. Patarroyo, D. Damov, D. Shepherd, G. Snyder, M. Tremblay & M. Villeneuve</i>	205
Predictive breach analyses for reservoir cascades <i>V. Stoyanova & R. Coombs</i>	220
25 years of Gabčíkovo Water Structure System – operation, upgrade, safety and impacts on environment <i>P. Panenka, M. Bakes, I. Grundova, R. Hudec, L. Koprivova & D. Volesky</i>	235
Dam and spillway rehabilitation to accommodate increased design flood: Calero Dam <i>A.R. Firoozfar, E.T. Zapel, A.L. Strain & N.B. Adams</i>	250
Performance of the complex spillway structure after gate replacement - physical modelling <i>M. Broucek, M. Kralik & L. Satrapa</i>	258
Levee and dam breach erosion through coarser grained materials <i>M.W. Morris, J.R. Courivaud, R. Morán, M.Á. Toledo & C. Picault</i>	266
Study of bank erosion and protection measures on Subansiri River, Assam, India <i>R.K. Chaudhary, V. Anand & P.C. Upadhyay</i>	276
Safety assessment of underflow stilling basin with matter element modal based on hydrodynamic loads and inspection data <i>X. Wu, Y. Chen, H. Wang, Y. Chen, Z. Liu & H. Wang</i>	289
<i>Thermal and alkali-silica reaction – Concrete dams I</i>	
<i>Réaction thermique et RAG – Barrages en béton</i>	303
FE assessment of the ASR-affected Paulo Afonso IV dam <i>R.V. Gorga, L.F.M. Sanchez, B. Martín-Pérez, P.L. Fecteau, A.J.C.T. Cavalcanti & P.N. Silva</i>	305

Management of ASR affected spillway structures at Kafue Gorge, Zambia <i>E. Nordström, R. Tornberg & R. Kamanga</i>	316
Assessment of frost damage in hydraulic structures using a hygro-thermo-mechanical multiphase model <i>D. Eriksson, R. Malm & R. Hellgren</i>	332
Refurbishment of the 120 years old inlet tower on Mundaring Weir <i>A. Gower & B. Wark</i>	347
Concrete slot cutting to mitigate AAR induced concrete growth at R.H. Saunders GS <i>Dehai Zhao, L. Adeghe & C. Plant</i>	366
Collapse of the terminal section of the access bridge to the intake tower of the Bezid Dam <i>I.D. Asman, C. Ban, C. David & I. Tibuleac</i>	373
Assessing the structural safety of cracked concrete dams subjected to harsh environment <i>R. Malm, M. Könönen, C. Bernstone & M. Persson</i>	383
Study of concrete hydroelectric facilities affected by AAR using multi-physical simulation: Consideration of the ultimate limit state <i>M.B. Ftima, E. Yildiz & O. Abra</i>	398
Thermal analysis and design features of Muskrat Falls RCC North Dam <i>H. Bouzaiene, T. Smith, G. Snyder, T. Chislett & J. Reid</i>	409
Design of Nimoo Bazgo project in Leh-Ladakh – A case study <i>N. Kumar, K. Deshmukh, A. Mittal & S. Dubey</i>	423
<i>Roller compacted concrete dams I</i>	
<i>Barrages en béton compacté au rouleau</i>	435
Bubbled Rolled compacted concrete dam <i>E.K. Mohamed & E.A. Khalil</i>	437
High performing RCC and pumpable poor CVC mix design for Monti Nieddu Dam (Italy) <i>T. Adamo, V. Aiello, S. Bonanni, R. Collarelli, F. D'Angeli & C. Rollo</i>	447
Design and implementation of RCC gravity dam in HD project <i>Yang Yiwen, Deng Liangjun, Hu Lingzhi & Xiang Hong</i>	462
Tallest RCC gravity dam in Lao PDR - need for high speed and solutions adopted at the Nam Ngiep 1 Hydropower <i>Y. Aosaka, T. Seoka & S. Tsutsui</i>	468
Changes in forty-year-old concrete: Some observations regarding the Itaipu dam <i>C. Neumann Jr, E.F. Faria & A.C.P. Santos</i>	483
Experiences for construction of RCC Dams in Sri Lanka (case study Uma Oya Project) <i>H. Mahdiloutorkamani</i>	494
Muskrat Falls North Dam – Overcoming the challenges of placing RCC in an extreme environment <i>T.P. Dolen, D. Protulipac, T. Chislett, R. Power, J. Reid & J. O'Brien</i>	507
Design aspects of the highest run of the river barrage on permeable foundation of India <i>B. Joshi, R.K. Dubey & M. Kumar</i>	524
RCC knowledge: How specific test can help to evaluate the real behavior of material and a better design of RCC dams <i>E. Schrader, P. Mastrofini, R. Saccone & F. Surico</i>	539

Special solutions for mass concrete mixing aggregate handling (cooling & heating) for RCC dams <i>R. Kletsch & S.J. Hegy</i>	551
<i>Design and numerical modelling of concrete dams I</i>	
<i>Conception et modélisation numérique des barrages en béton</i>	567
Best practice in preparing procurement specifications for dam protection gates <i>R. Digby & K. Grubb</i>	569
Design and operational safety of ultra-deep buried large headrace tunnels of Jinping II hydropower station in China <i>Chunsheng Zhang, Xiangrong Chen, Futing Sun, Yang Zhang, Feng Wang & Xiaohong Zheng</i>	575
The design of the Alto Tâmega dam in Portugal. A 106 m high double curvature arch dam <i>F. Hernando, C. Granell & C. Baena</i>	589
Diversion tunnel orifices for energy dissipation during reservoir filling at Site C <i>J. Bruce, J. Croockewit, F. Yusuf, J. Nunn & A. Watson</i>	598
3-D-FE models for stability analysis of concrete dams – challenges and solutions <i>K. Aldermann, U. Beetz & B. Tönnis</i>	613
Biscarrués. The first hardfill dam in Spain <i>C. Granell, A. Duque, J.L. Sanchez & L.J. Ruiz</i>	619
Influence of unbalanced reinforcement of abutments on long term deformation of Lijiaxia Arch Dam <i>W. Liu, J. Pan, J. Wang & F. Jin</i>	629
Detailed investigations and finite element analysis of Idukki dam in India <i>V.V. Arora, B. Singh, P. Narayan & B.K. Patra</i>	639
Safe design and operation of spillway gates under extreme conditions – Cold climate <i>P. Bennerstedt & A. Halvarsson</i>	652
Concrete assessment and service life extension planning for Morris Sheppard Dam <i>S.S. Vaghti, M. McClendon & G.S. Lund</i>	663
Dams in 3D: The importance of considering three-dimensional response of gravity dams <i>S.L. Jones, A. Jacobs & L. Martin</i>	676
Computation of safety margins of a cracked dam considering drainage efficiency in a coupled hydro-mechanical model <i>S.-N. Roth & P. Léger</i>	687
Assessment of apparent cohesion at dam-rock interfaces through multiscale modeling <i>S. Renaud, T. Saichi, N. Bouaanani & B. Miquel</i>	702
Reducing generation loss - operating with ice and debris on the Upper Mississippi River <i>B. Holman, A. Judd & A. Peters</i>	718
Blockage of driftwood and resulting head increase upstream of an ogee spillway with piers <i>P. Furlan, M. Pfister, J. Matos & A.J. Schleiss</i>	730
Design aspect of a dam without joint – Chamera-III Power Station <i>S. Chowdhury, N. Kumar, Y.K. Chaubey & S.C. Joshi</i>	740

<i>Design of embankment dams / Conception des barrages en remblai</i>	755
Seepage analysis and control of core-wall rockfill dam and underground powerhouse caverns in Shuangjiangkou hydropower station, China <i>B. Duan, Z.H. He, J. Yan, J.J. Yan & X.C. Peng</i>	757
Small embankment dams – benefits and problems <i>J. Říha</i>	769
Hydro-TISAR and Hydro-SEEP – innovative geophysical techniques for dam safety investigations <i>D. Campos Halas, J.L. Arsenault, B. McClement & M. Situm</i>	779
Refurbishment of Ontario Power Generation’s Sir Adam Beck Pump Generating Station reservoir, Niagara Falls – Design <i>S. Kam, F. Barone, M. Aydin & T. Bennett</i>	791
Feedback on the innovative spillway for Crotty Dam – 25 years of performance data <i>R. Herweynen & P. Southcott</i>	806
Jimmie Creek run-of-river project — geohazard and seepage control design of intake structure <i>E. de A. Gimenes & R. Norman</i>	818
The failure of homogeneous dams by internal erosion — the case of Sparmos Dam, Greece <i>G.T. Dounias & M.E. Bardanis</i>	833
Impact of variable foundation conditions on the design of the Itare Asphalt Core Rockfill Dam (ACRD) in Kenya <i>L. Lopez-Ortiz, J. Bekker, D.B. Badenhorst & C.R. Fynn</i>	841
Designing the grain-size distribution of reverse filters <i>I.N. Belkova, E.D. Gibyanskaya & V.B. Glagovsky</i>	853
Measures to prevent internal erosion in embankment dams <i>A. Soroush & P. Tabatabaie Shourijeh</i>	854
Underwater visualization for asset management and risk mitigation of dams <i>K.J. LaBry</i>	868
ICOLD Bulletin 164 on internal erosion – how to estimate the loads causing internal erosion failures in earth dams and levees <i>R. Bridle</i>	878
Case histories of tailings dam and reservoir waterproofed with a bituminous geomembrane (BGM) <i>N. Daly & B. Breul</i>	893
Application of Ground-Penetrating Radar (GPR) as supporting technology for monitoring cracks at Bening Dam, East Java, Indonesia <i>N. Sadikin</i>	902
Construction of diversion culverts on compressible foundations – Large Earthfill Dams <i>M. Safavian</i>	918
<i>Numerical modeling of embankment dams /</i>	
<i>Modélisation numérique des barrages en remblai</i>	927
Reliability-based safety factors for earth dam stability calculations <i>G. Molinder, I. Ekström, R. Malm & J. Yang</i>	929

Dynamic reliability analysis of earth dam's slope stability <i>S. Mousavi & A. Noorzad</i>	938
Global sensitivity analysis in the design of rockfill dams <i>R. Das & A. Soulaïmani</i>	950
Considering geosynthetic-reinforced piled embankments as Cemented Material Dam (CMD) foundation <i>A. Noorzad, E. Badakhshan & A. Bouazza</i>	963
Sustainable design considerations in the construction of earth dams: Case study of "Yammoune" earth dam (Lebanon) <i>A. Barada, H. Haidar & J. Halwani</i>	973
Numerical modelling of construction and impoundment of the Romaine-2 Asphaltic Core Rockfill Dam (Québec, Canada) <i>R. Plassart, F. Laigle, H. Longtin & E. Péloquin</i>	991
Comparison of cracks and settlements in Givi Dam body in two periods, before and after earthquake (case study, Givi Dam, Iran) <i>A. Negahdar, R. Eshragi & H. Negahdar</i>	1003
<i>Dam foundation and geology / Géologie et fondation des barrages</i>	1015
Mechanical characteristics of class-I columnar jointed basalt of Baihetan hydropower station <i>L.Q. Li, J.R. Xu, Y.L. Jiang, H.M. Zhou & Y.H. Zhang</i>	1017
Challenges in engineering of Pare dam on weak foundation <i>A. Mehta, D.V. Thareja & V. Batta</i>	1037
Innovative 3D ground models for complex hydropower projects <i>J. Weil, I. Pöschl & J. Kleberger</i>	1051
A story telling, dam stability issue and design review, a plea for early empirical geological/geotechnical assessment of adverse conditions in foundation <i>J.B.O. Adewumi, T. Genton, L. Frobert & E.O. Ajayi</i>	1058
Stabilization of abutments for dam safety: A case of Punatsangchhu-I dam with adverse geology <i>R.K. Gupta & V. Tripathi</i>	1069
Développement de nouveaux coulis cimentaires pour l'injection des fondations en milieu froid <i>K. Champagne, G. Touma & A. Yahia</i>	1079
<i>Instrumentation / Instrumentation</i>	1091
Research and practice on key technologies of intelligent construction and operation of cascade hydropower stations in the river basin <i>Y.J. Tu & B. Duan</i>	1093
Recent remote underwater surveys: Advances in methods and technologies for structural assessments of dams and spillways <i>K.W. Sherwood</i>	1104
Dam monitoring flaws and performance issues: Some thoughts and recommendations <i>M.G. de Membrillera, R. Gómez & M. De la Fuente</i>	1117
Reservoir Safety System (RSS) V2.0: A highly automated platform for managing the operation of reservoirs <i>K. Murray, L. Mason & T. Judge</i>	1130

“regObs”, a tool to share observations in safety management <i>P.H. Hiller, G.H. Midttomme & R. Ekker</i>	1143
The need for instrumentation; experiences on irrigation dams of Ethiopia <i>Y.K. Hassen & M. Abebe</i>	1151
Dam operation support system utilizing Artificial Intelligence (AI) <i>Y. Hida, H. Takiguchi, K. Kudo & M. Abe</i>	1162
Lessons learned in application of automated monitoring systems on hydraulic structures in Slovakia <i>M. Minarik, T. Meszaros, L. Tulak & E. Bednarova</i>	1167
Updating the dam safety instrumentation systems of concrete gravity dams: A case study from the Kootenay River, British Columbia, Canada <i>A.I. Bayliss, L. Hurlbut, A. Hughes, P. Hamlyn & G. Johnston</i>	1175
Fiber optic temperature sensors in under-documented dams <i>M.C.L. Quinn, C. Engel, T. Coleman, S. Johansson & C.D.P. Baxter</i>	1184
Theme 2 – SUSTAINABLE DEVELOPMENT	1193
Planning, design, construction, operation, decommissioning and closure management strategies for water resources or tailings dams, e.g. climate change, sedimentation, environmental protection, risk management.	
Thème 2 – DÉVELOPPEMENT DURABLE	1193
Stratégies de gestion pour la planification, la conception, la construction, l’exploitation, la mise hors service et la fermeture de barrages hydrauliques ou des barrages de résidus miniers, par exemple, changement climatique, sédimentation, protection de l’environnement, gestion des risques.	
Sedimentation / Sédimentation	1193
Research on risk assessment of sediment depositing at the deep intakes of reservoir dams <i>C. Jiang, J.B. Sheng & L.R. Fan</i>	1195
The study on optimization of sediment flushing efficiency from cascade reservoirs as mitigation to the secondary impact of volcanic hazard <i>P.T. Juwono, F. Hidayat, R.V. Ruritan, A. Rianto & M. Taufiqurrachman</i>	1207
Experimental study on effective sediment channel with reservoir topography and morphology <i>Y. Kitamura, T. Ishino & T. Okada</i>	1218
Study on water diversion and sediment control of diversion type hydropower station downstream of high dam with large reservoir <i>Xiangrong Chen, Hongliang Sun, Yimin Chen & Fei Yang</i>	1231
Turbidity control and sediment management using sluicing tunnel at hydropower dam <i>H. Okumura, C. Onda, T. Satoh & T. Sumi</i>	1244
Sediment management plan in Sakawa River – the results of the first phase <i>Y. Fukuda, R. Akita & K. Doke</i>	1254
Study on siltation downstream of sluice and risk response measures regarding building sluice on Jiao River <i>L.H. Gao, L. Ouyang & X.D. Zhao</i>	1261

Filling with sediment of the reservoir “Shpilje” <i>S. Milevski</i>	1276
Sediment replenishment as a measure to enhance river habitats in a residual flow reach downstream of a dam <i>S. Stähly, A.J. Schleiss, M.J. Franca & C.T. Robinson</i>	1284
Sustainable sediment management of small capacity Pandoh dam reservoir of Beas Satluj Link Project <i>D.K. Sharma</i>	1293
Morphological modelling of sediment-induced problems at a cascade system of hydropower projects in hilly region of Nepal <i>S. Giri, A. Omer, P. Mool & Y. Kitamura</i>	1306
Sustainable dams in vital river systems – relevance of sediment balance <i>L. Bolsenkötter, J. Küppers & R. Lothmann</i>	1318
Sediment management of Nathpa Dam from heavy silt in river Satluj (India) <i>V.K. Thakur</i>	1327
Study on the sediment discharge regulation of the Xiaolangdi reservoir during flood season <i>W. Ting, W. Yuanjian, Q. Shaojun, L. Xiaoping & D. Shentang</i>	1338
Theoretical framework of dynamic game-theory model for water and sediment allocation between cascade reservoirs and lower channel <i>X. Wang, Y. Wang & E. Jiang</i>	1351
Reservoir operation of Mangdechhu project and safety of the structure <i>B. Joshi, N. Kumar, K. Deshmukh, R. Baboota & M. Mishra</i>	1358
Change in river basin morphology due to climate change led extreme flood event <i>D.V. Singh & R.K. Vishnoi</i>	1368
Bener Dam as the management efforts of Bogowonto Watershed <i>M. Yushar Yahya Alfarobi</i>	1379
<i>Climate change and environmental issues / Changements climatiques et environnement</i>	1387
Impact of Tibet Xianghe water conservancy project to the black-necked crane and protection measures <i>Xuhang Wang, Gaojin Xu, Jian Guo, Jiayue Shi, Le Yang & Ning Miao</i>	1389
Comparison of reproducibility of water temperature and water temperature stratification formation by different methods in dam reservoir water quality prediction model <i>F. Kimura, T. Kitamura, Y. Tsuruta, T. Kanayama, R. Kikuchi, Y. Kitamura, T. Morikawa, Y. Okada, Y. Fukuda, T. Shoji, A. Mieno, T. Suzuki & M. Kobayashi</i>	1390
Development of a prediction model used in measures for reducing mold odor in dam reservoirs <i>Y. Okada, K. Shima, K. Okabe, N. Arakawa, Y. Watabe, M. Hongou & H. Kushibiki</i>	1404
Integrating climate change impacts in the valuation of hydroelectric assets <i>K. Pineault, E. Fournier, A. Lamy, A. Hannart & R. Arsenault</i>	1414
Effects of a salt-contained formation on Gotvand Reservoir, an overview on a 7-year monitoring <i>A. Zia, H. Hassani & N. Kamjou</i>	1424

Potential effects of the soluble formation of Gachsaran on reservoir water quality of Persian Dam reservoir <i>N. Tavoosi, A. Farokhnia & F. Hooshyaripor</i>	1432
Water quality management of an artificial lake, case study: The lake of the Martyrs of the Persian Gulf <i>J. Bayat, S.H. Hashemi, M. Zolfagharian, A. Emam & E.Z. Nooshabadi</i>	1442
The study on the impetus mechanism into resettlement due to reservoirs in China—the analyses based on WDD hydropower station's immigration <i>S. Yanguang</i>	1450
Greenhouse gas emissions from newly-created boreal hydroelectric reservoirs of La Romaine complex in Québec, Canada <i>M. Demarty, C. Deblois, A. Tremblay & F. Bilodeau</i>	1456
Monitoring of water quality and planktonic production in Romaine estuary, three years after impoundment <i>M. Demarty, C. Deblois & A. Tremblay</i>	1467
Numerical simulation of sea water intrusion due to partial gate opening of the Nakdong Estuary Dam <i>Kyung Soo Jun, Jin Hwan Hwang & Dong Hyeon Kim</i>	1476
<i>Water management / Gestion de l'eau</i>	1477
Analyzing the water supply effect of Three Gorges Reservoir on Dongting Lake during the dry season <i>L.Q. Dai, H.C. Dai, H.B. Liu, Z.Y. Tang & Y. Xu</i>	1479
Flexible approaches to maximum supply water level of multi-purpose dams <i>M. Möller & W. Thiele</i>	1489
Sustainability of water resources development: A case study from the southwest of Iran <i>A. Heidari</i>	1501
Practice and optimization of the flood control operation mode for the Three Gorges Project <i>S. Li, Y. Gao, L. Xing & H. Wang</i>	1513
Analysis of joint optimization scheduling rules for Jinsha River cascade and Yalong River cascade <i>Zhang Hairong, Tang Zhengyang, Li Peng, Ren Yufeng & Liang Zhiming</i>	1522
Unknown DPRK's dam water level analysis applying artificial intelligence and machine learning method <i>J.B. Park, S.H. Lee & S.J. Kim</i>	1529
A study on water level management criteria of reservoir failure alert system <i>B. Lee & B.H. Choi</i>	1543
Optimal water resources allocation and water supply risk assessment under changing environment in the Mid-lower Hanjiang River Basin, China <i>X. Hong, L. Zhang, Y. Huang, Q. Zou, R. Zhang, X. He, L. Wang & X. Hong</i>	1548
Operation of large Norwegian hydropower reservoirs after quantifying the downstream flood control benefits <i>B. Glover & K.L. Walloe</i>	1563
The method for increasing the waterpower generation by using the storage volume for flood control in the multipurpose dams <i>H. Takeuchi, T. Ikeda, S. Nagasawa & S. Tada</i>	1576

National census on river and dam environments in Japan and utilization for appropriate dam management using the results <i>T. Osugi, E. Akashi, K. Yamaguchi, H. Kanazawa & M. Nishikawa</i>	1590
The role of streamflow forecast horizon in real-time reservoir operation <i>K. Gavahi, S.J. Mousavi & K. Ponnambalam</i>	1603
Assessment of increase in bed level of Ghazi-Barotha reservoir <i>K. Munir & M. Zain</i>	1611
Multipurpose water uses of reservoirs in Slovenia <i>N. Smolar-Žvanut, J. Meljo, N. Kodre & T. Prohinar</i>	1619
Reestimation of flood control storage and fixing an optimum spill <i>A.K. Paul</i>	1630
<i>Performance and monitoring of concrete dams I</i>	
<i>Comportement et surveillance des barrages en béton</i>	1631
Application of Laser Doppler Vibrometry in dam health monitoring <i>M. Klun, D. Zupan, J. Lopatič & A. Kryžanowski</i>	1633
A guideline for ageing management of post-tensioning tendons for dam owners <i>P. Lundqvist, C. Bernstone, A. Marklund & C.-O. Nilsson</i>	1644
Measurement of in situ stresses in the concrete of the Cahora Bassa dam <i>L. Lamas, J.P. Gomes, A.L. Batista, E.F. Carvalho & B. Matsinhe</i>	1649
Evaluating the operational safety of an old run-of-river power plant <i>J.P. Laasonen</i>	1663
Structural health monitoring of a buttress dam using digital image correlation <i>C. Popescu, G. Sas & B. Arntsen</i>	1671
Guideline for structural safety in cracked concrete dams <i>E. Nordström, R. Malm, M. Hassanzadeh, T. Ekström & M. Janz</i>	1681
Investigation of repeated penstock weld ruptures – Case study <i>C. Sparkes, G. Saunders & M. Pyne</i>	1697
Maintenance management in hydropower project: Safety aspects in Shiroro dam project in focus <i>E. Imo & M. Aminu</i>	1712
<i>Construction and rehabilitation of concrete dams I</i>	
<i>Construction et réhabilitation des barrages en béton</i>	1721
Restoring treatment engineering on the soleplate of stilling basin of Ankang hydropower station <i>Liu Dianhai, Wang Jue, Ding Jinghuan & Yang Liu</i>	1723
Anti – seepage technology and defect treatment measures of pumped storage power station <i>Lei Xianyang, Xiong Yanmei, Chen Xiangrong & Sun Tanjian</i>	1728
Rehabilitation works of Minab Dam spillway <i>M. Sadri Omshi, A. Amini & F. Manouchehri Dana</i>	1739
Underwater technologies for rehabilitation of dams: Studena case history <i>A.M. Scuero & G.L. Vaschetti</i>	1749
Safety by design – the new intake at John Hart generating station project <i>A.V. Maiorov, A. Kartawidjaja & K. Gdela</i>	1761

Development and application of various new technologies for construction of Yamba Dam <i>T. Hiratsuka, N. Yamashita & T. Kase</i>	1776
The application of Rubble Masonry Concrete (RMC) construction for African dams and small hydropower projects <i>R. Greyling, E. Scherman & S. Mottram</i>	1787
Dams in Angola, reconstruction of the Matala dam <i>C.J.C. Pontes & P. Portugal</i>	1802
Långströmmen Dam Safety – best practice project, an additional new spillway with an emergency radial gate and 2.5 km earth-fill dam enlargement <i>P. Kotrba, C. Sjöberg & P. Bylander</i>	1813
Geomembrane sealing systems for rehabilitation and upgrading concrete dams <i>D. Cankoski</i>	1828
Acaray generating station life extension and modernization studies <i>D. Flores, A. Bridgeman, F. Welt, J. Aveiro, D. Benítez & J. Vallejos</i>	1842
<i>Construction and rehabilitation of embankment dams I</i>	
<i>Construction et réhabilitation des barrages en remblai</i>	1859
Challenging conditions in the design and construction of Puah Dam in Malaysia <i>M. Afif & H. Fries</i>	1861
Innovations in drawoff works replacement <i>A. Bush, B. Cotter, A.L. Warren & C.E. Woolcombe-Adams</i>	1874
Kangaroo Creek Dam upgrade – A balanced approach to the design of upgrade works <i>P.A. Maisano, J.P. Buchanan & M.B. Barker</i>	1885
Refurbishment of Ontario Power Generation's Sir Adam Beck Pump Generating Station reservoir, Niagara Falls – Construction execution <i>P. Merry, B. Andruchow, V. Rombough & P. Toth</i>	1897
Retour d'expérience sur les mélanges chaux/ciment dans les écrans « deep soil mixing » des levées de la Loire <i>S. Patouillard, L. Saussaye, F. Mathieu, A. Le Kouby & R. Tourment</i>	1913
Small earth dam failure in Burkina Faso: The case of the Koumbri dam <i>A. Nacanabo & M. Kaboré</i>	1919
Radius analysis of the distribution mixture of sodium silicate Portland cement grouting material on various types soil of dam foundation <i>B. Risharnanda, S. Soegiarto, S. Purwaningsih & A.G. Majdi</i>	1931
<i>Investigation and monitoring of embankment dams I</i>	
<i>Investigation et surveillance des barrages en remblai</i>	1936
Empirical shear stiffness of embankment dams <i>D.S. Park, D.-H. Shin & S.-B. Jo</i>	1939
Internal settlement measurements of the Romaine-3 rockfill dam <i>M. Smith & J. Brien</i>	1951
Study on the deformation of 200 m concrete face rockfill dam in deep foundation of narrow valley in Houziyan <i>Fuhai Yao & Xing Chen</i>	1962

Analysis of leakage water sources around dam using water analysis <i>Jae-Seok Ha, Bong-Gu Cho, Jung-Ryeol Jang & Jung-Ju Bea</i>	1973
Vegetation control on embankment dams as a part of remediation work <i>L. Demers, S. Doré-Richard & D. Verret</i>	1974
The North Spur story: Two years later <i>R. Bouchard, A. Rattue, J. Reid & G. Snyder</i>	1983
Means and methods of evaluating subsurface conditions and project performance at Mosul Dam <i>G. Hlepas & V. Bateman</i>	1966
Investigation and treatment of buried channels in river valley projects in Himalayas <i>N. Kumar, I. Sayeed, R.C. Sharma & A. Chakraborty</i>	2010
<i>Spillways / Évacuateurs de crues</i>	2025
“You Don’t Know What You Don’t Know” <i>P. Schweiger, R. Kline, S. Burch & S.R. Walker</i>	2027
Effect of boundary layer conditions on uplift pressures at open offset spillway joints <i>T.L. Wahl</i>	2039
The challenge of securing a concrete lined spillway founded on weak fractured rock containing active aquifer layers <i>D. Ryan, P. Foster & B. Wark</i>	2049
High resolution spillway monitoring: Towards better erodibility models (and benchmarking spillway performance) <i>M.F. George</i>	2064
Avoiding rock erosion in the discharge channel of the Péribonka spillway <i>C. Correa & M. Quirion</i>	2072
Determining geomechanical parameters controlling the hydraulic erodibility of rock in unlined spillways <i>L. Boumaiza, A. Saeidi & M. Quirion</i>	2083
<i>Dam safety / Sécurité des barrages</i>	2097
Consequences of flooding: Comparing different quantitative methods for estimating Loss of Life (LOL) <i>J. Perdikaris, W. Kettle & R. Zhou</i>	2099
Regulating dams in Canada’s nuclear industry <i>G. Su & G. Groskopf</i>	2107
Dam safety surveillance innovation - online remote supervision <i>S.J. Wang, J.H. Yan & C.B. Ge</i>	2108
Safety vs wildlife: Managing conflicting interests during dam projects in the UK <i>T.A. Williamson & P. Wells</i>	2114
Development of new simulator for training of dam operation and its future outlook <i>K. Tamura & S. Kano</i>	2126
Necessity of a new public safety program around dams in Korea <i>D.H. Shin & D.S. Park</i>	2135

Study on disaster mitigation measures and emergency management of reservoir dams in strong earthquake region <i>Peng Lin</i>	2144
Application of mechanical facilities support system using tablet terminals for dam management <i>T. Yoshida, Y. Matsumoto & K. Sasaki</i>	2151
Multifactorial studies for management of operating life of hydroelectric power plants <i>I.V. Kaliberda</i>	2161
Using maturity matrices to evaluate a dam safety program and improve practices <i>R. Knott & L. Smith</i>	2171
Oroville in retrospect: What needs to change? <i>S.J. Rigbey & D.N.D. Hartford</i>	2184
A case for innovation in establishing policies, practices and standards for dam safety <i>D.N.D. Hartford</i>	2196
Toward effective emergency action plan of a dam by using a network analysis <i>B.-H. Choi & B. Lee</i>	2210
Dam safety framework for decision-making and asset portfolio management <i>T. Salloum & S. Alrhiieh</i>	2223
Lessons learned from dam failures and incidents due to spillway malfunctions <i>F. Bacchus, F. Champiré, L. Deroo, F. Lempérière & M. Poupart</i>	2238
Importance of emergency management programs for dams and hydropower projects – Canadian perspective and Nepalese context <i>M. Acharya, C.R. Donnelly, J. Groeneveld, J.H. Rutherford, T. Bennett & A. McAllister</i>	2252
Design, construction and operation safety of a reinforced soil dam <i>A. Maita</i>	2270
Safety measures for earth dams on basis of instrumentation data, dam site location and reservoir volume <i>F. Jafarzadeh, A. Akbari Garakani, J. Maleki & M. Banikheir</i>	2284
Investigation and assessment of interfaces with earthen levees <i>J. Simm, M. Roca Collell, J. Flikweert, R. Tourment, C. Neutz & P. van Steeg</i>	2298
A consequence-based tailings dam safety framework <i>J. Herza, M. Ashley, J. Thorp & A. Small</i>	2309
Risk tolerability criteria in dam safety – what is missing? <i>P. Zielinski</i>	2323
Challenges and needs for dams in the 21st century <i>H. Blohm & L. Deroo</i>	2331
New guidelines and processes for development of additional water storage in the U.S. <i>B.N. Dwyer & K.J. Ranney</i>	2343
Classification of Itaipu and Three Gorges dams according to criteria of Brazilian and Chinese government agencies <i>C. Wenbo, F. Huachao, S.F. Matos, E.F. Faria & M. Gayoso</i>	2358

Emergency plans for large dams of hydroenergy sector in Albania <i>A. Jovani & E. Qosja</i>	2370
<i>Risk I Aléa</i>	2371
Development of an agile risk management paradigm for under-operation hydropower dams <i>S. Yousefi, M. Rahbari & N. Kheyrikhah</i>	2373
Incorporation of a time-dependent risk analysis approach to dam safety management <i>J. Fluixá-Sanmartín, A. Morales-Torres, L. Altarejos-García & I. Escuder-Bueno</i>	2384
Integrated hydrological risk analysis for hydropower projects <i>T.H. Bakken, D. Barton & J. Charmasson</i>	2393
Analysis of the probability of failure of the Moste Dam <i>P. Žvanut</i>	2409
Dam portfolio risk management: What we learned from analyzing seven dams owned by the Regional Government of Extremadura (Spain) <i>M. Setrakian-Melgonian, I. Escuder-Bueno, J.T. Castillo-Rodríguez, A. Morales-Torres & D. Simarro-Rey</i>	2419
Hazard management of Nathpa Dam (India) from Parechu lake in Tibet <i>V.K. Thakur</i>	2429
Understanding risk communication approaches for dam related disasters <i>E. Yasui</i>	2441
Simulation supported Bayesian network for estimating failure probabilities of dams <i>K. Ponnambalam, A. El-Awady, S. Jamshid Mousavi & A. Seifi</i>	2453
Conditional flood risk management <i>B. Kolen, M. Zethof & B.I. Thonus</i>	2465
Méthode et outil de calcul de l'aléa de rupture des digues de protection contre les inondations appliqués à la Loire <i>S. Patouillard, S. Braud, E. Durand, B. Bridoux & R. Tourment</i>	2479
A risk-informed approach to justify dam safety improvements <i>A.R. Firoozfar, K.C. Moen, B. McGoldrick & A.N. Jones</i>	2484
Risk management of new hydropower dams on the White Nile Cascade – A case study of Isimba & Karuma Hydropower Dams in Uganda <i>W. Manirakiza, F. Wasike, N.A. Rugaba, J. Sempewo, H.E. Mutikanga & L. Spasic-Gril</i>	2493
In praise of monitoring and the Observational Method for increased dam safety <i>S. Lacasse & K. Höeg</i>	2505
Bayesian Network approach for failure prediction of Mountain Chute dam and generating station <i>A. El-Awady, K. Ponnambalam, T. Bennett, A. Zielinski & A. Verzbobio</i>	2518
Scaling risk assessment methods and approaches – From over 200 dams to site-specific studies <i>J.A. Quebbeman & S.K. Carney</i>	2531
<i>Design of hydropower scheme I Conception d'aménagement hydroélectrique</i>	2547
Current investment in dam construction in Indonesia, forward-looking decisions <i>A. Assegaf</i>	2549

Construction spillway over whole area downstream of CFRD for climate change <i>J.B. Park, S.J. Kim & S.H. Lee</i>	2550
Unexpected risks and work experience in construction of HPP's cascade on the Grande-de-Santiago River, Mexico <i>A. Kozyrev, A. Lashin, I. Uskov & V. Uskov</i>	2558
Site C Clean Energy Project, design overview <i>A.D. Watson, G.W. Stevenson & A. Hanna</i>	2574
Small historic dams made safe <i>D.E. Neeve & M. Jenkins</i>	2588
Role of dams and levees in the flood risk management in Romania <i>A. Abdulamit</i>	2603
Un barrage en milieu aride <i>L. Deroo, A. Tardieu & N. Ouchar</i>	2613
Selection of dam type for Luapula hydropower site at Mumbotuta site CX <i>M. Simainga, R. Mukuka, M. Muamba & L. Engendjo</i>	2621
Theme 3 – HAZARDS	2633
Hazards (design, mitigation and management of hazards to water or tailings dams, appurtenant structures, spillways and reservoirs (e.g. floods, seismic, landslides).	
Thème 3 – RISQUES	2633
Mesures d'atténuation et gestion des risques liés aux barrages hydrauliques et barrages de résidus miniers, aux ouvrages annexes, aux évacuateurs de crues et aux réservoirs, par exemple, inondations, tremblements de terre, glissements de terrain.	
Seismic analysis of concrete dams / Analyse sismique des barrages en béton	2633
Seismic safety evaluation of Tekeze arch dam <i>A. Aman, T. Mammo & M. Wieland</i>	2635
Seismic assessment of a dam-foundation-reservoir system using Endurance Time Analysis <i>J.W. Salamon, M.A. Hariri-Ardebili, H.E. Estekanchi & M.R. Mashayekhi</i>	2649
Analytical study on effects of fracture energy for crack propagation in arch dam during large earthquake <i>H. Sato, M. Kondo, T. Sasaki, H. Hiramatsu & H. Kojima</i>	2660
Towards reliability based safety assessment of gated spillways subjected to severe loadings <i>R. Leclercq & P. Léger</i>	2671
Effect of joints behavior on seismic safety of concrete arch dams <i>A. Noorzad, A. Daneshyar & M. Ghaemian</i>	2687
A new approach for dynamic analysis of concrete gravity dam-foundation-reservoir system using different assumptions of foundation <i>A. Noorzad, P. Sotoudeh & M. Ghaemian</i>	2700
Dynamic analysis of a Piano Key Weir situated on concrete dams <i>M. Kashiwayanagi, Z. Cao & T. Oohashi</i>	2713
Comparative analysis of observed and estimated PGA for Himalayan earthquakes <i>S.L. Kapil & P. Khanna</i>	2725

The effect of radiation damping on seismic sliding stability of gravity dams <i>S. Guo, H. Liang, D. Li & A. Zhang</i>	2737
Seismic failure mechanism and safety evaluation of high arch dam-foundation system under MCE <i>D. Li, J. Tu, S. Guo & L. Wang</i>	2744
Vibration analysis due to frequent spilling over hollow buttress Chenderoh Dam sector gate spillway <i>M.R.M. Radzi, M.H. Zawawi, L.M. Sidek, M.H.M. Ghazali & A.Z.A. Mazlan</i>	2753
Comparative seismic performance of dams in Canada and China using numerical analysis and shake table testing <i>S. Li, S. Alam, A.S. Issa, T. Alam & R. Austin</i>	2759
Assessment of seismic design response spectra for Binaloud dam and pumped-storage project <i>S. Soleymani, A. Mahdavian, H.R. Bayati & H. Bahrami</i>	2769
Topographic amplification on hilly terrain under oblique incident waves <i>Z.W. Chen, D. Huang, G. Wang & F. Jin</i>	2778
Design of seismic reinforcement by post-tensioned anchors in Senbon Dam <i>H. Kawasaki, S. Ishifuji & H. Fukumoto</i>	2787
Junction and Clover Dams: Risk-based seismic evaluation of two slab-and-buttress dams <i>S.L. Jones, P.E. O'Brien, S. Hughes & D.D. Christopher</i>	2798
The use of Ambient Vibration Monitoring in the behavioral assessment of an arch dam with gravity flanks and limited surveillance records <i>L. Hattingh, P. Moyo, S. Shaanika, M. Mutede, B. le Roux & C. Muir</i>	2809
State of the art nonlinear seismic analysis of an arch dam <i>G.S. Sooch, D.D. Curtis & M. Likavec</i>	2822
Nonlinear seismic analysis of an existing arch dam under intense earthquake <i>G.S. Sooch & D.D. Curtis</i>	2833
Spillway gate-reservoir interaction under earthquakes <i>N. Bouaanani, C. Gazarian-Pagé & JF. Masse</i>	2845
Modal identification of Karun 4 arch dam using ambient vibration tests <i>R. Tarinejad, M. Damadipour, H. Golmohammadi & K. Falsafian</i>	2858
DamQuake: More than just a database, a powerful tool to analyze and compare earthquake records on dams <i>E. Robbe & N. Humbert</i>	2864
<i>Seismic analysis of embankment dams / Analyse sismique des barrages en remblai</i>	2873
Seismic analysis of Narmab earth dam and optimization of its parameters using cuckoo <i>S.R. Anisheh, S.A. Anisheh & S.H. Anisheh</i>	2875
Earthquake-induced cracking evaluation of embankment dams <i>L. Mejia & E. Dawson</i>	2884
Seismic design aspects and first reservoir impounding of Rudbar Lorestan rockfill dam <i>M. Wieland & H. Roshanomid</i>	2899
Key technologies on the harnessing project of Hongshiyan Barrier Lake on Niulan River triggered by the 2014 Ludian earthquake <i>Z. Zang, K. Cheng & Z. Yang</i>	2914

Modified equivalent linear analysis of the Aratozawa dam subjected to the 2008 Miyagi earthquake <i>Z. Kteich, P. Labbé, M. Kham, V. Alves Fernandes & P. Kolmayer</i>	2928
Site effect study of Denis-Perron Rockfill Dam <i>D. Verret, E. Péloquin & D. LeBoeuf</i>	2937
Passive seismic interferometry's state-of-the-art – a literature review <i>C.T. Rodrigues, A.Q. de Paula, T.R. Corrêa, C.S. Sebastião, O.V. Costa, G.G. Magalhães & L.D. Santana</i>	2951
Geohazards / Géo-risques	2961
A large landslide, a reservoir and a small inspection gallery – a risk assessment, based on a well-designed instrumentation <i>F. Landstorfer, A. Blauhut & E. Wagner</i>	2963
Diversion tunnels – risk management confronting multiple hazards <i>W. Riemer & K. Thermann</i>	2974
A multi-disciplinary approach to active fault rupture risk characterization: 3D geological modelling of the Willunga fault, Mt Bold Dam, South Australia <i>S.R. Macklin, Z. Terzic, J.F. Barter, P. Buchanan & M. Quigley</i>	2984
The 2014 Ludian co-seismic landslide dam (Yunnan, China): Transformation from high hazard to dual purpose water conservancy and hydropower project <i>S.G. Evans, Jing Luo, Xiangjun Pei & Runqiu Huang</i>	2998
Review of the mudflow incident at Kafue Gorge Power Station and lessons learnt <i>M. Silwembe & A. Mutawa</i>	3014
Study on temporal and spatial distribution characteristics of seismic activities in Shanxi Reservoir, China <i>X.X. Zeng, T.G. Chang & X. Hu</i>	3026
Machine learning to predict landslide displacement in dam reservoir <i>B.B. Yang, K.L. Yin, Z.Q. Liu & S. Lacasse</i>	3027
Seasonal and spatial variation of seismic activity due to groundwater fluctuation in South Korea <i>Suk-Hwan Jang, Kyoung-Doo Oh, Jae-Kyoung Lee & Jun-Won Jo</i>	3040
Theme 4 – EXTREME CONDITIONS	3041
Management for water or tailings dams (e.g. permafrost and ice loading, arid/wet climates, geo-hazards).	
Thème 4 – ENVIRONNEMENT EXTRÊME	3041
Gestion des barrages hydrauliques et barrages de résidus miniers, par exemple, pergélisol et charge de glace, climats secs / humides, géorisques.	
Protection / Protection	3041
Riprap upgrade at WAC Bennett Dam in Canada <i>G. Wu, K. Wellburn, M. Lawrence, F. Sadeque & L. Yan</i>	3043
Modelling of the ice load on a Swedish concrete dam using semi-empirical models based on Canadian ice load measurements <i>R. Hellgren, R. Malm & D. Eriksson</i>	3058

Restoration of the upstream slope face of the Itaipu Binacional Rockfill Dam—procedures and characterization of materials	3071
<i>J. Patias, P.C. de Oliveira, D.O. Fernandes, D.P. Coelho & E.F. de Faria</i>	
Measurement of static ice loads on dams, with varied water level	3084
<i>A.B. Foss, L. Lia & B. Arntsen</i>	
Protection of embankments and banks against action caused by oscillatory wind waves	3085
<i>M. Spano</i>	
River management challenges during construction of large hydropower projects in cold climates	3093
<i>J. Malenchak, D. Damov, J. Groeneveld, G. Snyder & S. O'Brien</i>	
Multi-purpose permanent booms – Design approach and past experience	3108
<i>R. Abdelnour & E. Abdelnour</i>	
Hydrology / Hydrologie	3123
Integrated watershed modeling to support dam safety studies	3125
<i>J. Perdikaris, W. Kettle & R. Zhou</i>	
Applying CFD analysis to scouring river bed caused by discharge flow from the dam and estimating effectiveness of some countermeasures	3135
<i>K. Hirao, F. Watanabe, S. Ohmori, T. Tsukada & T. Kurose</i>	
Improving prediction of river-basin precipitation by assimilating every-10-minute all-sky Himawari-8 infrared satellite radiances – a case of Typhoon Malakas (2016)	3140
<i>S. Takino, T. Tsukada, T. Honda & T. Miyoshi</i>	
Design flood calculation using tropical rainfall measuring mission (TRMM) data	3146
<i>A. Mayangsari & W. Adidarma</i>	
An inundation event due to the unbalance of hydraulic design scales of a dam and the downstream levee	3156
<i>Sangho Lee & Yougkyu Jin</i>	
Hurricane Harvey rainfall, did it exceed PMP and what are the implications	3157
<i>B. Kappel</i>	
PMP estimation for mine tailings dams in data limited regions	3170
<i>B. Kappel</i>	
Hydrological modelling of ungauged catchments — a case study of the Lower Kariba Catchment	3183
<i>B.B. Mwangala</i>	
Sensitivity of Probable Maximum Flood estimates: Climate change, modelling, and adaptation	3190
<i>K. Sagan, K. Koenig, P. Slota & T. Stadnyk</i>	
Risk assessment on Bribin underground dam, focusing on the effects of Cempaka tropical cyclone 2017, Indonesia	3205
<i>V. Ariyanti & E.A. Frebrianto</i>	
Etude de régularisation du réservoir du barrage de Guitti	3216
<i>M. Kaboré & A. Nombé</i>	
Revisiting Creager flood peak-drainage area relationship using a Bayesian quantile regression approach	3228
<i>Jin-Guk Kim, Yong-Tak Kim, Young-Il Moon & Hyun-Han Kwon</i>	

Identifying the role of temperature for extreme rainfalls and floods over South Korea <i>Sumiya Uranchimeg, Woo-Sik Ban & Seung-Oh Lee</i>	3229
Impact of climate change on the flow regime and operation of reservoirs – A case study of Bhakra and Pong dams <i>D.K. Sharma</i>	3230
Climate change and waterpower – Reducing the impacts and adapting to a new reality <i>C.R. Donnelly, S. Bohrn, S. McGeachie & J. Groeneveld</i>	3245
Australian experience with application of Monte Carlo approach to extreme flood estimation <i>D.A. Stephens, M.J. Scolah, P.I. Hill & R.J. Nathan</i>	3261
Theme 5 – TAILINGS	3277
Design, construction, operation and closure for tailings dams; recent advancements and best practice.	
Thème 5 – BARRAGES DE RÉSIDUS MINIERS	3277
Conception, construction, exploitation et fermeture des barrages de stériles; avancées récentes et meilleures pratiques.	
Innovation in dams screening level risk assessment <i>F. Oboni, C. Oboni & R. Morin</i>	3279
Minimising the risk of tailings dams failures with remote sensing data <i>C. Goff, O. Gimeno, G. Petkovsek & M. Roca</i>	3295
Drainage and consolidation of mine tailings near waste rock inclusions <i>F. Saleh-Mbemba, M. Aubertin & G. Boudrias</i>	3296
Tailings dam operator training – 10 years on <i>D.M. Brett & M. Rankin</i>	3306
Safeguard embankment dam safety <i>R.C. Lo</i>	3311
Reducing the long term risk and enhancing the closure of tailings impoundments <i>A. Adams, C. Hall & K. Brouwer</i>	3330
Design and operating challenges at a TSF in a high altitude, desert setting in China <i>B.P. Wrench, F.W. Gassner & M. Platts</i>	3343
Static liquefaction analysis of the Fundão dam failure <i>G.A. Riveros & A. Sadrekarimi</i>	3354
Risk mitigation by conceptual design of a tandem of tailings dams <i>D. Stematiu & R. Sarghiuta</i>	3368
Application status and development trend of tailings pond on-line monitoring system in China <i>X. Liu, H. Zhou & J. Su</i>	3377
Research and development of real-time monitoring systems for mine tailings dams <i>L. Charlebois, S. Hui & C. Sun</i>	3386
Enhancement of contractive tailings using deep soil mixing technique at Kittilä mine <i>E. Masengo, M.R. Julien, P. Lavoie, T. Lépine, J. Nousiainen, J. Saukkoriipi, M. Piekkari & J. Karvo</i>	3396

Application of simplified/empirical framework to estimate runout from tailings dam failures <i>M. De Stefano, G. Nadarajah & D. Bleiker</i>	3410
Development of a preliminary risk assessment tool for a portfolio of TSFs with limited and uncollated data <i>R. Singh & J. Herza</i>	3420
Tailings dams in Romania <i>A. Abdulamit & M. Grozea</i>	3437
An operational perspective in the implementation of the new guidelines related to tailings management <i>M. Julien, E. Masengo, P. Lavoie & T. Lépine</i>	3447
Comparison of cyclic resistance ratios of tailings estimated using standard empirical methods and cyclic direct simple shear tests <i>G. Nadarajah, D. Bleiker & S. Sivathayalan</i>	3460
Maintenance of safety and reliability of high tailings dams in cold regions of Russia during the design phase <i>E. Bellendir, E. Filippova, O. Buryakov & A. Vakulenko</i>	3472
CDA technical bulletin on tailings dam breach analyses <i>V. Martin, M. Al-Mamun & A. Small</i>	3484
Responsible tailings management – global best practice guidance <i>C. Dumaresq & M. Davies</i>	3499
Staged emergency spillway development – design considerations <i>K.L Ainsley, B. Otis & E. Chong</i>	3512
Tailing management – current practice in Sweden <i>S. Töyrä, A. Bjelkevik, R. Sutton, L. Lindahl & J. Jonsson</i>	3520
Author-Index / Index des auteurs	3533
ICOLD Proceedings series	3541