

**Sunday, February 21, 3 - 4:30 p.m.**

### Modeling of Geotechnical Engineering Systems

140 Nonlinear Analysis for a Single Vertical Drain Including the Effects of Vacuum Preloading Considering the Compressibility and Permeability of the Soil, Xueyu Geng, University of Wollongong, Wollongong, New South Wales, Australia, Buddhima Indraratna, University of Wollongong, Wollongong, New South Wales, Australia, Cholachat Rujikiatkamjorn, University of Wollongong, Wollongong, New South Wales, Australia

270 Poromechanical Model for Freezing Soil, Xiong Yu, Case Western Reserve University, Cleveland, Ohio, Zhen Liu, Case Western Reserve University, Cleveland, Ohio

291 Limit Equilibrium of 2D and 3D Nonhomogeneous Loaded Ground Masses, Julio Martins, University of Minho, Braga, Portugal, Gaspar Machado, University of Minho, Guimaraes, Portugal, Helder Ribeiro, University of Minho, Guimaraes, Portugal

407 Numerical Study of Effect of Encasement on Stone Column Performance, Majid Khabbazian, University of Delaware, Newark, Delaware, Victor Kaliakin, University of Delaware, Newark, Delaware, Christopher Meehan, University of Delaware, Newark, Delaware

493 Development of Performance Upgrade Technique of Existing Rockfall Protection Fence, Shinichiro Tsuji, Gifu University, Gifu, Japan, Takashi Hara, Gifu University, Gifu, Japan, Atsushi Yashima, Gifu University, Gifu, Japan, Masaki Yoshida, Maeda Kosen Co., Ltd.,

743 Advances in Computational Limit State Analysis and Design, Matthew Gilbert, University of Sheffield, Sheffield, United Kingdom, Colin Smith, University of Sheffield, Sheffield, United Kingdom

### Characterization of Problematic Soils

70 New Developments in the Modeling and the Design of Geosynthetic Reinforcements of Platforms Subjected to Localized Sinkholes, Laurent Briancon, Conservatoire National des Arts Et Metiers, Paris, France, Pascal Villard, University Joseph Fourier, Grenoble, France, Bastien Chevalier, University Joseph Fourier, Grenoble, France

93 Experimental Study on Subsurface Erosion of Peats, Ming Xiao, California State University, Fresno, California, Jose Gomez, California State University, Fresno, California, Nathan Shwiyhat, California State University, Fresno, California, Exequiel Sinco, California State University, Fresno, California, Benjamin Adams, California State University, Fresno, California

200 Load Deformation Behavior of Drilled Shafts in Residual Soil, Hazem Sarhan, Sogreah Gulf, Dubai, United Arab Emirates

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**Characterization of Problematic Soils**

215 Study of Expansive Soil Behavior Using Low to Medium Frequency Electromagnetic Waves, Botao Lin, University of Oklahoma, Norman, Oklahoma, Amy Cerato, University of Oklahoma, Norman, Oklahoma

258 Equivalent Effective Stress in Unsaturated Fine Sand, Luis Vesga, Domeight Research Institute, Chino Hills, California

315 A Case History of Construction Induced Sinkholes, Wing Heung, PB Americas Inc., Ft. Lauderdale, Florida, Roger Gobin, PB Americas Inc., Ocoee, Florida

**Pile Foundations in Weak Soils**

183 Setup Prediction of Piles Driven into Louisiana Soft Clays, Jay Wang, Louisiana Tech University, Ruston, Louisiana, Neha Verma, Louisiana Tech University, Ruston, Louisiana, Ching Tsai, Louisiana Department of Transportation and Development, Baton Rouge, Louisiana, Zhongjie Zhang, Louisiana Transportation Research Center, Baton Rouge, Louisiana

398 Simulation of a Centrifuge Model Test of Pile Foundations in CDSM Improved Soft Clays, Karrthik Kirupakaran, University of Oklahoma, Norman, Oklahoma, Amy B. Cerato, University of Oklahoma, Norman, Oklahoma, Chunyang Liu, University of Oklahoma, Norman, Oklahoma, Gerald A. Miller, University of Oklahoma, Norman, Oklahoma, Kanthasamy K. Muraleetharan, University of Oklahoma, Norman, Oklahoma, Juan D. Pinilla, University of Oklahoma, Norman, Oklahoma, Sean Price, University of Oklahoma, Norman, Oklahoma, Zachary M. Thompson, University of Oklahoma, Norman, Oklahoma,

441 An Innovative Prefabricated Pile Installation Method Utilizing Jetting and Pressure Grouting, Michael McVay, University of Florida, Gainesville, Florida, David Bloomquist, University of Florida, Gainesville, Florida, Peter Lai, Florida Department of Transportation, Tallahassee, Florida, Heath Forbes, S&ME Inc., Charleston, South Carolina

531 Increased Lateral Resistance of Pile Group in Clay Using Compacted Fill, Kyle Rollins, Brigham Young University, Provo, Utah, Jeffrey Snyder, BBC&M Engineering, Inc., Valley View, Ohio, Matthew Walsh, Precision Systems Engineering, Salt Lake City, Utah

549 Design Challenges of a NYC Waterfront Development, Jan Cermak, Mueser Rutledge Consulting Engineers, New York, New York, Logan Brant, Mueser Rutledge Consulting Engineers, New York, New York

626 Characterizing Lateral Load Behavior of a Pile in Improved Soils Surrounded by Soft Clay using the Winkler Analysis Concept, Sri Sritharan, Iowa State University, Ames, Iowa, Jinwei Huang, Iowa State University, Ames, Iowa

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### **Tunnels**

27 Nonlinear Analysis of Tunneling Effects on Buildings using Macro-elements, Itai Elkayam, Technion - Israel Institute of Technology, Haifa, Israel, Assaf Klar, Technion - Israel Institute of Technology, Haifa, Israel

421 Risk Assessment of the Voids Behind the Lining of Mountain Tunnels, Jifei Wang, Civil Engineering, Shanghai, People's Republic of China, Hongwei Huang, Civil Engineering, Shanghai, People's Republic of China, Xiongyao Xie, Civil Engineering, Shanghai, People's Republic of China

596 Centrifuge Modeling of Face Excavation in Tunnels with a Deformable Lining, John McCartney, University of Colorado at Boulder, Boulder, Colorado, Herbert Walker, University of Colorado at Boulder, Boulder, Colorado, Charles Coccia, University of Colorado at Boulder, Boulder, Colorado, Hon-Yim Ko, University of Colorado at Boulder, Boulder, Colorado

656 Three-dimensional FEM Analysis of Large Cross-section Tunnel in Collapsible Loess Constructed by CRD Method, Fu-Chun Xue, Southwest Jiaotong University, Chengdu, Sichuan, People's Republic of China, Jian-Lin Ma, Southwest Jiaotong University, Chengdu, Sichuan, People's Republic of China, Liping Yan, Los Angeles Department of Water and Power, Los Angeles, California, Yong-Ming Zhao, China Railway 23th Bureau Group Co., Ltd., Chengdu, Sichuan, People's Republic of China

761 Shallow NATM Tunnel with Advancing Face Support: Numerical Analysis with Hypoplastic Model, Xue-tao Wang, Institute of Geotechnical Engineering, Vienna Austria, Wei Wu, Institute of Geotechnical Engineering, Vienna Austria, Johann Brueckl, Institute of Geotechnical Engineering, Vienna Austria

784 Health Monitoring of Tunnel Shotcrete Lining using Nondestructive Testing Methods, Gye-Chun Cho, Korea Advanced Institute of Science and Technology, Daejeon, Republic of Korea, Ki-Il Song, University Technology MARA, Selangor, Malaysia

### **Geotechnical Engineering Education**

129 A Project-Based Introductory Geotechnical Laboratory Course, William A. Kitch, California State Polytechnic University, Pomona, California, Donald P. Coduto, California State Polytechnic University, Pomona, California

301 Teaching with Case Histories through Critical Thinking, Joseph Hagerty, University of Louisville, Louisville, Kentucky

404 Reinvigorating Geology Through Hands-on and Case-based Learning, Andrea Welker, Villanova University, Villanova, Pennsylvania

408 The Use of Term Paper Projects to Learn Geo-Engineering, Christopher Swan, Tufts University, Medford, Massachusetts

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**Geotechnical Engineering Education**

545 Geoengineering and Refereed Journals: A Survey, Dimitrios Zekkos, University of Michigan, Ann Arbor, Michigan

716 Using Modern Sensors in High School Science Labs to Promote Engineering Careers, Maged Iskander, Polytechnic Institute of New York University, Brooklyn, New York, Vikram Kapila, Polytechnic Institute of New York University, Brooklyn, New York, Noel Kriftcher, Polytechnic Institute of New York University, Brooklyn, New York

**Slopes**

83 A Slope Stability Case Study by Limit Equilibrium and Finite Element Methods, Lei Wei, HNTB Corp., Therese Koutnik, HNTB Corp., Mark Woodward, U.S. Army Corps of Engineers, New Orleans District, New Orleans, Louisiana

216 Rational Analysis of Slope Stabilization with Piers and Determination of Unfactored Pier Load, Daniel R. Vanden Berge, P.E., M.ASCE, EDP Consultants, Inc., Kirtland, Ohio, Alan J. Esser, P.E., M.ASCE, EDP Consultants, Inc., Kirtland, Ohio

222 Stability Analyses for a Landfill Experiencing Elevated Temperatures, Kamran Akhtar, University of Illinois, Urbana, Illinois, Timothy D. Stark, University of Illinois, Urbana, Illinois, Manzoor Hussain, University of Illinois, Urbana, Illinois

375 Wave-induced Failure of Soft Cliff and Its Evaluation, Shima Kawamura, Muroran Institute of Technology, Muroran, Japan, Seiichi Miura, Hokkaido University, Sapporo, Japan

463 Deterministic Landslide Hazard Assessment at Regional Scale, Piernicola Lollino, National Research Council, Bari, Italy, Federica Cotecchia, Technical University of Bari, Bari, Italy, Francesca Santaloia, National Research Council, Bari, Italy, Claudia Vitone, Technical University of Bari, Bari, Italy, Giuseppina Mitaritonna, Technical University of Bari, Bari, Italy

506 Reduction in Factor of Safety for Various Landslide Repair Works with Earthquake Induced Ground Shaking, Binod Tiwari, California State University, Fullerton, Fullerton, California, Osiel Jaime, California State University, Fullerton, Fullerton, California, Dinesh Shrestha, California State University, Fullerton, Fullerton, California

**Geoenvironmental Processes for Soil Remediation and Geohazard Mitigation**

351 An Experimental Setup for Electromagnetic Stimulation of Air Sparging, Arvin Farid, Boise State University, Boise, Idaho, Jim Browning, Boise State University, Boise, Idaho, Harlan Sangrey, Boise State University, Boise, Idaho

405 Comparative Assessment of Contaminant Sorption in Lateritic Soil - Bentonte Mixtures, Kolawole Osinubi, Ahabadu Bello University, Zaria, Kaduna, Nigeria, Agapitus Amadi, Federal University of Technology, Minna, Niger, Nigeria,

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**Geoenvironmental Processes for Soil Remediation and Geohazard Mitigation**

422 Binder Stabilization of Oily Refinery and Dredged Marine Sediments. Part 2: Pilot Tests and Full Scale Implementation Approach, Kristof Fabian, Arcadis, Seattle, Washington, Vito Schifano, Arcadis, Seattle, Washington, John DeJong, Arcadis, Seattle, Washington

424 Binder Stabilization of Oily Refinery and Dredged Marine Sediments. Part 1: Laboratory Tests, Vito Schifano, Arcadis, Seattle, Washington, Kristof Fabian, Arcadis, Seattle, Washington

505 A Feasibility Study on Reducing Flowability of Vacuum Tower Bottoms using Aggregate, Jie Han, The University of Kansas, Lawrence, Kansas, Cheng Lin, The University of Kansas, Lawrence, Kansas

636 Probabilistic Design and Cost Assessment for a Deep Geologic Repository, Lee Petersen, CAN Consulting Engineers, Minneapolis, Minnesota, Gary Kramer, Hatch Mott MacDonald, Inc., Mississauga, Ontario, Canada, Richard Heystee, Nuclear Waste Management Organization, Toronto, Ontario, Canada

**Non-Destructive Technologies for Geo-Materials and Infrastructure Assessment**

17 Living With Deep Foundation Defects, Edward Ulrich, Jr., Ulrich Engineers, Inc., Houston, Texas

76 Non-destructive Test to Measure Pollutant Transport Into Landfill Liners, Abdelillah Bezzar, Tlemcen University, Tlemcen, Algeria, Fouad Ghomari, Tlemce University, Tlemcan, Algeria

154 Mapping Soft-Soil Zones and Top-of-Bedrock Beneath High Traffic Areas in Honolulu Using 2D ReMi, Phil Sirles, Zonge International, Inc., Lakewood, Colorado, Zoran Batchko, PB Americas, Los Angeles, California

366 Site Characterization and Modeling for an Underground Water Storage Tank, Thoms Chapel, Tetra Tech, Inc., Fort Collins, Colorado, Douglas Laymon, Tetra Tech, Inc., Austin, Texas

459 The Effect of Water Content on Light Weight Deflectometer Measurements, Faraz S. Tehrani, University of Delaware, Newark, Delaware, Christopher L. Meehan, University of Delaware, Newark, Delaware

512 Evaluation of Stiffness and Void Ratio by Field Velocity Probe in Soft Soils, Hyung-Koo, Korea University, Republic of Korea, Soon-Hyuck, Korea University, Republic of Korea, Sung-Jin Hong, Korea University, Republic of Korea, Jong-Sub Lee, School of Civil, Environmental and Architectural Engineering, Korea University, Republic of Korea

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### Numerical Modeling of Discontinuous Rock Masses

67 Fracture and Fragmentation of Rock Subjected to Uniaxial Cyclical Loading, Dr. Manoj Bagde, Central Institute of Mining and Fuel Research, Nagpur, Maharashtra, India,

178 Rock Catchment Area Design Charts, Lysandros Patelidis, Technological Educational Institute of Thessaloniki, Greece

241 Load Transfer to Micropile Rock Socket, Issa Oweis, Oweis Engineering Inc., Jeaan Hwang, Oweis Engineering Inc.

355 Analysis of Mine Subsidence Below Landfills, Shahriyar Baig, American Electric Power, Columbus, Ohio, Timothy Stark, University of Illinois, Urbana, Illinois, Erik Newman, University of Illinois, Urbana, Illinois, Pedro Amaya, American Electric Power, Columbus, Ohio

358 Rock Slope Stability Modeling, Osman Pekin, Camp Cresser & McKee Inc., Irvine, California

418 Prediction of Side Resistance in Poor Quality Rock: RQD vs. GSI, Arlan Rippe, Kleinfelder, Beaverton, Oregon, Scott Mackiewicz, Kleinfelder, Beaverton, Oregon

### Characterization of Problematic Soils

349 A Case History of Pile Foundation Remediation for Karst Activity, Roger Gobin, PB Americas, Orlando, Florida, Heung Wing, PB Americas, Ft. Lauderdale, Florida

373 Modeling and Numerical Analysis of Expansive Soil in Stress Path Tests, Dr. Nurul Islam, Rajshahi University of Engineering & Technology, Rajshahi, Bangladesh, Syed Mofiz, Rajshahi University of Engineering & Technology, Rajshahi, Bangladesh

394 Laboratory Performance Evaluation of Stabilized Sulfate Containing Soil with Lime and Class C Fly Ash, Joakim G. Laguros, The University of Oklahoma, Norman, Oklahoma, Dharamveer Singh, The University of Oklahoma, Norman, Oklahoma, Rouzbeh Ghabchi, The University of Oklahoma, Norman, Oklahoma, Musharraf Zaman, The University of Oklahoma, Norman, Oklahoma

413 Influence of Lime Dosage on Stabilization Effectiveness of Montmorillonite Dominant Clays, Anand Puppala, The University of Texas at Arlington, Arlington, Texas, Aravind Pedarala, The University of Texas at Arlington, Arlington, Texas, Srinivas Chittoori, Parsons and Brinckerhoff Americas Inc., Laureano Hoyos, The University of Texas at Arlington, Arlington, Texas, Sireesh Saride, The University of Texas at Arlington, Arlington, Texas

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**Characterization of Problematic Soils**

466 Stiffness Response of Residual and Saprolitic Soils Using Resonant Column and Bender Element Testing Techniques, Laureano Hoyos, University of Texas at Arlington, Arlington, Texas, Jorge Arturo Pineda, University of Texas at Arlington, Arlington, Texas, Julio Esteban Colmenares, National University of Colombia, Colombia

476 Characterization of Problematic Expansive Soils from Mineralogical and Swell Characterization Studies, Muawia Dafalla, King Saud University, Riyadh, Saudi Arabia, Anand Puppala, University of Texas at Arlington, Arlington, Texas, Mosleh Al-Shamrani, King Saud University, Riyadh, Saudi Arabia, Mutaz E, King Saud University, Riyadh, Saudi Arabia

**Site Characterization by Surface Wave Method**

46 Optimum MASW Survey-Revisit after a Decade of Use, Choon Park, Park Seismic LLC, Shelton, Connecticut, Mario Carnevale, Hager GeoScience, Inc., Woburn, Massachusetts

57 Characteristic Shear Velocity Profiles for Predominant Sediment Fill Units in the Las Vegas Basin, Jeff Wagoner, Lawrence Livermore National Laboratory, Livermore, California, Barbara Luke, UNLV, Las Vegas, Nevada Helena Murvosh, Stanley Consultants, Wanda Taylor, UNLV, Las Vegas, Nevada

144 Shallow Marine MASW: A Case History and Lessons Learned, JB Shawver, Zonge, Alex Fisher, FMG Engineering, Choon Park, Park Seismic

294 Joint Use of Surface-wave Method and Resistivity Method for Safety Assessment of Levee Systems, Koichi Hayashi, OYO Corporation, Tsukuba, Ibaraki, Japan, Chisato Konishi, OYO Corporation, Tsukuba, Ibaraki, Japan

395 MASW Survey Identifies Causes of Sink Activity Along I-476 (Blue Route), Montgomery County, Pennsylvania, Richard Lee, Quantum Geophysics, Phoenixville, Pennsylvania, Paula Callahan, Pennsylvania Department of Transportation, King of Prussia, Pennsylvania, Bruce Shelly, AECOM USA, Inc., Philadelphia, Pennsylvania, Ayub Iqbal, Applied Geosciences and Engineering, Inc., Reading, Pennsylvania, Gary Kribbs, Aeon Geosciences, Havertown, Pennsylvania

478 Improving MASW Results for a Site with Shallow Bedrock Through the Use of Higher-Mode Data, Daniel W. Casto, Technos, Inc., Doral, Florida, Carlos Calderon-Macias, ION-GX Technology, Houston, Texas, Barbara Luke, University of Las Vegas, Las Vegas, Nevada, Ronald Kaufmann, Technos, Inc., Doral, Florida

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### Reinforced Soil Slopes and Walls

7 A Case History of MSE Wall Failure: Finite Element Modeling and Evaluation, Sujit Bhowmik, Willmer Engineering Inc., Atlanta, Georgia, James Willmer, Willmer Engineering, Inc., Atlanta, Georgia, Duhwan Kim, Willmer Engineering, Inc., Atlanta, Georgia

30 Evaluation of Kinematic Constraints Based Method for Reinforced Soil Walls, Assaf Klar, Technion - Israel Institute of Technology, Haifa, Israel, Tal Sas, Technion - Israel Institute of Technology, Haifa, Israel

114 Numerical Simulation of the Failure of Dense Sand Reinforced with a Smooth Brass Plate in Plane Strain Compression, Yan-Bo Cao, Tongji University, Shanghai, People's Republic of China, Fang-Le Peng, Tongji University, Shanghai, People's Republic of China, Yong Tan, Tongji University, Shanghai, People's Republic of China, M.S.A. Siddiquee, University of Science and Engineering, Bangladesh

520 Simplified Method of Design of Nailed Soil Wall, M. Muthukumar, Anna University, Chennai, Tamilnadu, India, Premalatha Krishnamurthy, Anna University, Chennai, Tamilnadu, India, K. Sundarapandian, Anna University, Chennai, Tamilnadu, India

537 A Model for Rockfall Protection Structures Based on a Multi-scale Approach, Franck Bourrier, L3S-R, Philippe Gotteland, L3S-R, Francois, Nicot, Cemagref - UR ETGR, Stephane Lambert, Cemgref - UR ETGR

557 Finite Element Simulation of Strip Footing Resting on Double Faced Wrap-Around Reinforced Soil Walls, Anubhav, Indian Institute of Technology, Kanpur, Kanpur, U.P., India, P.K. Basudhar, Indian Institute of Technology, Kanpur, Kanpur, U.P., India

### Deep Foundations I

35 Effects of Soil Improvement by Mass Mixing on the Lateral Capacity of Pile Group using Finite Element Method, Zhao, Cheng, Earth Mechanics, Inc., Oakland, California, Hubert Law, Earth Mechanics, Inc., Fountain Valley, California, Kyle Rollins, Brigham Young University, Provo, Utah

53 An Artificial Neural Network Approach for Prediction of Dynamic Pile-Soil-Pile Interaction under Vertical Motion, Sarat Kumar Das, National Institute of Technology Rourkela, Orissa, India, Bappaditya Manna, National Institute of Technology Rourkela, Orissa, India Dilip Kumar Baidya, Indian Institute of Technology Kharagpur, West Bengal, India

230 Predicting Non-linear Response of Laterally Loaded Pile Groups via Simple Solutions, Wei Dong Guo, Griffith University, Gold Coast, Queensland, Australia

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**Deep Foundations I**

414 Studies on Short Drilled Shaft Failures in Clayey Soils in Cold Environment, Anand Puppala, The University of Texas at Arlington, Arlington, Texas, Thornchaya Wejrungsikul, The University of Texas at Arlington, Arlington, Texas, Richard Williammee, The University of Texas at Arlington, Arlington, Texas, Thomas Witherspoon, Consulting Engineer, Nicasio Lozano, Texas Department of Transportation

572 Numerical Modeling of Rammed Aggregate Pier Construction, Mark Thompson, CH2M Hill, Bellevue, Washington, Muhannad Suleiman, Lafayette College, Easton, Pennsylvania

735 Jet Grouting and Soil Mixing for Increasing Lateral Pile Group Resistance, Kyle Rollins, Brigham Young University, Provo, Utah, Dan Brown, Dan Brown and Associates, Sequatchie, Tennessee, Mathew Adsero, Exxon Mobil Development Co., Houston, Texas, Mark Herbst, Exxon Mobil Pipeline Co., Houston, Texas

**Slopes**

518 Analysis of Landslide Reactivation Mechanisms in Daunia Clay Slopes by Means of Limit Equilibrium and FEM Methods, Piernicola Lollino, National Research Council, Bari, Italy, Federica Cotecchia, Technical University of Bari, Bari, Italy, Gaetano Elia, Technical University of Bari, Bari, Italy, Giuseppina Mitaritonna, Technical University of Bari, Bari, Italy

580 Examination of Simplified Displacement-Based Methods for Dynamic Analyses of Slopes, Christopher Meehan, University of Delaware, Newark, Delaware, Farshid Vahedifard, University of Delaware, Newark, Delaware

670 Evaluation of a Complex Landslide by Means of a 3D Geotechnical Model, Camilo Marulanda, INGETEC S.A, Bogota, Colombia, Fabio Amaya, INGETEC S.A, Bogota, Colombia, William Ruiz, INGETEC S.A, Bogota, Colombia, Ramiro Gutierrez, INGETEC S.A, Bogota, Colombia

732 A Case Study on Geomorphological Characteristics of Cut Slope Failure in Soksil District, Korea, Seung Hyun Kim, Korean Institute of Construction Technology, Goyang City, Republic of Korea, Jong Hyun Rhee, Korean Institute of Construction Technology, Goyang City, Republic of Korea, Ho Bon Koo, Korean Institute of Construction Technology, Goyang City, Republic of Korea, Jung Yup Lee, Korean Institute of Construction Technology, Goyang City, Republic of Korea

748 Use of Properly Designed Flexible Barriers to Mitigate Debris Flow Natural Hazards, Frank Amend, Geobrugg North America, Rocky Mount, North Carolina

780 Drained Residual Strength for Landslides, Timothy Stark, University of Illinois, Urbana, Illinois, Manzoor Hussain, American Society of Civil Engineers

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### Earthquake Engineering

37 SCOP Gaining Permission for Explosive Blasting Near Cultural Resources on Bureau of Reclamation Lands, Indradeep Banerjee, CH2M Hill Inc., Jim Devlin, Clean Water Coalition, Robert Law, CH2M Hill Inc.

78 Aseismic Design Charts for Rigid Retaining Walls, Alex Wu, HNTB Corp., Shamsheer Prakash, Missouri University of Science and Technology, Rolla, Missouri

277 Analysis of the Effects of Soil Behavioral Law on the Transfer and Impedance Functions in Soil-pile Interaction Models, Kamran Panaghi, University, Iran, Ahmad Mahboubi, University, Iran

362 Centrifuge Testing of Segmental Geosynthetic-Reinforced Soil Retaining Walls Subject to Modest Seismic Loading, Huabei Liu, City College of New York, New York, New York, Xiangyu Wang, Tsinghua University, Beijing, People's Republic of China, Erxiang Song, Tsinghua University, Beijing, People's Republic of China

432 Application of Interpolation methods for Peak Ground Acceleration Estimation in Emergency Management of Metropolises, Mohammad Reza Ghayamghamian, International Institute of Earthquake Engineering and Seismology, Tehran, Iran, Ali Komak Panah, University of Tarbiat Modares, Tehran, Iran, Reza Behroo, University of Tarbiat Modares, Tehran, Iran, Naimeh Govahi, International Institute of Earthquake Engineering and Seismology, Tehran, Iran

448 Dynamic Response of Pile Foundation in Partially Saturated Soils, Nadarajah Ravichandran, Clemson University, Clemson, South Carolina, Krishnapillai Hadakopan, Clemson University, Clemson, South Carolina

### LRFD and Partial Factor Design

71 Model Uncertainties in "Terzaghi and Peck" Methods for Estimating Settlement of Footings on Sand, Sami Akbas, Gazi University, Ankara, Turkey, Fred H. Kulhawy, Cornell University, Ithaca, New York

160 Calibrating Resistance Factors of Single Bored Piles Based on Incomplete Load Test Information, Jianye Ching, National Taiwan University, Taipei, Taiwan, Hord-Da Lin, National Taiwan University of Science and Technology

204 Reliability-based Analysis of Strip Footings Subjected to an Inclined or an Eccentric Loading, Dalia Youssef Abdel Massih, CNRS Lebanon, Bhanes, Lebanon, Abdul-Hamid Soubra, University of Nantes, Saint-Nazaire, France, Nut Mao, University of Nantes, Saint-Nazaire, France

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**LRFD and Partial Factor Design**

342 A Reliability-Based Approach for the Design of Spread Footings on Granular Soils, Shadi Najjar, American University of Beirut, Beirut, Lebanon, Salah Sadek, American University of Beirut, Beirut, Lebanon

374 LRFD Resistant Factors Including the Influence of Pile Setup for Design of Steel Pile Using WEAP, Kam Weng Ng, Iowa State University, Ames, Iowa, Sri Sritharan, Iowa State University, Ames, Iowa, Muhannad T. Suleiman, Layayette College, Easton, Pennsylvania

543 Incorporating Geostatistical Aspects in LRFD Design for Deep Foundations, Harald Klammler, University of Florida, Gainesville, Florida, Michael McVay, University of Florida, Gainesville, Florida, Peter Lai, Florida Department of Transportation, Florida, David Horhota, Florida Department of Transportation, Florida

**Microscale Properties to Macroscale Behavior of Engineered Soils**

53 Bacteria Help to Change Soil Properties, John Lambert, Deltares, Delft, Netherlands, Maaïke Blauw, Deltares, Delft, Netherlands, Marie-Noelle Latil, Deltares, Delft, Netherlands, Kent Novakowski, Queen's University, Kingston, Ontario, Canada, Lesley Knight, Queen's University, Kingston, Ontario, Canada, L. Bayona, Queen's University, Kingston, Ontario, Canada

306 Settlement Behavior of Compacted Soils Containing a Small Amount of Organic Matter, Tariq Hamid, GeoConcepts Engineering, Inc., Ashburn, Virginia, Paul Burkart, GeoConcepts Engineering, Inc., Ashburn, Virginia

542 Influence of Ionic Concentration and Internal Porosity on the Behavior of Diatom-Clay Mixtures, Angelica Palomino, Penn State University, University Park, Pennsylvania, Dante Fratta, University of Wisconsin-Madison, Madison, Wisconsin, Sungho Kim, Penn State University, University Park, Pennsylvania, Alex Summitt, University of Wisconsin-Madison, Madison, Wisconsin

581 Analysis of Particle Shape Using Fractals, Luis Vesga, Domeight Research Institute, Chino Hills, California, Luis Vallejo, University of Pittsburgh, Pennsylvania

744 Behavior of Sand-Rubber Mixtures According to Strain Level, Jong-Sub Lee, Department of Civil, Environmental and Architectural Engineering, Korea University, Seoul, Republic of Korea, Changho Lee, Georgia Institute of Technology, Atlanta, Georgia, Yong-Hoon Byun, Korea University, Seoul, Republic of Korea

772 Meso-scale Heterogeneity Effects on Excess Pore Water Pressure Dissipation, Hyun-Ki Kim, Kookmin University, Seoul, Republic of Korea, Jung-Ryal Kim, Kookmin University, Seoul, Republic of Korea

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[Linkins Panel Discussion](#)

[Clyde Baker Symposium I](#)

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[Physico-Chemical Response of Soils](#)

139 Effect of Alkali Solution on Swell Behaviour of Soils With Different Mineralogy, Hariprasad Reddy, National Institute of Technology, Warangal, Andhra Pradesh, India, Sivapullaiah Puwadi, Indian Institute of Science, Bangalore, Karnataka, India,

305 An Assessment of Soil Parameters Governing Soil Strength Increases with Chemical Additives, Nick Hussey, University of Oklahoma, Norman, Oklahoma, Amy Cerato, University of Oklahoma, Norman, Oklahoma, Jacob Grasmick, University of Oklahoma, Norman, Oklahoma, Eric Holderby, University of Oklahoma, Norman, Oklahoma, Wassim Tabet, University of Oklahoma, Norman, Oklahoma, Gerald Miller, University of Oklahoma, Norman, Oklahoma

562 Laboratory-prepared Iron Oxide Coatings on Coarse-grained Soils as Residual Soil Simulants, Joan M. Larrahondo, Georgia Institute of Technology, Atlanta, Georgia, Susan E. Burns, Georgia Institute of Technology, Atlanta, Georgia, W. Crawford Elliott, Georgia State University, Atlanta, Georgia

747 Revealing Fluoride Contaminated Aquifers in Hard Rock Terrain using Electrical Resistivity and Induced Polarization (IP) Methods, Nepal Mondal, National Geophysical Research Institute (Council of Scientific & Industrial Research), Hyderabad, Andhra Pradesh, India, Presently at BAEN, Texas A & M University, College Station, Texas, Ananda Rao, National Geophysical Research Institute (Council of Scientific & Industrial Research), Hyderabad, Andhra Pradesh, India, Vijay Singh, Texas A&M University, College Station, Texas

[Micromechanical Modeling of Granular Materials Including Crushing](#)

206 Static Fatigue Produces Time Effects in Granular Materials, Hamid Karimpour, The Catholic University of America, Washington, DC, Poul Lade, The Catholic University of America, Washington, DC

356 Grain Shape Quantifications and their Relationship to Dilatancy, Melissa Cox, URS Corporation, San Diego, California, Muniram Budhu, University of Arizona, Tucson, Arizona

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**Micromechanical Modeling of Granular Materials Including Crushing**

499 Measurement of the Abrasion of Granular Materials Using Fractals, Luis Vallejo, University of Pittsburgh, Pittsburgh, Pennsylvania, Zamri Chik, University of Malaysia, Selangor D.E., Malaysia

443 Crushing of Particles Under Static and Simulated Centrifuge Forces, Seastian Lobo-Guerrero, A.G.E.S., Inc., Luis Vallejo, University of Pittsburgh, Pittsburgh, Pennsylvania

**Site Characterization by Surface Wave Method**

527 A Comparison of Linear-Array Surface Wave Methods at a Soft Soil Site in the Mississippi Embayment, Brady Cox, University of Arkansas, Fayetteville, Arkansas, Clinton Wood, University of Arkansas, Fayetteville, Arkansas

564 The Use of Higher Modes in Surface Wave Testing, Mourad Karray, Universite de Sherbrooke, Sherbrooke, Quebec, Canada, Guy Lefebvre, Universite de Sherbrooke, Sherbrooke, Quebec, Canada

619 Towards Non-contact Surface Wave Testing of Subsonic Soil Layers Using Microphones, Nils Ryden, Lund University, Lund, Sweden

773 Multiple Impact Surface Waves (MISW) – Improved Accuracy for Pavement System Thicknesses and Moduli vs. Spectral Analysis of Surface Waves (SASW), Larry Olson, Olson Engineering, Inc., Wheat Ridge, Colorado, Patrick Miller, Olson Engineering, Inc., Wheat Ridge, Colorado

**Reliability I: Applications of Risk Analyses for Civil Infrastructures**

235 Dynamic Risk Management System for Large Project Construction in China, Hong-bo Zhou, Shanghai Jianke Project Management Co., Ltd., People's Republic of China, Hui Zhang, Shanghai Jianke Project Management Co., Ltd., People's Republic of China

353 Safety Assessment of Quake Lakes, Xingguo Yang, State Key Laboratory of Hydraulics and Mountain River Engineering, Sichuan University, Chengdu, Sichuan, People's Republic of China, Hongwei Zhou, College of Hydraulic and Hydroelectric Engineering, Sichuan University, Chengdu, Sichuan, People's Republic of China, Hongtao Li, College of Hydraulic and Hydroelectric Engineering, Sichuan University, Chengdu, Sichuan, People's Republic of China, Zhaohui Yang, University of Alaska, Anchorage, Alaska, Lu Qiao, College of Hydraulic and Hydroelectric Engineering, Sichuan University, Chengdu, Sichuan, People's Republic of China, Yuanyuan Lin, College of Hydraulic and Hydroelectric Engineering, Sichuan University, Chengdu, Sichuan, People's Republic of China

**Monday, February 22, 3:30 - 4:30 p.m.**

**Reliability I: Applications of Risk Analyses for Civil Infrastructures**

388 Geotechnical Baseline Reports for Foundation Projects, Elizabeth Dwyre, Parsons Brinckerhoff, Indianapolis, Indiana, Zoran Batchko, Parsons Brinckerhoff, Orange, California, Raymond Castelli, Parsons Brinckerhoff, New York, New York

494 Probabilistic Analysis of Slope Stability of Earth Dams During Rainfall Infiltration, Qun Chen, Sichuan University, Chengdu, People's Republic of China, Min Tang, Guodian Dadu River Zhentou Dam Hydropower Construction Co. Ltd., Leshan, People's Republic of China

**Shallow Foundations**

43 Full-scale Field Verification of Vibro-replacement Ground Improvement for Improving Static and Seismic Shallow Foundation Performance, James Tanner Blackburn, Hayward Baker Inc., Odenton, Maryland, Joseph Cavey, Hayward Baker Inc., Odenton, Maryland, Kevin Wikar, Hayward Baker, Inc., Odenton, Maryland, Michael Demcsak, Lippincott & Jacobs Consulting Engineers, Riverside, New Jersey

248 Part I: A Generalized Formulation of Continuum Models for Elastic Foundations, Asrat Worku, Addis Ababa University, Addis Ababa, Ethiopia

250 Part II: Application of Newly Derived and Calibrated Continuum Subgrade Models in the Analysis of Beams on Elastic Foundations, Asrat Worku, Addis Ababa University, Addis Ababa, Ethiopia, Yimer Degu, Bahir Dar University, Bahir Dar, Amhara, Ethiopia

446 Verification of the Load Transfer Mechanism of Geocell Reinforced Soil in Large Scale Model Tests and In-situ Test Fields, Ansgar Emersleben, Clausthal University of Technology, Clausthal-Zellerfeld, Germany, Norbert Meyer, Clausthal University of Technology, Clausthal-Zellerfeld, Germany

**Non-Destructive Technologies for Geo-Materials and Infrastructure Assessment**

534 Relationships between Compression Wave Velocity and Unconfined Compression Strength for Weathered Florida Limestone, Nick Hudyma, University of North Florida, Jacksonville, Florida, Ariel Sarno, University of North Florida, Jacksonville, Florida, Raoaa Farah, University of North Florida, Jacksonville, Florida, Dennis R. Hiltunen, University of North Florida, Jacksonville, Florida

618 A Smart Health Monitoring System for the New I-10 Twin Span Bridge over Lake Pontchartrain, Murad Abu-Farsakh, Louisiana State University, Baton Rouge, Louisiana, Sungmin Yoon, LADOTD, Allen Marr, Geocomp, Da Ha, Geocomp, Zhongjie, Zhang, LTRC, Ching Tsai, LADOTD

**Monday, February 22, 3:30 - 4:30 p.m.**

**Non-Destructive Technologies for Geo-Materials and Infrastructure Assessment**

621 Motion Sensors for Scour Monitoring: Laboratory Experiment with a Shallow Foundation, Jean-Louis Briaud, Texas A&M University, College Station, Texas, Congpu Yao, Texas A&M University, College Station, Texas, Colin Darby, Texas A&M University, College Station, Texas, Ok-Youn Yu, Texas A&M University, College Station, Texas, Stefan Hurlebaus, Texas A&M University, College Station, Texas, Kuang-An Chang, Texas A&M University, College Station, Texas, Jerry Price, ETI Sensors, Beatrice Hunt, STV Inc.

753 Integrating Multiple Subsurface Exploration Technologies in Slope Hydrogeologic Investigation: A Case Study in Taiwan, Shih-Meng Hsu, Sinotech Engineering Consultants, Inc., Taiwan, Hung-Chieh Lo, Sinotech Engineering Consultants, Inc., Taiwan, C.Y. Ku, National Taiwan Ocean University, Taiwan, S.Y. Chi, Sinotech Engineering Consultants, Inc., Taiwan, D. Isaac Jeng, Sinotech Engineering Consultants, Inc., Taiwan

**Reliability II: Random Fields: Modelling, Estimation, Simulation, and Design**

378 A New 2D Failure Mechanism for Face Stability Analysis of a Pressurized Tunnel in Spatially Variable Sands, Guilhem Mollon, INSA Lyon, Universite de Lyon, Villeurbanne, France, Kok Kwang Phoon, National University of Singapore, Singapore, Daniel Dias, INSA Lyon, Universite de Lyon, Villeurbanne, France, Abdul-Hamid Soubra, Universite de Nantes, Saint Nazaire, France

486 Random Fields for Site Response Analysis, Gonzalo A. Montalva, University of Concepcion, Chile, Pullman, Washington, Adrian Rodriguez-Marek, Washington State University, Pullman, Washington

555 The Importance of the Spatial Variability of Geotechnical Properties for Numerical Models of Downhole Seismic Arrays, Eric Thompson, Tufts University, Medford Massachusetts, Laurie Baise, Tufts University, Medford, Massachusetts

777 Reliability Analyses of Slopes Incorporating Head and Flow Anisotropy as Random Variables, Margela Shirley, Department of Geology & Geophysics, Boston College, West Roxbury, Massachusetts, Alfredo Urzua, Prototype Engineering, Winchester, Massachusetts, John Christian, Consulting Engineer, Waban, Massachusetts

**Dam Design and Construction**

298 Case History: Finite Element Analysis of Time Dependent Settlement of Lake Jessup Bridge Embankment in Central Florida, Amr Sallam, Nodarse & Associates, Inc., Winter Park, Florida, Jim Jammal, Nodarse & Associates, Inc., Winter Park, Florida

350 Risk Analysis of Tangjiashan Landslide Dam, Ming Peng, Hong Kong University of Science and Technology, Ming Peng, Hong Kong University of Science and Technology, Hong Kong, People's Republic of China, Limin Zhang, Hong Kong University of Science and Technology, Hong Kong, People's Republic of China

**Monday, February 22, 3:30 - 4:30 p.m.**

**Dam Design and Construction**

528 Raising a Rattlesnake: Rattlesnake Hollow Ash Pond Dam Crest Raise, James Pegues, Southern Company, Birmingham, Alabama

755 Stability Analysis of Fault Rock Heterogeneity on the Left Pressure Shaft Collapse of Siah Bisheh Dam, North Iran, Hossein Hassani, Amirkabir University of Technology, Tehran, Iran, Shobier Arshadnejad, Azad University, Mahalat, Iran, Hamid Sarkheil, Amirkabir University of Technology, Tehran, Iran

**Soil Improvement / Walls**

243 Embedding Sustainability into Geotechnics, Daniella Holt, The University of Birmingham, Colchester, United Kingdom, D. Ian Jefferson, The University of Birmingham, Colchester, United Kingdom, Peter Braithwaite, The University of Birmingham, Colchester, United Kingdom, Dr. David Chapman, The University of Birmingham, Colchester, United Kingdom

539 Modeling Soil-pile Interaction Under Axial Loading Using a Bilinear Mohr-Coulomb Based Model, Francisco Flores, Instituto de Ingenieria, UNAM, Distrito Federal, Mexico, Juan Mayoral, Instituto de Ingenieria, UNAM, Distrito Federal, Mexico, Manuel Mendoza, Instituto de Ingenieria, UNAM, Distrito Federal, Mexico, Miguel Romo, Instituto de Ingenieria, UNAM, Distrito Federal, Mexico, Enrique Ibarra, Instituto de Ingenieria, UNAM, Distrito Federal, Mexico

593 Forensic Analysis of an Excavation Bracing System Failure, William Tanner, ABE Enterprises, Inc., Kennesaw, Georgia, Daniel Brahana, ABE Enterprises, Inc., Kennesaw, Georgia, Larry Mullins, Geosystems Engineering, Inc., Roswell, Georgia, Cameron Troxel, Geosystems Engineering, Inc., Roswell, Georgia

776 Large-Scale Plate Load Testing of Ground Improved Using Displacement Grout Columns, Timothy Siegel, Berkel & Company Contractors, Inc., Knoxville, Tennessee, Willie NeSmith, Berkel & Company Contractors, Inc., Birmingham, Alabama

**Education / Pavement**

254 Nonlinear Cyclic Characteristics of Soils, Fred Yi, C.H.J., Incorporated, Colton, California

280 America's Research-active, Geotechnical Faculty Members: A Snapshot of the Community, Catherine McHale, University College Dublin, Dublin, Ireland, Debra Laefer, University College Dublin, Dublin, Ireland

684 Evaluation of EICM for Subsurface Moisture, Temperature, and Frost Depth in Flexible Pavements, Robert Liang, University of Akron, Akron, Ohio, Madhar Taamneh, University of Akron, Akron, Ohio

737 GeoWall: Creativity, Statistics, and Reliability, Richard Coffman, University of Missouri, Columbia, Missouri, Daniel Huaco, University of Missouri, Columbia, Missouri, John Bowders, University of Missouri, Columbia, Missouri

## Clyde Baker Symposium 2

**Wednesday, February 24, 8 - 9 a.m.**

### Micro-Mechanics of Granular Soils: Experimentation, Modeling and Computational Analyses

135 3-D Arching Effect in the Trap-Door Problem - A Comparison Between X-ray CT Scanning and DEM Analysis, Jun Otani, Kumamoto University, Kumamoto, Japan, Bastien Chevalier, Kumamoto University, Kumamoto, Japan, Toshifumi Mukunoki, Kumamoto University, Kumamoto, Japan

196 From Microscopic Particle Simulation to Macroscopic Experimental Phenomena of Cross-anisotropic Soil Elasticity, Young-Hoon Jung, Kyung Hee University, Yongin, Republic of Korea, Eui-Ryong Jang, Seoul National University, Seoul, Republic of Korea, Choong-Ki Chung, Seoul National University, Seoul, Republic of Korea

665 A Hypoplastic Sand Model Taking into Account Fabric Anisotropy, Camilo Herrera, Los Andes University, Bogota, Colombia, Arcesio Lizcano, Los Andes University, Bogota, Colombia

687 DSS Test Results Using Wire-Reinforced Membranes and Stacked Rings, Christopher Baxter, University of Rhode Island, Narragansett, Rhode Island, Aaron Bradshaw, Merrimack College, North Andover, Massachusetts, Manuel Ochoa-Lavergne, Fugro Consultants, Inc., Baton Rouge, Louisiana, Rachid Hankour, Geocomp Corporation

### Imaging Applications

5 Application of Electrical Resistivity for Subsurface Characterization of Hattian Bala Landslide Dam, Fawad Niazi, Georgia Institute of Technology, Atlanta, Georgia, Tayyeb Akram, National Institute of Transportation (National University of Sciences and Technology), Islamabad, Pakistan, Habib Ur-Rehman, National Institute of Transportation (National University of Sciences and Technology), Islamabad, Pakistan

151 Application of Surface Geophysics for Providing a Detailed Geotechnical Assessment of a Large Resort Development Site in Anguilla, BWI, Sandy Nettles, N.S. Nettles & Associates, Inc., Palm Harbor, Florida, Eric Cross, N.S. Nettles & Associates, Inc., Palm Harbor, Florida, Bret Jarrett, N.S. Nettles & Associates, Inc., Palm Harbor, Florida

**Wednesday, February 24, 8 - 9 a.m.**

[Imaging Applications](#)

276 An X-ray Computed Tomography Study of the Influence of Inherent Particle Characteristics on the Packing Density of Granular Materials, Beena Sukumaran, Rowan University, Glassboro, New Jersey, Michael Bloom, Rowan University, Glassboro, New Jersey, Aliaksei Kustau, Rowan University, Glassboro, New Jersey, Keicha Muriel, Rowan University, Glassboro, New Jersey, David Rohmeyer, Rowan University, Glassboro, New Jersey, Shreekanth Mandayam, Rowan University, Glassboro, New Jersey, Stephen Thomas, Rowan University, Glassboro, New Jersey

472 Imaging Piles in Bridge Foundations Using Tomography and Horizontal Seismic Reflector Tracing, Jozef Descour, C-Thru Ground, Inc., Littleton, Colorado, Jahangir J. Kabir, GeoMechanics, Inc.

[Reliability III: Practical Reliability-Based Methods in Geo-Engineering](#)

138 Reliability Assessment of Excavation-related Movements of Underground Structures, Anthony Goh, Nanyang Technological University, Singapore, Ashraf Hefney, Nanyang Technological University, Singapore

159 Complexity of Limit Equilibrium Based Slope Reliability Problems, Jianye Ching, National Taiwan University, Taipei, Taiwan, Kok-Kwang Phoon, National University of Singapore, Yu-Gang Hu, National Taiwan University, Taipei, Taiwan

431 Reliability-based Design for Basal Heave in an Excavation Considering Spatial Variability, Shih-Hsuan Wu, National Taiwan University of Science and Technology, Taipei, Taiwan, Chang-Yu Ou, National Taiwan University of Science and Technology, Taipei, Taiwan, Jianye Ching, National Taiwan University of Science and Technology, Taipei, Taiwan, C. Hsein Juang, Clemson University, Clemson, South Carolina

574 Use of Reliability Methods as a Project Management Tool: The Cherry Island Landfill Expansion Project, Michael Houlihan, Geosyntec Consultants, Columbia, Maryland, David Espinoza, Geosyntec Consultants, Columbia, Maryland, Anne Germain, Delaware Solid Waste Authority, Dover, Delaware, Chunling Li, Geosyntec Consultants, Columbia, Maryland, Carlos Lazarte, Geosyntec Consultants, Columbia, Maryland

[Methane Emissions and Oxidation in Landfills](#)

470 Developing Cover Designs for California Landfills Capable of Minimizing Methane Emissions, Tarek Abichou, Florida State University, Tallahassee, Florida, Terry Johnson, Waste Management, Inc.

**Wednesday, February 24, 8 - 9 a.m.**

**Methane Emissions and Oxidation in Landfills**

492 Methane Emission Estimation and Control through the Life Cycle of MSW Landfills, Lei Yuan, Geosyntec Consultants, Columbia, Maryland, Tarek Abichou, Florida State University, Tallahassee, Florida

766 Comparison between Field and Laboratory Methane Oxidation Rates, C. Roncato, Universite be Sherbrooke Quebec, Canada, M. Letourneau, Universite be Sherbrooke Quebec, Canada, A. Cabral, Universite be Sherbrooke Quebec, Canada

771 Hydraulic Aspects of the Design of a Passive Methane Oxidation Biocover, Amir Massood Abdolazadeh, Universite de Sherbrooke, Quebec, Canada, Jonathan Lafond, Universite Laval, Quebec, Canada, Suzanne Allaire, Universite Laval, Quebec, Canada, Alexandre Cabral, Universite de Sherbrooke, Quebec, Canada

**Shallow Foundations**

474 Use of Rigid Foundation System on Expansive Soils, Muawia Dafalla, King Saud University, Riyadh, Saudia Arabia

495 Predicted Tunnel-induced Settlement and Damage to Findlater's Church with Respect to Freefield and Constructed Side Considerations, Debra Laefer, UCD, Dublin, Ireland, Joseph Murphy, UCD, Drogheda, Ireland, Simon Gaynor, UCD, Dublin, Ireland

579 Settlement Behavior of a Shallow Foundation in Dry Sand under Simulated Earthquake Motion on a Biaxial Shake Table, Horng-Jyh Yang, University of Nevada, Reno, Reno, Nevada

627 Estimation of Settlement of Footings Under Working Loads Using Equivalent-Linear Elasticity, Roy Olson, University of Texas at Austin, Austin, Texas, Andrew Sheehan, University of Texas at Austin, Austin, Texas, Kenneth Stokoe, II, University of Texas at Austin, Austin, Texas, Kwangsoo Park, University of Texas at Austin, Austin, Texas

**Earthquake Engineering**

595 Wedge Stability Assessment of a High Rock Slope, Dean Smith, California Department of Water Resources, Sacramento, California

614 Experimental Calibration and Verification of Equivalent Linear Models for Intrinsic Damping in Soil-Structure Dynamics, Judith Wang, Colorado School of Mines, Golden, Colorado, Andrea Ham, Colorado School of Mines, Golden, Colorado, Grant Mott, Colorado School of Mines, Golden, Colorado

**Wednesday, February 24, 8 - 9 a.m.**

### Earthquake Engineering

631 Seismic Soil Pile Structure Interaction Analytical Models, Sanjeev Malhotra, Parsons Brinckerhoff, Inc., New York, New York

705 Challenges in Predicting Earthquake-Induced Settlements of Partially Saturated Sands, John McCartney, University of Colorado at Boulder, Boulder, Colorado, Majid Ghayoomi, University of Colorado at Boulder, Boulder, Colorado, Ali Khosravi, University of Colorado at Boulder, Boulder, Colorado, Honl-Yim Ko, University of Colorado at Boulder, Boulder, Colorado

### Modeling and Design of Geoenvironmental Systems

194 Parameters Controlling Strength of Coal Fly Ash - Lime Improved Soil, Nilo Cessar Consoli, Federal University of Rio Grande do Sul, Porto Alegre, Rio Grande do Sul, Brazil, Amanda Dalla Rosa, Federal University of Rio Grande do Sul, Porto Alegre, Rio Grande do Sul, Brazil

302 Using WiscLEACH to Estimate Groundwater Impacts from Fly Ash Stabilized Layers in Roadways, Lin Li, Jackson State University, Jackson, Mississippi, Nathan Kebede, Jackson State University, Jackson, Mississippi, Li Jin, Jackson State University, Jackson, Mississippi

364 Novel Implicit Automated Time Stepping Algorithm for Contaminant Transport through Soil, Tadikonda Venkata Bharat, Indian Institute of Science, Bangalore, Karnataka, India, Puwadi Sivapullaiah, Indian Institute of Science, Bangalore, Karnataka, India, Mehter Allam, Indian Institute of Science, Bangalore, Karnataka, India

783 State-of-the-Art: Consolidation-Induced Contaminant Transport for High Water Content Geo-Materials, Patrick Fox, Ohio State University, Columbus, Ohio, Charles Shackelford, Colorado State University, Fort Collins, Colorado

### Soil Improvement

146 Wick Drains and Rock Fill Save the Day, Pervaiz Alvi, GeoMechanics, Inc., Elizabeth, Pennsylvania

156 The Behaviour of Ballasted Track Foundations: Track Drainage and Geosynthetic Reinforcement, Buddhima Indraratna, University of Wollongong, Wollongong, New South Wales, Australia, Nayoma Tennakoon, University of Wollongong, Wollongong, New South Wales, Australia, Sanjay Nimbalkar, University of Wollongong, Wollongong, New South Wales, Australia

317 Improved Modeling of Stresses in Soil-Bentonite Slurry Trench Cutoff Walls, Jeffrey Evans, Bucknell University, Lewisburg, Pennsylvania, Daniel Ruffing Geo-Solutions, New Kensington, Pennsylvania, Michael Malusis, Bucknell University, Lewisburg, Pennsylvania

**Wednesday, February 24, 8 - 9 a.m.**

[Soil Improvement](#)

343 Undrained Load Response of Soft Clays Reinforced with Geosynthetic-Encased Sand Columns, Shadi Najjar, American University of Beirut, Beirut, Lebanon, Salah Sadek, American University of Beirut, Beirut, Lebanon, Tarek Maakaroun, American University of Beirut, Beirut, Lebanon

[Panel Discussion: Application of ground improvement technologies toward \(Panel lead: Tanner Blackburn\)](#)

**Wednesday, February 24, 9:15 - 10 a.m.**

[Numerical Modeling of Discontinuous Rock Masses](#)

483 Slope Stability with Permanent Rock Anchors, Rasin Duzceer, Kasktas As, Istanbul, Turkey

485 Stability Analysis of Vertical Boreholes Using a Three-dimensional Hoek-Brown Strength Criterion, Lianyang Zhang, University of Arizona, Tucson, Arizona, K. C. Radha, University of Arizona, Tucson, Arizona

575 Simulation of Pore-Scale Fluid Flow through Glass Beads Using Lattice Boltzmann Method, Tong Qiu, Clarkson University, Potsdam, New York, Wei Chen, Clarkson University, Potsdam, New York

[Unsaturated Soil Modeling in Engineering Practice](#)

182 Shear Strength of Unsaturated Soil-Geotextile Interfaces, Charbel Khoury, University of Oklahoma, Norman, Oklahoma, Gerald Miller, University of Oklahoma, Norman, Oklahoma, Kianoosh Hatami, University of Oklahoma, Norman, Oklahoma

209 A Study of Tidal Influence on Embankment Settlement in Coastal Louisiana, Ching Tsai, Louisiana Department of Transportation and Development, Baton Rouge, Louisiana, Jesse Rauser, Ardaman & Associates, Sungmin Yoon, Louisiana Department of Transportation and Development, Baton Rouge, Louisiana

**Wednesday, February 24, 9:15 - 10 a.m.**

**Unsaturated Soil Modeling in Engineering Practice**

233 Dynamic Capillary Effect and Its Impact on Residual Water Content in Unsaturated Soils, Chen Hui, Institute of Rock and Soil Mechanics, Chinese Academy of Sciences, Wu Han, Hu Bei Province, People's Republic of China, Wei Changfu, Institute of Rock and Soil Mechanics, Chinese Academy of Sciences, Wu Han, Hu Bei Province, People's Republic of China, Cao Huafeng, Institute of Rock and Soil Mechanics, Chinese Academy of Sciences, Wu Han, Hu Bei Province, People's Republic of China, Wu Erlin, Institute of Rock and Soil Mechanics, Chinese Academy of Sciences, Wu Han, Hu Bei Province, People's Republic of China, Li Huan, Institute of Rock and Soil Mechanics, Chinese Academy of Sciences, Wu Han, Hu Bei Province, People's Republic of China

**Pavements I: Mechanistic Based Pavement Design**

471 Modeling Fracture and Failure of Heterogeneous and Inelastic Asphaltic Materials Using the Cohesive Zone Concept and the Finite Element Method, Francisco Aragao, University of Nebraska, Lincoln, Nebraska, Yong-Rak Kim, University of Nebraska, Lincoln, Nebraska

653 Sensitivity of Predicted Flexible Pavement Performance to Unbound Material Hydraulic Properties, Charles Schwartz, University of Maryland, College Park, Maryland, Rui Li, University of Maryland, College Park, Maryland

762 Plastic Deformation of the Recycled Pavement Material, Ali Ebrahimi, University of Wisconsin-Madison, Madison, Wisconsin, Brian Kootstra, University of Wisconsin-Madison, Madison, Wisconsin, Tuncer Edil, University of Wisconsin-Madison, Madison, Wisconsin, Craig Benson, University of Wisconsin-Madison, Madison, Wisconsin

**Deep Foundations II**

400 Design and Construction Considerations for Offshore Wind Turbine Foundations in North America, Sanjeev Malhotra, Parsons Brinckerhoff, Inc., New York, New York

707 Case Study of the Influence of Flexural Stiffness on the Developed Soil Reactions of Three Laterally Loaded Piles, Sixto Fernandez, University of Puerto Rico, Mayaguez, Puerto Rico, Miguel Pando, University of Puerto Rico, Mayaguez, Puerto Rico, Mohamed Ashour, University of Alabama, Huntsville, Alabama

726 Evaluation of Base Grouting of Drilled Shafts at the Audubon Bridge, Steve Dapp, Dan Brown and Associates, Sequatchie, Tennessee, Dan Brown, Dan Brown and Associates, Sequatchie, Tennessee

**Wednesday, February 24, 9:15 - 10 a.m.**

**Soil-Foundation Interaction Due to Ground Movements I**

59 Modeling Stability of Stacked Geotextile Tubes, Ming Zhu, Geosyntec Consultants

125 Failure Analysis of an Instrumented Stiff Clay Slope, Walter Kutschke, URS Corporation, Pittsburgh, Pennsylvania, Luis Vallejo, University of Pittsburgh, Pittsburgh, Pennsylvania

214 Failing Tunnels from Changed Conditions, Joseph Hagerty, University of Louisville, Louisville, Kentucky, Charles Ullrich, University of Louisville, Louisville, Kentucky

**LRFD and Partial Factor Design**

166 Load Resistance Factor Design using Target Reliability Approach for External Seismic Stability of Reinforced Soil Walls, Munwar Basha, IISc Bangalore, Bangalore, KA, India, Sivakumar Babu GL, IISc Bangalore, Bangalore, KA, India

181 Parametric Study of Seismic AASHTO Design Methods for Metallic Mechanically Stabilized Earth Walls, Fransiscus Hardianto, The Reinforced Earth Company, John Sankey, The Reinforced Earth Company, Kim Truong, The Reinforced Earth Company

242 Simulating Differential Settlement of Landfill Foundations Using Random Fields, Kevin Foye, CTI and Associates, Inc., Brighton, Michigan, Te-Yang Soong, CTI and Associates, Inc., Brighton, Michigan

**Liquefaction Computational Models**

371 Analytical Study on Mitigation of Liquefaction-related Damage to Flume Channel Using Sheet-pile with Drain, Kazutaka Otsushi, Sumitomo Metal Industries, Ltd., Kamisu City, Ibaraki, Japan, Tomoo Kato, Japan Water Agency, Japan, Takashi Hara, Gifu University, Japan, Atsushi Yashima, Gifu University, Japan, Yu Otake, CTI Engineering Co., Ltd., Japan, Kazuhiko Sakanashi, CTI Engineering Co., Ltd., Japan, Ayumi Honda, CTI Engineering Co., Ltd., Japan

477 Investigation of Critical Depth of Liquefaction in Soil Deposits Containing Double Loose Sand Lenses, Yadolah Pashang Pisheh, Amirkabir University of Technology, Tehran, Iran, Navid Ganjian, University of Tehran, Tehran, Iran, Kaveh Shakiba Nia, K.N. Toosi University of Technology, Vienna, Virginia, Majdeddin Mir Mohammad Hosseini, Amirkabir University of Technology, Tehran, Iran

570 A Simplified Coupled Soil-pore Water Pressure Generation for Use in Site Response Analysis, Oscar Moreno-Torres, University of Illinois at Urbana-Champaign, Champaign, Illinois, Youssef M.A. Hashash, University of Illinois at Urbana-Champaign, Champaign, Illinois, Scott M. Olson, University of Illinois at Urbana-Champaign, Champaign, Illinois

**Wednesday, February 24, 9:15 - 10 a.m.**

**Soil Improvement**

453 A Practical Method to Account for Strength Variability of Deep-Mixed Ground, Mike Navin, USACE, George Filz, Virginia Tech, Blacksburg, Virginia

513 I-78 and PA-33 Sinkhole Mitigation Measures, Michael Perlow, Jr., MichaelPerlowJr.Com, East Greenville, Pennsylvania, Michael Franceschina, Lehigh University, Bethlehem, Pennsylvania

637 Comparison of Drum/Soil Contact Width Based on Experimental Observation and Numerical Analysis, Odon Musimbi, Colorado School of Mines, Golden, Colorado, Robert Rinehart, Colorado School of Mines, Golden, Colorado, Michael Mooney, Colorado School of Mines, Golden, Colorado

**Wednesday, February 24, 2 – 3:30 p.m.**

**Reliability IV: Risk Assessment Tools in Geotechnical Engineering**

24 Coastal Wastewater Systems and the Mitigation of Geohazards, Brian J. Van Weele, Parsons Brinckerhoff, San Francisco, California, Donald Treadwell, Treadwell Consulting, Sausalito, California

63 Risk Modeling Issues and Appropriate Technology, Gregory Baecher, University of Maryland, College Park, Maryland, John Christian, Engineering Consultant, Waban, Massachusetts

245 Comparison of Slope Reliability Methods of Analysis, DV Griffiths, Colorado School of Mines, Superior, Colorado, Jinsong Huang, Colorado School of Mines, Superior, Colorado, Gordon Fenton, Dalhousie University, Halifax, Canada

247 Statistical Evaluation of Levee Design Data, Hollie Ellis, Shannon & Wilson, Seattle, Washington, Christopher Groves, Shannon & Wilson, Seattle, Washington, Kyle Tabor, Shannon & Wilson, Seattle, Washington

332 Expected Design Factor of Safety from a Pile Load Test Program, Jie Zhang, The Hong Kong University of Science and Technology, Hong Kong, People's Republic of China, Wilson H. Tang, The Hong Kong University of Science and Technology, Hong Kong, People's Republic of China, Limin Zhang, The Hong Kong University of Science and Technology, Hong Kong, People's Republic of China

681 Statistical Assessment of Repeatability of Soil-Geomembrane Interface Shear Tests, Omer Bilgin, University of Dayton, Dayton, Ohio, Bhavikkumar Shah, University of Houston, Houston, Texas

**Wednesday, February 24, 2 – 3:30 p.m.**

### Characterizations of Problematic Soils

480 Particle Size Analysis of Shale Rich Mined Clay from Appalachian Ohio, Chamil Hettiarachchi, Lawrence Technological University, Southfield, Minnesota, Anthony Moran, Golder Associates, Lansing, Michigan

481 Laboratory and Field Investigation on Variation of Soil Erodibility with Dry Unit Weight, Chamil Hettiarachchi, Lawrence Technological University, Southfield, Michigan, Matthew McClerren, Lawrence Technological University, Southfield, Michigan, Donald Carpenter, Lawrence Technological University, Southfield, Michigan

491 Assess the Stress-Strain and Interfacial Frictional Behavior of Nonwoven Geotextile Reinforced Residual Soils, Mohammad Nurul Islam, Rajshahi University of Engineering & Technology, Rajshahi, Bangladesh, Syed Abdul Mofiz, Rajshahi University of Engineering & Technology, Rajshahi, Bangladesh

559 Cyclic Triaxial Behaviour of Pond Ash, Nihar Ranjan Patra, Indian Institute of Technology, Kanpur, Kanpur, Uttar Pradesh, India, Bijayananda Mohanty, Indian Institute of Technology, Kanpur, Kanpur, Uttar Pradesh, India, Sarvesh Chandra, University of Kwazulu-Natal, Durban, South Africa

566 Static and Dynamic Properties of a Calcareous Sand from Southwest Puerto Rico, Joanna Catano, Gannett Fleming, Inc., Jacksonville, Florida, Miguel Pando, University of Puerto Rico, Mayaguez, Puerto Rico

622 Characterization of Reinforced Asphalt Pavement Structures built over Organic Soils employing Falling Weight Deflectometer, Khaled Sobhan, Florida Atlantic University, Boca Raton, Florida, KP George, Florida Atlantic University, Boca Raton, Florida, Daniel Pohly, Florida Atlantic University, Boca Raton, Florida, Hesham Ali, Florida Department of Transportation, Florida

### Unsaturated Soil Modeling in Engineering Practice

359 Characterization of Unusual Ground Fissuring In A Dry Lake Bed – Broadwell Basin, San Bernardino County, California, William J. Johnson, D'Appolonia Engineers, Monroeville, Pennsylvania, Marcella G. Johnson, Rhea Engineers and Consultants, Gibsonia, Pennsylvania, Edward G. Zullo, Paul C. Rizzo Associates, Monroeville, Pennsylvania

361 Performance of Reinforced Collapsible Soil, Sherif Soliman, Concordia University, Canada, Adel Hanna, Concordia University, Canada

436 Analytical Model for Prediction of Strains for Tunneling in Swelling Grounds, Davood Parsapour, AmirKabir University of Technology, Tehran, Iran, Ahma+C389d Fahimifar, AmirKabir University of Technology, Tehran, Iran

**Wednesday, February 24, 2 – 3:30 p.m.**

**Unsaturated Soil Modeling in Engineering Practice**

465 A Refined True Triaxial Cell for Modeling Unsaturated Soil Response Under Suction Controlled Stress Paths, Laureano Hoyos, University of Texas at Arlington, Arlington, Texas, Diego Perez-Ruiz, Universidad Javeriana, Cali, Colombia, Anand Puppala, University of Texas at Arlington, Arlington, Texas

671 Soil Water Characteristic Curves of Compacted Clay Subjected to Multiple Wetting and Drying Cycles, Milind Khire, Michigan State University, E. Lansing, Michigan, Ramil Mijares, Michigan State University, E. Lansing, Michigan

720 Impact of Effective Stress on the Dynamic Shear Modulus of Unsaturated Sand, John McCartney, University of Colorado at Boulder, Boulder, Colorado, Majid Ghayoomi, University of Colorado at Boulder, Boulder, Colorado, Ali Kosravi, University of Colorado at Boulder, Boulder, Colorado, Hon-Yim Ko, University of Colorado at Boulder, Boulder, Colorado

**In-Situ Testing for Geo-Engineering Analysis and Design**

15 Cone Tip Resistance of Highly Compressible Jeju Beach Sand, Moon-Joo Lee, Korea University, Seoul, Republic of Korea, Woojin Lee, Korea University, Seoul, Republic of Korea, Jaejeong Kim, Korea University, Seoul, Republic of Korea

49 Evaluation of the PVD Smear Zone Using Micro Penetrometer, Woojin Lee, Korea University, Seoul, Republic of Korea, Raehyun Kim, Korea University, Seoul, Republic of Korea, Young-Min Choi, Korea University, Seoul, Republic of Korea, Jong-Sub Lee, Korea University, Seoul, Republic of Korea

158 Updating Uncertainties in Undrained Shear Strengths by Multivariate Correlations, Jianye Ching, National Taiwan University, Taipei, Taiwan, Kok-Kwang Phoon, National University of Singapore

211 Estimation of the Coefficient of Consolidation from Piezocone Dissipation Tests in Jiangsu Quaternary Clay Deposits, China, Guojun Cai, Southeast University, Songyu Liu, Southeast University, Anana J. Puppala, University of Texas at Arlington, Arlington, Texas, Liyuan Tong, Southeast University, Guangyin Du, Southeast University

357 Soil Parameter Evaluation from Hybrid Penetration-geophysics Testing, Paul Mayne, Georgia Tech, Atlanta, Georgia

635 End of Primary Consolidation for the Gulf Coast Soils, Jeongl-Yun, Fugro Consultants, Inc., Houston, Texas, Byron Porter, Fugro Consultants, Inc., Houston, Texas, Blake Cotton, Fugro Consultants, Inc., Baton Rouge, Louisiana

**Wednesday, February 24, 2 – 3:30 p.m.**

**Instrumentation and Data Acquisition for Site Geo-Characterization**

162 Characterization of an Urban Site by Ambient Noise HVSR Method: Resonance Frequencies and Site Amplifications, Pavlick Harutoonian, University of Western Sydney, Penrith South DC, New South Wales, Australia, Chin Jian Leo, University of Western Sydney, Penrith South DC, New South Wales, Australia, Ben Chapman, University of Western Sydney, Penrith South DC, New South Wales, Australia, Samanthika Liyanapathirana, University of Western Sydney, Penrith South DC, New South Wales, Australia

177 Bridge Restoration and Landslide Correction Using Stabilization Piers and Grade Beam Structural System, Peter Chou, Jacobs Engineering Group, Boston, Massachusetts, Swaminathan Srinivasan, H.C. Nutting, A Terracon Company, Cincinnati, Ohio

188 Real-time Slope and Wall Monitoring and Reporting Using 3-D MEMS-based, In-place Instrumentation System, Swaminathan Srinivasan, H.C. Nutting, A Terracon Company, Cincinnati, Ohio, Peter Chou, Jacobs Engineering Group, Boston, Massachusetts, Aaron Muck, H.C. Nutting, A Terracon Company, Cincinnati, Ohio

238 Levee Evaluation Studies in Sacramento, California: Correlating Helicopter-borne EM data, Borings and Geology, Dima Amine, Fugro Airborne Surveys, Mississauga, Ontario, Canada, Greg Hodges, Fugro Airborne Surveys, Mississauga, Ontario, Canada, Selvaratnam Selvamohan, Department of Water Resources, Sacramento, California, Duston D. Marlow, Fugro West, Inc., Roseville, California, Bob Woldringh, Fugro West, Inc., Roseville, California

257 The Use of Forensic Engineering in Subsurface Investigations, Edward Zisman, ATC Associates Inc., Tampa, Florida

310 Experimental Study on Triaxial Geogrid-Reinforced Bases over Weak Subgrade under Cyclic Loading, Yu Qian, University of Kansas, Lawrence, Kansas, Jie Han, University of Kansas, Lawrence, Kansas, Sanat Pokharel, University of Kansas, Lawrence, Kansas, Robert Parsons, University of Kansas, Lawrence, Kansas,

**Pavements II: Modeling of Subgrade Soils and Pavement Materials**

55 Bearing Strength and Swelling Behaviors of Jingmen Expansive Soils, Lingwei Kong, Institute of Rock and Soil Mechanics, Chinese Academy of Sciences, Wuhan, Hubei Province, People's Republic of China, Aiguo Guo, Institute of Rock and Soil Mechanics, Chinese Academy of Sciences, Wuhan, Hubei Province, People's Republic of China

119 Simulating Rate-Dependent Behavior of Geogrid-Reinforced Sands by FEM, Fu-lin Li, Tongji University, Shanghai, People's Republic of China, Fang-le Peng, Tongji University, People's Republic of China, Yong Tan, Tongji University, Shanghai, People's Republic of China, Warat Kongkitkul, King Mongkut's University of Technology, Bangkok, Thailand

**Wednesday, February 24, 2 – 3:30 p.m.**

**Pavements II: Modeling of Subgrade Soils and Pavement Materials**

289 Applicability of Burger Model in Predicting the Response of Viscoelastic Soil Beds, Arindam Dey, Indian Institute of Technology, Kanpur, Uttar Pradesh, India, Prabir Basudhar, Indian Institute of Technology, Kanpur, Uttar Pradesh, India

628 Soft Computing Methodology to Determine Pavement Thickness from Falling Weight Deflectometer Testing, Erol Tutumluer, University of Illinois, Urbana, Illinois, Onur Pekcan, University of Illinois, Urbana, Illinois, Jamshid Ghaboussi, University of Illinois, Urbana, Illinois

678 Design of Effective Subsurface Drainage for Flexible Pavement, Robert Liang, University of Akron, Akron, Ohio, Madhar Taamneh, University of Akron, Akron, Ohio

750 Application of Random Vibration Techniques to Resonant Column Testing, Ronald Y.S. Pak, University of Colorado at Boulder, Boulder, Colorado, Jeramy C. Ashlock, Iowa State University, Ames, Iowa

**Soil-Foundation Interaction Due to Ground Movements II**

266 The Behavior of a Deep Retained Excavation in Soft San Francisco Bay Mud, Dr. Gregory P. Wilson, Texas A&M University-Commerce, Commerce, Texas

285 Design of Drilled Shaft for Slope Stabilization, Robert Liang, University of Akron, Akron, Ohio, Mohammad Yamin, University of Akron, Akron, Ohio

299 Riverbank Instability from Imperfect Adherence to Instructions, Joseph Hagerty, University of Louisville, Louisville, Kentucky

316 Measured Soil-Pile Interaction Pressures for Small-Diameter Laterally Loaded Pile in Loose Sand, Muhannad Suleiman, Lafayette College, Easton, Pennsylvania, Anne Raich, Lafayette College, Easton, Pennsylvania, Mary Roth, Lafayette College, Easton, Pennsylvania, Timothy Polson, Lafayette College, Easton, Pennsylvania, William Kingston, Lafayette College, Easton, Pennsylvania,

412 Deep Soil Mixing (DSM) Columns to Improve Foundation Support for Bridge Approach Embankment, Sireesh Saride, The University of Texas at Arlington, Arlington, Texas, Ekarut Archeewa, The University of Texas at Arlington, Arlington, Texas, Anand Puppala, The University of Texas at Arlington, Arlington, Texas, Soheil Nazarian, The University of Texas at El Paso, El Paso, Texas

673 A Case Study of Drilled Shaft Performance from Excavation Induced Slope Movements, San-Shyan Lin, National Taiwan Ocean University, Taiwan, Jen-Cheng Liao, Taiwan Construction Research Institute, Taiwan, Sheng-Der Yang, Artech Engineering Service Inc., Taiwan, Robert Liang, University of Akron, Akron, Ohio

**Wednesday, February 24, 2 – 3:30 p.m.**

**Sustainable Geotechniques: Beneficial Use and Materials Substitutions**

60 Soil Stabilization and Erosion Control of Slopes using Cement Kiln Dust, Bahara Ghazvinian, Shannon & Wilson, Seattle, Washington, Mehrdad Razavi, New Mexico Institute of Mining and Technology, Socorro, New Mexico

221 Behavior of Vertical Hydraulic Barriers Composed by Sandy Soil, Bentonite and Cement Subjected to Alkaline Contaminants, Karla Heineck, Federal University of Rio Grande do Sul, Porto Alegre, Brazil, Nilo Cesar Consoli, Federal University of Rio Grande do Sul, Porto Alegre, Brazil, Rosemar Gomes Lemos, Federal University of Pelotas, Pelotas, Brazil, Carlos Emmanuel Lautenschlager, Federal University of Rio Grande do Sul, Porto Alegre, Brazil

457 Model for Characterization of the Scrap Tire Bale Interface Strength, Jorge Zornberg, The University of Texas at Austin, Austin, Texas, Brian Freilich, The University of Texas at Austin, Austin, Texas

489 Design of Dredged Material Containment Area Dikes on Soft Foundations, Kwasi Badu-Tweneboah, Geosyntec Consultants, Jacksonville, Florida, Keneth Cargill, KW Cargill, P.A., Punta Gorda, Florida, Victor Damasceno, Geosyntec Consultants, Tampa, Florida, Ethan Cargill, ConeTec, Charles City, Virginia

650 Characterization of Slag Fines for Use as a Dredged Material Amendment, Dennis Grubb, Schabel Engineering, LLC, West Chester, Pennsylvania, Mahmoud Wazne, Stevens Institute of Technology, Hoboken, New Jersey, Nicholas Malasavage, Schnabel Engineering, LLC, West Chester, Pennsylvania

655 Evaluation of Two Aluminum Powders for Soil-cement Applications, Dennis Grubb, Schnabel Engineering, LLC, Maria Chrysochoou, University of Connecticut, Storrs, Connecticut, Jeff Fair, LaFarge North America

**Wednesday, February 24, 3:45 - 5:15 p.m.**

**Computational Methods in Unsaturated Flow and Coupled Processes**

66 Design Charts for Vertical Drains Considering Soil Disturbance, Dipanjan Basu, University of Connecticut, Storrs, Connecticut, Monica Prezzi, Purdue University, West Lafayette, Indiana

438 Modeling Rheological Properties of Coarse Grained Materials, Erich Bauer, Graz University of Technology, Graz, Austria

588 Strain Localization by Mean of the Bifurcation Theory Applied to a Hypoplastic Constitutive Model, Alfonso Ramos, Universidad de Los Andes, Bogota, Colombia, Arcesio Lizcano, Universidad de Los Andes, Bogota, Colombia

**Wednesday, February 24, 3:45 - 5:15 p.m.**

**Computational Methods in Unsaturated Flow and Coupled Processes**

649 Visco-hypoplasticity for Structured Soils, William Mario Fuentes, Universidad de los Andes, Bogota, Colombia, Arcesio Lizcano, Universidad de los Andes, Bogota, Colombia

660 Modification of the Hypoplasticity von Wolffersdorff Equation Using a Bounding surface and State-Dependent Peak Dilatancy Criterion, Camilo Herrera, Los Andes University, Bogota, Colombia, Arcesio Lizcano, Los Andes University, Bogota, Colombia

736 Simulation of Expansive Clay Behavior Under Simultaneous Heating-hydration for Nuclear Waste Storage Applications, Marcelo Sanchez, Texas A&M University, College Station, Texas, Maria Victoria Villar, Centro de Investigaciones Energeticas, Mediambientales y Tecnológicas, Antonio Gens, Technical University of Catalonia, Antonio Lloret, Technical University of Catalonia

**Landfills**

29 Lysimetry Versus Deep Water Content Monitoring for Field Performance Evaluation of Alternative Landfill Covers, Jubily Musagasa, Dar es Salaam Institute of Technology, Dar es Salaam, Tanzania, Kamal Tawfiq, FAMU-FSU College of Engineering, Tallahassee, Florida, Jeff Chanton, Florida State University, Tallahassee, Florida, Tarek Abichou, Florida State University, Tallahassee, Florida

33 Seismic Translational Failure Analysis of MSW Landfills Using Pseudo-static Approach, Deepankar Choudhury, Indian Institute of Technology (IIT), Bombay, Mumbai, Maharashtra, India, Purnanand Savoikar, Indian Institute of Technology (IIT) Bombay, Mumbai, Maharashtra, India

45 Spatial Correlation of Groundwater and Leachate Quality Data from a Solid Waste Disposal Site, Banu Sizirici Yildiz, Florida International University, Miami, Florida, Berrin Tansel, Florida International University, Miami, Florida

498 Lysimeters versus Actual Earthen Caps: Numerical Assessment of Soil Water Storage, Milind Khire, Michigan State University, E. Lansing, Michigan, Ramil Mijares, Michigan State University, E. Lansing, Michigan, Terry Johnson, Waste Management, Inc., Minneapolis, Minnesota

550 Use of SHANSEP Design Parameters in Landfill Design: A Cost/Benefit Case Study, Richard Coffman, University of Missouri, Columbia, Missouri, John Bowders, University of Missouri, Columbia, Missouri, Peter Burto, Burns and McDonnell

729 In-Service Hydraulic Properties of Two Landfill Final Covers in Northern California, Paul D. Schlicht, University of Wisconsin-Madison, Madison, Wisconsin, Craig H. Benson, University of Wisconsin-Madison, Madison, Wisconsin, James M. Tinjum, University of Wisconsin-Madison, Madison, Wisconsin, William H. Albright, Desert Research Institute, Reno, Nevada

**Wednesday, February 24, 3:45 - 5:15 p.m.**

### **In-Situ Testing for Geo-Engineering Analysis and Design**

263 Suspension P-S Logging for Geophysical Investigation of Deep Soil and Bedrock, Emre Biringen, Bechtel Power Corporation, Frederick, Maryland, John Davie, Bechtel Power Corporation, Frederick, Maryland

369 Seismic Site Classification Using Boreholes and Shear Wave Velocity: Assessing Suitable Method for Shallow Engineering Rock Region, P. Anbazhagan, Indian Institute of Science, Bangalore, Karnataka, India, T.G. Sitharam, Indian Institute of Science, Bangalore, Karnataka, India

468 Demands for Seismic Site Investigation at Wind Power Station Foundation in Former Mining Areas, Frank Wuttke, Bauhaus-Universität Weimar, Weimar, Thuringia, Germany, Hans-Gottfried Schmidt, Geotechnics & Geodynamics Consulting, Weimar, Thuringia, Germany

488 Numerical Investigation of the Pressuremeter Results Affected by Anisotropy of Geomaterials, Robert Liang, University of Akron, Akron, Ohio, Abdulla Sharo, University of Akron, Akron, Ohio

561 Comparison of Underwater MASW, Seismic CPT and Downhole Methods, Offshore Croatia, Lorenzo Paolettiti, D'Appolonia S.p.A., Edouard Mouton, Sismocean, Ivana Liposcak, Crosco d.o.o.

738 Evaluating Shear Wave Velocity of In-Place Compacted Backfill, John Damm, Bechtel Power Corporation, Frederick, Maryland, Michael Lewis, Bechtel National Incorporated, Aiken, South Carolina, Kenneth Stokoe, University of Texas, Austin, Texas, Donald Moore, Southern Company Services, Birmingham, Alabama

### **Instrumentation and Data Acquisition for Site Geo-Characterization**

420 A Study on the Development of Anisotropic Shear Modulus for Soft Clay During the  $k=0$  Consolidation, Chang-Yu Ou, National Taiwan University of Science and Technology, Taipei, Taiwan, Fu-Chen Teng, National Taiwan University of Science and Technology, Taipei, Taiwan

454 A Suggested Approach to Study Variability of Impact Hardness Strength in Heterogeneous Rock Materials, Annalisa Bandini, University of Bologna, Bologna, Italy, Paolo Berry, University of Bologna, Bologna, Italy

479 Installation of Dowlndrag Instrumentation on a Bridge Abutment Foundation: Lessons Learned, Aaron Budge, Minnesota State University, Mankato, Minnesota, Derrick Dasenbrock, Minnesota Department of Transportation, Maplewood, Minnesota

**Wednesday, February 24, 3:45 - 5:15 p.m.**

**Instrumentation and Data Acquisition for Site Geo-Characterization**

577 Shear Deformation Behavior of the Cemented Interface between Concrete and Argillaceous Siltstone, Changjiang Wu, Tongji University, Shanghai, People's Republic of China, Zixing Zhang, Geotechnical Engineering, Tongji University, Shanghai, People's Republic of China, Yunjin Lai, Geotechnical Engineering, Tongji University, Shanghai, People's Republic of China

598 Photoelastic Sensors for Measurement of  $K_0$ , Roman Hryciw, University of Michigan, Ann Arbor, Michigan, Thaweesak Jirathanathaworn, University of Michigan, Ann Arbor, Michigan, Russell Green, Virginia Tech, Blacksburg, Virginia

727 Development of Opto-laser Borehole Scanning System, Myung Sagong, KRRI, Sunghyuk Ahn, Sangsangdom, Seonkeun Hwang, KRRI

**Deep Foundations III**

231 Analysis of a Deep Shaft Excavation in Argillaceous Rock, Benoit Garitte, CIMNE, Antonio Gens, Universitat Politecnica de Catalunya, Barcelona, Spain, Jean Vaunat, Universitat Politecnica de Catalunya, Barcelona, Spain

251 Birmingham Bridge Emergency Repair, Donald Splitstone, HDR, Pittsburgh, Pennsylvania, Scott Stonecheck, Moretrench, Monroeville, Pennsylvania, Rob Dodson, HDR, Pittsburgh, Pennsylvania, Jason Fuller, HDR, Pittsburgh, Pennsylvania

312 Analysis of Large Diameter Pipe Pile Drivability in Tokyo Bay Using Piezocone Data, James Schneider, University of Wisconsin-Madison, Madison, Wisconsin, David White, University of Western Australia, Crawley, WA, Australia, Yoshiaki Kikuchi, Port and Airport Research Institute, Japan

344 Analysis of Monopile for Offshore Wind Turbine, Elsbeth Hearn, Tufts University, Medford, Massachusetts, Lewis Edgers, Tufts University, Medford, Massachusetts

328 Reliability Analysis of Extrapolated Ultimate Load of Drilled Shafts Embedded in Weathered Rock, MyoungMo Kim, Seoul National University, Seoul, Republic of Korea, SungJun Jung, Seoul National University, Seoul, Republic of Korea, SangInn Lee, Seoul National University, Seoul, Republic of Korea, JongWoo Jeon, Seoul National University, Seoul, Republic of Korea, SungHeon Kim, Seoul National University, Seoul, Republic of Korea

523 Axial Load-Displacement Behavior of Augered Cast-In-Place Piles and Pressure-Injected Footings, Jie-Ru Chen, National Chi Nan University, Puli, Nantou, Taiwan, Fred H. Kulhawy, Cornell University, Ithaca, New York

**Wednesday, February 24, 3:45 - 5:15 p.m.**

**Soil-Foundation Interaction Due to Ground Movements III**

223 Prediction of Load Transfers in Granular Layers Used in Rigid Inclusions Technique - Experimental and Discrete Element Method Analysis, Bastien Chevalier, Grenoble Universites, UJF, INPG, CNRS, Grenoble, France, Laurent Briancon, Conservatoire national des Arts et Metiers, Paris, France, Pascal Villard, Grenoble Universites, UJF, INPG, CNRS, Grenoble, France, Gael Combe, Grenoble Universites, UJF, INPG, CNRS, Grenoble, France

275 Behavior of Up-Lift Pile Foundation During Large-Scale Deep Excavation, Jin-Jian Chen, Shanghai Jiao Tong University, Shanghai, People's Republic of China, Jian-Hua Wang, Shanghai Jiao Tong University, Shanghai, People's Republic of China, Robert Liang, University of Akron, Akron, Ohio, Wei Fan, Shanghai Jiao Tong University, Shanghai, People's Republic of China, Wei-Dong Wang, East China Architecture Design Institute

286 Field Study of Drilled Shafts Behavior During Surcharge Load Induced Slope Movement, Robert Liang, University of Akron, Akron, Ohio, Wassel Al Bodour, University of Akron, Akron, Ohio

391 A Numerical Study of Soil-Pile-Shield Tunneling Interaction for Guangzhou Subway Project, Lin Ki, Tianjin University, People's Republic of China, Xinliang Jiang, Tianjin University, People's Republic of China, Robert Liang, University of Akron, Akron, Ohio

504 Shear Strength Reduction at Soil-Structure Interface, Binod Tiwari, California State University, Fullerton, Fullerton, California, Garrett Kaya, MTK, Irvine, California, Beena Ajmera, California State University, Fullerton, Fullerton, California

612 Characterization of “t-z” Parameters and their Variability for Auger Cast Piles Using Field Load Test Data, Anil Misra, University of Kansas, Lawrence, Kansas, Sungwon Park, University of Kansas, Lawrence, Kansas, Lance Roberts, South Dakota School of Mines and Technology, Rapid City, South Dakota

**Pavements III: Analysis and Modeling of Pavement Layered Systems**

40 Yeager Airport Runway Extension: Tallest Geosynthetic Reinforced 1H:1V Slope in North America, John Lostumbo, TenCate Geosynthetics, East Amherst, New York

240 A Best-fit Rigid Pavement Back-calculation Method Based on Site Site-specific FEM Analysis, Juan Marchant, NAPCO, Athanassios T. Papagiannakis, University of Texas at San Antonio, San Antonio, Texas

558 FDOT Testing and Evaluation of a Beneficial Re-Use Base Course Material, Scott Schultz, JEA, Jacksonville, Florida, N. Mike Jackson, University of North Florida, Jacksonville, Florida

**Wednesday, February 24, 3:45 - 5:15 p.m.**

**Pavements III: Analysis and Modeling of Pavement Layered Systems**

611 Finite Element Analysis of Permanent Deformation Under Accelerated Loading, Zhong Wu, Louisiana Transportation Research Center, Baton Rouge, Louisiana, Xingwei Chen, Louisiana Transportation Research Center, Baton Rouge, Louisiana, Zhongjie Zhang, Louisiana Transportation Research Center, Baton Rouge, Louisiana

617 A Numerical Study on Stress-Strain Responses of Biaxial Geogrids under Tension at Different Directions, Yanli Dong, The University of Kansas, Lawrence, Kansas, Jie Han, The University of Kansas, Lawrence, Kansas, Xiaohong Bai, Taiyuan University of Technology, Taiyuan, Shanxi, People's Republic of China

702 A Review on Flexible Pavement Performance Life Assessment, Jie Zhang, New Mexico State University, Las Cruces, New Mexico, Can Chen, New Mexico State University, Las Cruces, New Mexico

**Firing Range Soils: Advances in Characterization, Metal Speciation and Treatment**

149 Characterization and Evaluation of Stabilized / Solidified Heavy Metal Contaminated Clays, Unyime John, University of Birmingham, Birmingham, United Kingdom, Ian Jefferson, University of Birmingham, Birmingham, United Kingdom, David Boardman, University of Birmingham, Birmingham, United Kingdom, Gurmel Ghataora, University of Birmingham, Birmingham, United Kingdom

584 The Effect of Plants on Lead Dissolution, Afrachanna Butler, US Army Corps of Engineers, Engineer Research and Development Center, Environmental Laboratory, Vicksburg, Mississippi, Victor Medina, US Army Corps of Engineers, Engineer Research and Development Center, Environmental Laboratory, Vicksburg, Mississippi, Steven Larson, US Army Corps of Engineers, Engineer Research and Development Center, Environmental Laboratory, Vicksburg, Mississippi, Catherine Thomas, Jackson State University, Jackson, Mississippi

590 Passive Reactive Berm (PRBerm) to Provide Low Maintenance Lead Containment at Small Arms Firing Ranges, Michelle Thompson, US Army Corps of Engineers, Engineer Research and Development Center, Environmental Laboratory, Vicksburg, Mississippi, Steven Larson, US Army Corps of Engineers, Engineer Research and Development Center, Environmental Laboratory, Vicksburg, Mississippi, Andy Martin, US Army Corps of Engineers, Engineer Research and Development Center, Environmental Laboratory, Vicksburg, Mississippi, Gregory O'Connor, US Army RDECOM-ARDEC, Picatinny, New Jersey, David Mackie, AMEC Earth and Environmental, Inc., Somerset, New Jersey, Michael Warminsky, UXB International, Inc., Flemington, New Jersey

600 Fragmentation and Distribution of Lead Following Firing into Various Types of Range Soils, Christopher Griggs, US Army Corps of Engineers, Engineer Research and Development Center, Environmental Laboratory, Vicksburg, Mississippi, Steven Larson, US Army Corps of Engineers, Engineer Research and Development Center, Environmental Laboratory, Vicksburg, Mississippi, Gregory O'Connor, Army RDECOM-ARDEC, Picatinny, New Jersey

**Wednesday, February 24, 3:45 - 5:15 p.m.**

**Firing Range Soils: Advances in Characterization, Metal Speciation and Treatment**

604 Treatment of Metals-Contaminated Soil by the Application of Lime and Grasses, Andy Martin, US Army Corps of Engineers, Engineer Research and Development Center, Environmental Laboratory, Vicksburg, Mississippi, Steven Larson, US Army Corps of Engineers, Engineer Research and Development Center, Environmental Laboratory, Vicksburg, Mississippi, Afrachanna Butler, US Army Corps of Engineers, Engineer Research and Development Center, Environmental Laboratory, Vicksburg, Mississippi, Gene Fabian, US Army Aberdeen Test Center, Aberdeen Proving Grounds, Maryland, Catherine Nestler, Applied Research Associates, Inc., Vicksburg, Mississippi

644 Immobilization of W, Pb, and Cu in Mixed Munitions Firing Range Contaminated Soils by Various Amendments, Antonis Karachalios, Stevens Institute of Technology, Hoboken, New Jersey, Juan Betancur, Bioengineering Group, Christos Christodoulatos, Stevens Institute of Technology, Hoboken, New Jersey, Washington Braid, Stevens Institute of Technology, Hoboken, New Jersey, Gregory O'Connor, US Army, Mahmoud Wazne, Stevens Institute of Technology, Hoboken, New Jersey, Santhi Chandra Jagupilla, Stevens Institute of Technology, Hoboken, New Jersey

**Poster Presentations**

**Monday, February 22 and 23, 12 - 1:30 p.m.**

11 A Comparative Evaluation of Unbalanced Loads in the Stability Analysis of T-walls Subjected to Hurricane Loading, J. Chatterjee, Ph.D, A.M. ASCE, Jackson State University, Jackson, Mississippi, Farshad Amini, Ph.D, P.E., F.ASCE, Jackson State University, Jackson, Mississippi

28 A Coupled Damage and Plasticity Drucker-Prager Model Based on Thermodynamics of Internal Variables, Yaoting Zhu, Southeast University, Nanjing, Jiangsu, People's Republic of China, Lu Sun, Catholic University of America, Washington, DC, Haoran Zhu, Southeast University, Nanjing, Jiangsu, People's Republic of China

31 Simplified Design Approach of Laterally Loaded Short Piles on Finite Slope in Cohesionless Soils, Wing Heung, PB Americas (Parsons Brinckerhoff) Inc., Ft. Lauderdale, Florida, Yeo Hoon Yoon, California Department of Transportation, Sacramento, California, Byoungjae Mun, PB Americas (Parsons Brinckerhoff) Inc., New York, New York

50 Improvement of Rainer System with a Porous Plate, Moon-Joo Lee, Korea University, Seoul, Republic of Korea, Sung-Kun Choi, Nawoogeo Consultant Co., Ltd., Woojin Lee, Korea University, Seoul, Republic of Korea, Mehmet T. Tumay, Louisiana State University, Baton Rouge, Louisiana

84 Analysis of Engineering Properties of Red Clay During Drying Process, Lingwei Kong, Institute of Rock and Soil Mechanics, Chinese Academy of Sciences, Wuhan, Hubei Province, People's Republic of China, Aiguo Guo, Institute of Rock and Soil Mechanics,

Chinese Academy of Sciences, Wuhan, Hubei Province, People's Republic of China

105 Controlling Preshear Relative Density in Triaxial Tests and its Effects on Undrained Behavior of Sand, Assem Elsayed, Gannett Fleming, Inc., Jacksonville, Florida

111 Prediction of Pile Settlement Using Artificial Neural Networks Based Cone Penetration Test Data, Fereydoon Pooya Nejad, Ferdowsi University, Mashhad, Khorasan, Iran, Mark Jaksa, Adelaide University, Adelaide, Australia

115 Estimation of Shear-wave Velocity Profiles: Inversion of Spatial Autocorrelation Coefficients, Argun Kocaoglu, Istanbul Technical University, Istanbul, Turkey, Karolin Firtana, Istanbul Technical University, Istanbul, Turkey

124 Investigation on Tunnel-induced Successive Surface Displacements During Construction Period at Shallow Depths in Shanghai Soft Ground, Zi-Song Yang, Tongji University, Shanghai, People's Republic of China, Fang-Le Peng, Tongji University, Shanghai, People's Republic of China, Yong Tan, Tongji University, Shanghai, People's Republic of China, Yu-Yin Hu, Technical Center, Shanghai Construction (Group) General Co., Shanghai, People's Republic of China, Wei-Ping Chen, Shanghai Foundation Engineering Co., Shanghai, People's Republic of China

127 Estimation of Soil Properties and Deformations in Staged Constructions Based on MCMC Method, Jun Kyung Park, Texas A&M University, College Station, Texas, Paolo Gardoni, Texas A&M University, College Station, Texas, Giovanna Biscontin, Texas A&M University, College Station, Texas

189 Development Mechanism and Remediation of Multiple Spontaneous Sinkholes: A Case History, Amr Sallam, Nodarse & Associates, Inc., Winter Park, Florida, Jim Jammal, Nodarse & Associates, Inc., Winter Park, Florida, Jay Casper, Nodarse & Associates, Inc., Winter Park, Florida

190 Assessment of Slope Failure Using Advanced Geotechnical Tests: Case Study in Harrisonburg, Louisiana, Sungmin Yoon, Louisiana Department of Transportation and Development, Baton Rouge, Louisiana, Ching Tsai, Louisiana Department of Transportation and Development, Baton Rouge, Louisiana, Kim Garlington, Louisiana Department of Transportation and Development, Baton Rouge, Louisiana

205 Florida Clay Gets a Bad Rap, Edward Zisman, ATC Associates, Inc., Tampa, Florida

219 The Use of MASW to Improve the Geotechnical Site Characterization of the 18.5 Km (11.5 Miles) long Augusta Levee- Preliminary Findings, Amin Tomeh, Matrix Engineering Group, Inc., Tucker, Georgia, Sam Alyateem, Matrix Engineering Group, Inc., Tucker, Georgia, Hameed Malik, City of Augusta, Georgia, Abie Ladson, City of Augusta, Georgia

239 Application of Effective Cone Factor for Strength Characterization of Saturated Clays, Junhwan Lee, Yonsei University, Seoul, Republic of Korea, Kyungbum Seo, Yonsei University, Seoul, Republic of Korea, Beongjoon Kang, Yonsei University, Seoul,

Republic of Korea, Sunghwan Cho, Yonsei University, Seoul, Republic of Korea, Changdong Kim, EJTech Co., Ltd., Sunnam, Kyunggi-do, Republic of Korea

259 Differential Settlements in Partial-Cut and Partial-Fill Embankments of Mountain Expressways in China, Darhao Chen, Changsha University of Science & Technology, Changsta, Hunan, People's Republic of China, Hongyuan Fu, Changsha University of Science & Technology, Changsta, Hunan, People's Republic of China, Guiyao Wang, Changsha University of Science & Technology, Changsta, Hunan, People's Republic of China, Jianjun Xu, Changsha University of Science & Technology, Changsta, Hunan, People's Republic of China, Xudong Zha, Changsha University of Science & Technology, Changsta, Hunan, People's Republic of China

278 Analysis of Structurally Restrained Eccentrically Loaded Footings, Ryan Corey, RTE Technologies, Inc., Overland Park, Kansas, Jie Han, University of Kansas, Lawrence, Kansas

323 Using Outcrop-Scale Digital Images for Size Distribution of Boulders and Blocks, Jeffrey Keaton, MACTEC, Los Angeles, California

340 Seismic Behavior of Gravity Retaining Walls, Mehran Javanmard, University of Zanjan, Zanjan, Iran, AliReza Angha, Azad University, Zanjan, Iran

347 A Simple Attenuation Prediction Method for Ground Vibration Induced by High-Speed Trains, Yit-Jin Chen, Chung Yuan Christian University, Chung-Li, Tao Yuan, Taiwan, Ting-Jui Chiu, Chung Yuan Christian University, Chung-Li, Tao Yuan, Taiwan

348 A Comparison of Numerical Algorithms in the Analysis of Pile Reinforced Slopes, Vaughan Griffiths, Colorado School of Mines, Golden, Colorado, Hang Lin, Central South University, Changsha, Hunan, People's Republic of China, Ping Cao, Central South University, Changsha, Hunan, People's Republic of China

363 Integrating Engineering into a General STEM Program for Middle School Girls, Tanya Kunberger, Florida Gulf Coast University, Fort Myers, Florida, Kristine Csavina, Florida Gulf Coast University, Fort Myers, Florida

403 Unsaturated Hydraulic Conductivity of Compacted Lateritic Soil Treated with Bagasse Ash, Kolawole Osinubi, Ahmadu Bello University, Zaria, Kaduna, Nigeria, Adrian Eberemu, University of Agriculture, Makurdi, Benue, Nigeria, Kolawole Osinubi, Ahmadu Bello University, Zaria, Kaduna, Nigeria

430 Experimental Study on the Creep Behavior of the Yangtze River Sand, Fei Wang, Southeast University, People's Republic of China, Linchang Miao, Southeast University, People's Republic of China, Weihua Lv, Southeast University, People's Republic of China

433 Pile Responses Due to Lateral Soil Movement of Uniform and Triangular Profiles, Hongyu Qin, Griffith University, Gold Coast, QLD, Australia, Wei Dong Guo, Griffith University, Gold Coast, QLD, Australia

437 Site Characterization of Clay Deposits in Northeast Nile Delta, Mohammad Farid Abbas, King Saud University, Saudi Arabia, Mohammad Amer, Cairo University, Giza, Egypt, Khalid El-zahaby, Housing and Building National Research Center, Giza, Egypt, Ashraf Kamal Hussien, Cairo University, Giza, Egypt

487 Suction Stress Influence on Earth Retaining Structures, Rafael Baltodano-Goulding, University of Costa Rica, San Jose, Costa Rica, Diana Korte, Costa Rica Institute of Technology, San Jose, Costa Rica

516 Landslide Stability Analysis of Utilizing Shear Strength of Slip Surface Soil: Asato and Tyunjun Landslides, Okinawa, Japan, Sho Kimura, Kagoshima University, Japan, Seiichi Gibo, University of Ryukyus, Nishihara, Okinawa, Japan, Shinya Nakamura, University of Ryukyus, Nishihara, Okinawa, Japan, Shriwantha Biidhi Vithana, Kagoshima University, Japan

517 Application of Recovered Strength in Stability Analysis of Reactivated Landslide, Xuechengzhen, China, Shinya Nakamura, University of the Ryukyus, Nakagami-gun, Okinawa, Japan, Seiichi Gibo, University of the Ryukyus, Nakagami-gun, Okinawa, Japan, Jun Yasumoto, University of the Ryukyus, Nakagami-gun, Okinawa, Japan, Sho Kimura, Kagoshima University, Japan, Shriwantha Buddhi Vithana, Kagoshima University, Japan

519 Influence of Laboratory-created OCR on Large Deformation Shear Strength: Ring Shear Behaviour of Two Types of Landslide Slip Surface Soil, Shriwantha Buddhi Vithana, Kagoshima University, Japan, Seiichi Gibo, University of the Ryukyus, Nakagami-gun, Okinawa, Japan, Shinya Nakamura, University of the Ryukyus, Nakagami-gun, Okinawa, Japan, Sho Kimura, Kagoshima University, Japan

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