

Geotechnical Frontiers 2025

Geotechnics of Natural Hazards

Selected Papers from Sessions of Geotechnical Frontiers 2025

Geotechnical Special Publication Number 366

Louisville, Kentucky, USA

2-5 March 2025

Editors:

Melissa S. Beauregard
Aaron S. Budge

ISBN: 979-8-3313-1520-7

Printed from e-media with permission by:

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



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

Copyright© (2025) by American Society of Civil Engineers
All rights reserved.

Printed with permission by Curran Associates, Inc. (2025)

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

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

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

www.asce.org

Additional copies of this publication are available from:

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

Contents

Climate Change

Effect of Pore Fluid Salinity on Isotropic Compressibility, Vertical Permeability, and Triaxial Stress–Strain Behavior of Kaolinite.....	1
Siamak Yoosefi, Mohammadreza Jebeli, William J. Baker III, and Christopher L. Meehan	
Cementing Soils via Electrodeposition.....	11
Alessandro F. Rotta Loria, Andony Landivar Macias, and Yeong-Man Kwon	
Simulation of Subsurface Urban Heat Islands via the Random Forest Algorithm	20
Zhonghao Chu and Alessandro F. Rotta Loria	
Quantifying Creeping Deformations due to Subsurface Urban Heat Islands in Chicago	30
Anjali N. Thota and Alessandro F. Rotta Loria	
Degradation of the Shear Strength Induced by Thawing of Frozen Fine-Grained Soils	39
Hossein Emami Ahari and Beena Ajmera	
Tangential Heave Stress on Piles in Cold Regions.....	49
Hossein Emami Ahari, Beena Ajmera, Rohit Pant, Chang Huang, and Yuqing Liu	
2D Numerical Modeling of Pavements on Expansive Soil in Extreme Climates	59
Ekansh Agarwal, Xiong Zhang, and Ning Luo	
Hysteresis Model of Permafrost Thermal State Variation with Air Temperature in Utqiagvik, Alaska, Based on Distributed Temperature Sensing.....	69
Xiaohang Ji, Ming Xiao, and Eileen Martin	
Monitoring of In Situ Moisture Content and Bulk Electrical Conductivity of Base Course and Subgrade of a Coastal Alabama State Highway	79
Amy Diekmann, Benjamin F. Bowers, and J. Brian Anderson	
Evaluation of Climate Resiliency of Highway Embankment Using LiDAR and Electrical Resistivity Imaging	89
Fariha Rahman, A. Q. M. Zohuruzzaman, Sadik Khan, and Tyra-Nicole Whyte	

Earthquake Engineering and Soil Dynamics

Prediction Mechanism for Liquefaction Threshold Void Ratio of Granular Soils	100
Sao-Jeng Chao, Jyun-Yi Li, and Jason Chao	
CPT-Based Assessment of Preliminary Soil Classification, Stress History, and Monotonic and Cyclic Strength of Transitional Silts.....	109
Susan C. Ortiz and Armin W. Stuedlein	
Investigating the Effect Size of Earthquake Catalog with Bayesian BEST Estimation: A Case Study in Ethiopia	123
Mohammed Al-Ajamee and Ritesh Kumar	
Past, Present, and Future Liquefaction Hazards at Greenmeadows School, Napier, New Zealand	134
Aavash Ghimire, Kaleigh M. Yost, Andrew Stolte, Alfonso Mejia, and Rolando Orense	
Evaluation of Analysis Methods for Earthquake-Induced Slope and Bridge Foundation Displacement—A Case Study on Vincent Thomas Bridge, West Tower Foundation, Port of Los Angeles, California	145
Amin Rahmani, Anoosh Shamsabadi, Hubert Law, and Patrick Wilson	
Efficient Uncertainty Quantification in Seismic Site Response via Random Field Modeling.....	158
Ayele Chala and Richard Ray	
A New Methodology for Earthquake Ground Motion Spatial Correlation	170
Pengfei Wang and Busra Bocekli	
Evaluation of Shear-Modulus Reduction Models for Quaternary Sediment and Fill in South Carolina.....	181
Ali Sedaghat, Ronald Andrus, Andrew Russell, Hossein Golkarfard, Nadarajah Ravichandran, Glenn Rix, and Clinton Carlson	
Seismic Ground Deformation Patterns in Fluvial Deposits for Alternative Scales of Soil Variability	194
Mohammad F. Athar and Patrick Bassal	
Geotechnical Characterization of the Soil along the Oregon Coast: Preparing for the Next Subduction Event	204
Amalesh Jana, Maxwell Williams, Coen Hiegelke, Ali Dadashiserej, and Saswati Ray	
A Numerical Validation of a Simplified Solution for Seismic Earth Pressure on a Tall Dry Dock Wall.....	216
Zhongze Xu, Emrah Yenier, and Brice Exley	

Effects of Loading Frequency on Liquefaction Susceptibility of a Natural Sand Using Cyclic Direct Simple Shear Tests.....	228
Reza Mohammadi, Peiman Zogh, and Ramin Motamed	
Next Generation Liquefaction Laboratory Database for Susceptibility and Cyclic Strength Assessment	238
Arda Sahin, Amalesh Jana, Christine Z. Beyzaei, Rodolfo Sancio, Kristin J. Ulmer, Scott J. Brandenberg, Steven L. Kramer, Jonathan P. Stewart, and Armin W. Stuedlein	
Selection of Input Motions for a Series of Large-Scale Bidirectional Shake Table Tests Based on Nonlinear Site Response Analysis	248
Satish Manandhar and Ramin Motamed	
Earthquake Event Subset for Reliability Analysis of the Sacramento-San Joaquin Delta Levee System	258
Zehan Liu, Scott J. Brandenberg, Jonathan P. Stewart, and Pengfei Wang	
Effect of Varying Freezing Temperatures on the Dynamic Behavior of Clays.....	268
Sepehr Akhtarshenas, Seyed Morteza Zeinali, and Sherif L. Abdelaziz	
Comparison Static and Dynamic Compressibility of Poorly Graded Gravel in Centrifuge Modeling Tests	278
Nampol Chaowalittrakul and Inthuorn Sasanakul	
Numerical Simulations of Sand Elements Based on Constant-Volume versus True-Undrained Data from Cyclic Direct Simple Shear Tests.....	288
Catherine T. Nguyen, Wing Shun Kwan, and Cesar Leal	
Liquefaction Triggering Model for Injection-Induced Seismic Events in Oklahoma, Texas, and Kansas.....	300
Russell A. Green, Tyler Quick, and Ellen Rathje	
Evaluation of Seismic Slope Displacement Models Using Case History Data.....	311
Venkataraman Ramesh and Ellen M. Rathje	
Numerical Analysis of Liquefaction-Induced Deformation in Under-River HDD Crossings: A Case Study on Geotechnical Challenges and Solutions	324
Yasser Soltanpour, Erik Newman, Lance Finnefrock, and Mathew Francis	
Numerical Assessment of Vs Profile Gradient as a Site Response Predictor	335
Santosh Katuwal and Renmin Pretell	
Optimizing Luminaire Pole Foundation Designs with Hybrid FEM+ALE Impact Simulations	345
Tewodros Y. Yosef, Chen Fang, Joshua S. Steelman, Mojdeh Asadollahipajouh, and Ronald K. Faller	

Seismic Behavior of Localized Liquefied Sand in Three Subsequent Weak Events	357
Roohollah Farzalizadeh, Abdolreza Osouli, and Prabir Kolay	
Assessing Numerical Simulations of Liquefiable Geosystems Using Time History-Based Validation Metrics	366
Maziar Mivehchi and Katerina Ziotospoulou	
Effect of Flexibility Ratio on Shallow Circular Tunnels Subjected to Love Waves.....	375
Md. Asad Ahmad and Antonio Bobet	
Applying the Energy-Based Liquefaction Framework on a Well-Graded Gravelly Soil	385
Satuk Bugrahan Sari and Adda Athanasopoulos-Zekkos	
Cyclic and Post-Cyclic Shear Responses of Intact Specimens from Three Alluvial Fine-Grained Soils.....	399
Kayla Sorenson, Arash Khosravifar, and Diane Moug	
Assessing Seismic Hazards for Engineering Design and Other Applications in Kentucky	409
Zhenming Wang and N. Seth Carpenter	
Comparing Cyclic Direct Simple Shear Behavior of Fine-Grained Soil Prepared with SHANSEP or Recompression Approaches	419
Amir Barati-Nia, Andrew Earl Parrott, Kayla Sorenson, Diane M. Moug, and Arash Khosravifar	
Seismic Settlement Evaluation of the Nihal Atakas Mosque after the 2023 Kahramanmaraş, Turkiye, Earthquakes	430
Ozgun Alp Numanoglu, Renmin Pretell, Sevil Akkaya, and Vashish Taukoor	

Geotechnics of Soil Erosion

Optimizing Fungal Growth Duration and Concentrations of Cementation Solutions for Fugitive Dust Mitigation via FICP	444
Taylor Tuckett, Adesola Adegoke, and Emmanuel Salifu	
Biopolymer Impact on Grassroot Growth and Strength of Surficial Soils	454
Negin Mousavi, Anish Lamsal, Mohammadhasan Sasar, and Sherif L. Abdelaziz	
Experimental Investigation for a Novel Bio-Inspired Scour Countermeasure.....	463
Rodolfo Castillo, Stacey Kulesza, and Landolf Rhode-Barbarigos	

Identifying Key Factors for Initiating Soil Erosion around Defective Buried Pipes under Infiltration Conditions	474
Fei Wang, Ruth Abegaz, Jun Xu, and Jie Huang	
Integrating Unconfined Compressive Strength Analysis with Erosion Testing for Enhanced Soil Erosion Category Predictions.....	484
Mostafa Ebrahimi, Abdolreza Osouli, and Heather Z. Shoup	
Variation in Rainfall Erosivity Estimations due to Different Regression Models and Changing Climatic Conditions.....	493
Mengting Chen, Jaime C. Schussler, and Debakanta Mishra	
Erosion Characteristics of Select Biopolymers and Their Cross-Linking Effect on the Stability of Cohesive Slopes.....	504
M. Ashok Kumar, Arif Ali Baig Moghal, Romana Mariyam Rasheed, and Mohammad Nuruddin	
Erosion Mechanism Assessment and Scour Depth Prediction of Offshore Cemented Sand Using Erosion Function Apparatus.....	512
Suhyük Park, Jinwoo Park, and İlhan Chang	
Monitoring Pier Scour at Alabama Bridges Using Low-Cost Equipment	520
Murilo H. P. Tarozzo, Luis F. Castaneda, Jose G. Vasconcelos, and J. Brian Anderson	
 <i>Hazard Mitigation</i>	
Modern Methods for Investigating Sinkhole and Subsidence Risks Relating to Abandoned Underground Coal Mines	529
Joshua T. Zimmermann	
Geosynthetic Reinforcing Technique against Earthquake-Induced Damage of Rubble Mound Breakwaters	538
Pattan K. Akarsh, Babloo Chaudhary, Manu K. Sajan, Babita Sah, and S. Kumar	
Multi-Hazard Fragility Curves for Vulnerability Assessment of Buried Pipelines Subjected to Earthquakes and Expansive Soil Conditions.....	548
Ali Shojaeian and Kanthasamy K. Muraleetharan	
Best Practices for Combining Geophysical Data and Geotechnical Exploration in Karst Geology	558
Matthew A. Dettman	
Design of Distributed Fiber Optic Sensing Monitoring System for Earthquake-Resistant Ductile Iron Pipelines Crossing Seismic Fault.....	567
Shih-Hung Chiu, Maksymilian Jasiak, Chuao Dong, Gersena Banushi, Kenichi Soga, Michael Riemer, David Katzev, Brad Wham, Blake Berger, Jeff Mason, and Thomas O'Rourke	

Go/No-Go Drawings for Excavation of Ash Pond—Case Study	576
Katherine G. Coco, Joseph Keller, Kirkland Broadwell, and Matthew Ksanznak	

Landslides

An IoT-Based Monitoring System for Detecting Slope Movement.....	586
Md. Jobair Bin Alam, Luis Salgado Manzano, Rahul Debnath, Ahmed Abdelmoamen Ahmed, Synia Williams, and Markus Hartsfield	
A New Probabilistic Based Approach for Rainfall-Triggered Landslide Hazard Assessment	597
Sara Tahajomi Banafshehvaragh and Pengfei Wang	
Shear Slide Analysis of Sloping Seabed Caused by Waves Using Random Finite Element Method	608
Amin Rafiei and Areen Al Ababneh	
Computationally Efficient Simulation of Long-Term Landslide Motion Driven by Rainfall Cycles.....	619
Fabio Rollo and Giuseppe Buscarnera	
USACE Landslide Database: Characterizing, Understanding, and Managing Risks from Unstable Soils and Rock	629
April L. Fontaine and Daniel A. Vellone	
Reducing Site Investigation Uncertainties Using Coupled Electrical Resistivity Imaging and Ground Penetrating Radar Methods.....	638
M. F. Khan, S. A. Alzghoul, S. Khan, and I. LaCour	