NATIONAL ACADEMIES *Sciences Engineering Medicine*

Symposium on Geotechnical Engineering Needs for Extreme Hazards

Hosted by the Committee on Geological and Geotechnical Engineering (COGGE)

WEDNESDAY, JANUARY 7, 2026

8:00–8:55 **Breakfast**

9:00–9:15 **Welcome and Housekeeping**

Michelle Schwalbe (National Academies of Sciences, Engineering, and Medicine)
Youssef Hashash (University of Illinois Urbana-Champaign, COGGE Chair)
Brittany Segundo (National Academies of Sciences, Engineering, and Medicine)

9:15–9:25 **Sponsor Remarks**
Giovanna Biscontin (National Science Foundation)

9:25–10:15 **Keynote**
Extreme Events and Natural Hazards: Research Needs for Building Resilience and Mitigating Risk
Moderated by **Krishna Kumar (***University of Texas at Austin)*

Scott Anderson (BGC Engineering Inc.)**

10:15–10:35 **BREAK**

10:35–12:00 **Session 1: Flooding and Storm Surges**
Moderated by **Nina Stark** *(University of Florida)*

Britt Raubenheimer (Woods Hole Oceanographic Institution)**
Ghada Ellithy (Embry-Riddle)**
Nathan Snorteland (HDR)
Rafael Tinoco (U of Illinois)

12:00 – 12:45 **LUNCH**

12:45 – 1:45 **Session 2: Fire**

Moderated by **Oladoyin Kolawole** *(New Jersey Institute of Technology)*

Francis Rengers (USGS)**
Michael Lamb (Cal Tech)**
Idil Akin (UCLA)

1:45 – 1:55 **BREAK**

1:55–3:30 **Session 3: Information Resources and Opportunities**
Moderated by **Zenon Medina-Cetina** *(Texas A&M University)*

FEATURED ADDRESS: *Digital twins for natural hazards: Real-time tsunami forecasting in Cascadia*
Omar Ghattas (UT Austin)**

**indicates speaker is virtual

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EXPERT DISCUSSANTS:

Ilkay Altintas (SDSC, UC San Diego)
Doug Edmonds (Indiana University)
Greg Baecher (University of MD)
Dimitrios Zekkos (Berkeley)

3:30–3:45   **BREAK**

3:45–4:30   **Townhall Discussion**
*Moderated by Dr. **Youssef Hashash*** (University of Illinois Urbana-Champaign, COGGE Chair)

4:30 – 5:00   **Overarching Themes and Meeting Synthesis**
Committee members

MEETING ADJOURNED

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Idil Akin is an Associate Professor in the Civil and Environmental Engineering Department at UCLA. Her current research primarily focuses on post-wildfire slope stability. She has also worked on many research questions related to fundamental mechanisms that control the behavior of saturated and unsaturated soils, bio-geotechnics, waste recycle and reuse, and geoenvironmental engineering. Her research has been sponsored by NSF, DOTs, and industry. Among her awards are the ASCE Arthur Casagrande Professional Development Award in 2026, ASCE Thomas Middlebrooks Award in 2025, and NSF CAREER Award in 2021. Dr. Akin earned her PhD in 2017 and MS in 2014 from University of Wisconsin-Madison, and her BS in 2012 from Middle East Technical University, Turkey.

İlkay Altıntaş is a research scientist at the University of California San Diego, the Chief Data Science Officer of the San Diego Supercomputer Center, and a Founding Faculty Fellow of the Halıcıoğlu Data Science Institute within the School of Computing, Information, and Data Science. Specializing in scientific workflows, scalable computing and data systems, her research enables collaborative teams to deliver impactful results and sustainable solutions by making computational data science and AI more reusable, programmable, scalable, accessible, and reproducible. She is the Founding Director of the Societal Computing and Innovation Lab, which focuses on novel approaches to creating breakthrough technological innovations that address complex scientific and societal challenges. Her work has been applied to many domains including bioinformatics, geoinformatics, high-energy physics, material science, multi-scale biomedical science, smart cities, and smart manufacturing. She is also the Founder of the WIFIRE Program for wildland fire innovations and the Principal Investigator of the NSF National Data Platform, the Wildfire Science and Technology Commons, and other diverse grants that advance scalable computing, AI, and data systems across the digital continuum from edge to HPC. Her honors include the 2015 IEEE TCSC Award for Excellence in Scalable Computing for Early Career Researchers and the 2017 ACM SIGHPC Emerging Woman Leader in Technical Computing Award. She serves on the governing boards of Climate and Wildfire Institute and Data Science Alliance, was elected to the Board of Governors for the IEEE Computer Society, and was appointed by California Governor Gavin Newsom to the Wildfire Technology Research and Development Review Advisory Board. Ilkay received her Ph.D. from the University of Amsterdam.

Scott Anderson is a Senior Principal Geotechnical Engineer at BGC, a former member of the National Academies of Science, Engineering and Medicine's Committee on Geological and Geotechnical Engineering, a Steering Committee member of the National Science Foundation Geotechnical Extreme Event Reconnaissance Association, the former leader of the U.S. Federal Highway Administration's technical resources in geotechnical engineering and a former professor at the University of Hawaii. He is active with the ASCE Geo-Institute, the Deep Foundations Institute, the Association of Engineering Geologists and other professional organizations. At BGC, Scott works with clients in all business sectors to help characterize, manage and communicate geotechnical risks. He is a strong advocate for innovation, and he makes his home in Golden, Colorado.

Dr. **Gregory B. Baecher** is Professor of Civil and Environmental Engineering at the University of Maryland and Hagler Institute Fellow at Texas A&M University. He works on risk management of water infrastructure. He has co-authored six books and 250+ publications on these topics and 17 National Academy consensus reports on risk management in federal policy. He holds a PhD in Civil Engineering from MIT and BSCE from the University of California, Berkeley.

Dr. **Giovanna Biscontin** has been serving as a program director of the Engineering for Civil Infrastructure (ECI) program at the National Science Foundation since 2020. Her research focuses on characterization and modeling of the response of soils, especially when subjected to cyclic loading. She has worked on many aspects of geotechnical engineering including constitutive modeling, offshore foundations, discrete element modeling, bio-mediated geotechnics, as well as applications of machine learning techniques to urban excavations. Dr. Biscontin earned her bachelor's degree from the University of Padova (Italy) and both her MS and PhD from the University of California,

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Berkeley (USA). She was an academic at Texas A&M University from 2002 to 2013 and then Cambridge University (UK) from 2013 to 2022.

Dr. **Douglas Edmonds** is a professor of earth sciences at Indiana University Bloomington, where he holds the Malcolm and Sylvia Boyce Chair in Geological Sciences and directs the Sedimentary Systems Lab. His research examines how sediment movement, fluid flow, and bed topography interact to build and reshape rivers, deltas, and coastlines, with a focus on environments that are both hotspots of human habitation and key archives of Earth's history. Combining field campaigns, remote sensing, numerical modeling, and machine learning approaches, Edmonds and his group aims to better predict landscape evolution and flood hazards under a changing climate. He has led projects quantifying land loss and restoration potential in major delta systems, assessing landscape change following catastrophic dam failures, and developing global datasets and models that link sediment fluxes to delta form and coastal risk. His work appears in leading journals including *Nature*, *Science*, and the *Journal of Geophysical Research*. For his contributions to ocean and coastal sciences he was named a Sloan Foundation Fellow in 2014, and recently for his contributions to understanding rivers, and flooding, Edmonds was named a Guggenheim Fellow in 2025. He holds a Ph.D. in Geoscience from Pennsylvania State University.

Dr. **Ellithy** has over 20 years of academic, research and professional experience in the field of geotechnical engineering. She works as an Assistant Professor of Geotechnical Engineering at ERAU. Before joining ERAU in 2020, Ghada worked as a Primary Investigator with USACE, and as an adjunct professor at Mississippi State University. Ghada worked as a Project Manager and Lead Design Engineer at private geotechnical consultant firms on various projects. Ghada has a broad range of research and design experiences related to soil mechanics and geoenvironmental applications including effects of climate change on civil infrastructure, unsaturated soil mechanics and soil erosion.

Omar Ghattas is Professor of Mechanical Engineering at The University of Texas at Austin and holds the Cockrell Chair in Engineering. He is also Principal Faculty and Director of the OPTIMUS (OPTimization, Inverse problems, Machine learning, and Uncertainty for complex Systems) Center in the Oden Institute for Computational Engineering & Sciences, and a member of the faculty in the Computational Science, Engineering, and Mathematics graduate program. He holds courtesy appointments in Earth & Planetary Sciences, Computer Science, and Biomedical Engineering. Before moving to UT Austin in 2005, he spent 16 years on the faculty of Carnegie Mellon University. His current research focuses on theory and algorithms for large-scale Bayesian inversion, stochastic optimal control/design, and digital twins for complex engineered and natural systems. He is a three-time winner of the ACM Gordon Bell Prize, a recipient of the SIAM Geosciences Career Prize and the SIAM Babuska Prize, and a Fellow of SIAM and USACM. He holds BSE (civil and environmental engineering) and MS and PhD (computational mechanics) degrees from Duke University.

Youssef M. Hashash is the Grainger Distinguished Chair in Engineering and Professor of Civil and Environmental Engineering at the University of Illinois Urbana-Champaign. Dr. Hashash's expertise includes underground structures, deep excavations, numerical modeling, earthquake engineering, and static and dynamic soil-structure interaction analysis, visualization and application of information technology, deep learning and artificial intelligence to geotechnical engineering. Dr. Hashash's experience encompasses geotechnical design for tunnels and excavations, seismic soil-structure interaction analysis, and construction monitoring, and the use of advanced computational tools for geotechnical practice. Dr. Hashash was elected to the National Academy of Engineering in 2022, is the recipient of the 2014 Peck Medal, and the 2000 Presidential Early Career Award for Scientists and Engineers amongst many honors and recognitions. Dr. Hashash received his Ph.D., M.S., and B.S., in Civil Engineering from the Massachusetts Institute of Technology.

Oladoyin Kolawole is an Assistant Professor in the Department of Civil and Environmental Engineering at the New Jersey Institute of Technology (NJIT). He is the director of the Geomechanics for Geo-Engineering and

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Sustainability (GGES) Lab. Prior to joining NJIT, Dr. Kolawole was a Postdoctoral Research Associate at Texas Tech University, before later working as a Visiting Assistant Professor (Faculty Fellow) at Hope College, Michigan. He pioneered the "biogeomechanics" concept, which studies the mechanical response of rocks due to biological-induced processes. He is a geomechanics and geotechnical engineer who studies the multiscale deformation behavior and physical attributes of geomaterials (rocks and soils) to address problems related to natural and built infrastructure, earth systems, energy, and hazard mitigation and remediation. Additionally, He studies how earth materials respond mechanically to biologically induced processes, applying our findings to mitigating rock failure and collapse, post-hazard remediation, and energy resources. Dr. Kolawole is a recipient of the Future Leader Award and the Distinguished Service Award from the American Rock Mechanics Association (ARMA). He has authored and co-authored several peer-reviewed journal and conference papers on geomechanics and geotechnical engineering. He is an Editorial Board Member of Springer Nature's Discover Civil Engineering journal, and volunteers as a peer reviewer for reputable rock mechanics and geotechnical engineering journals, in addition to mentoring undergraduate and graduate students.

Krishna Kumar is an Assistant Professor and J. Neils Thompson Centennial Teaching Fellow in the Fariborz Maseeh Department of Civil, Architectural, and Environmental Engineering and the Oden Institute of Computational Sciences at the University of Texas at Austin. His research explores the intersection of artificial intelligence (AI) and machine learning (ML), Civil Engineering, simulations, and robotics. He is mainly known for his contributions to differential programming, graph neural networks, and the development of novel computational methods for simulating complex geotechnical problems. His work bridges the gap between traditional physics-based modeling and modern machine-learning approaches, advancing the field of computational geomechanics. He is the principal investigator and director of an NSF-funded national ecosystem for integrating AI in civil engineering. Dr. Kumar's honors include an NSF CAREER Award in 2024 and the Dean's Award for Outstanding Teaching by an Assistant Professor at UT Austin. He is an Associate Editor for the ASCE Journal of Computing in Civil Engineering and the International Journal of Rock Mechanics and Geotechnical Engineering. Dr. Kumar obtained his Ph D. in Engineering from the University of Cambridge.

Michael Lamb is a geomorphologist and professor of geology at Caltech. His group studies how water and sediment transport shape Earth's surface from its mountains to the coastal plains. Current research includes river delta sedimentation and coastal land loss in response to sea-level rise; riverbank erosion and carbon cycling in Arctic permafrost floodplains; and post-fire erosion and debris flow initiation in southern California. He also works to understand ancient water-rich environments on Mars as team member on the rovers Curiosity and Perseverance. He received his B.S. in Geology and Geophysics from the University of Minnesota, M.S. in Oceanography from the University of Washington, and PhD in Earth and Planetary Science at U.C. Berkeley.

Dr. **Zenon Medina-Cetina** is an Associate Professor in the Zachry Department of Civil & Environmental Engineering, and a Mosbacher Research Fellow in the Mosbacher Institute for Trade, Economics, and Public Policy at Texas A&M University (TAMU). Previously he held dual positions in the Computational Geomechanics Division and the International Centre for Geohazards at the Norwegian Geotechnical Institute (NGI). Dr. Medina-Cetina is expert at probabilistic risk assessment and management of geo-systems with components that vary across multiple spatial and temporal scales. His approaches have led to the integration of efforts of international transdisciplinary teams to formulate and implement risk models aimed at improving the stability of regional interdependent social, economic, and environmental systems. Dr. Medina-Cetina is a Fellow of the Society for Underwater Technology (SUT), former Fulbright Scholar, and recently received TAMU's College of Engineering Excellence Award, and twice held the Zachry Career Professorship Endowment. Dr. Medina-Cetina served as the Chair and President of SUT in the U.S., as Vice-Chair and now Chair of the Risk Assessment and Management Technical Committee of the American Society of Civil Engineers' Geo-Institute (ASCE-GI), and as member of the executive board of the international Geotechnical Safety Network (GEOSNet). He served as member of the Editorial Board of the journal of the SUT, and currently serves as member of the Editorial Board of the GeoRisk journal, and as Associate Editor of

the journal 'Machine Learning and Data Science in Geotechnics'. Dr. Medina-Cetina obtained his PhD and MSc degrees in Civil Engineering both from Johns Hopkins University, a ME degree in Civil Engineering from the Universidad Autónoma de Mexico, and his BSc in Civil Engineering from the Universidad Autónoma de Yucatán.

Britt Raubenheimer is a Senior Scientist at the Woods Hole Oceanographic Institution investigating processes impacting the evolution and resilience of our coasts. She initiated the NSF-funded Nearshore Extreme Events Reconnaissance (NEER) Association to facilitate rapid data collection before, during, and after major storms to understand feedbacks among natural system processes, the built environment, and societal actions, and is co-developing rapidly deployable towers to provide real-time observations of coastal winds, waves, and surge during hurricanes for coastal managers, communities, and researchers. She also developed a web app (iFlood) that is being used to investigate flooding. During her career, she has received an ONR Young Investigator award, an NSF Career Award, the Bob Dean Award for Coastal Academics from the American Shore and Beach Preservation Association, the WHOI Doherty Chair for education and the Arons Award for excellence in teaching, and the International Coastal Sediments Award.

For the past 11 years, **Francis Rengers** has worked as a Research Geologist at the U.S. Geological Survey (USGS) in the landslide hazard program (https://www.usgs.gov/programs/landslide-hazards). Prior to the USGS he worked in environmental consulting and for the Colorado Water Conservation Board. Dr. Rengers obtained undergraduate degrees in Geology and French, at West Virginia University (1999-2003), an M.S. degree from Colorado State University in Fluvial Geomorphology (2003-2005), and a Ph.D. in Geoscience from the University of Colorado (2009-2014) with a focus on highly erosive environments (gullies and wildfire areas). Since 2014, Dr. Rengers has worked at the USGS on postfire debris flows, and he has also served as an adjunct professor at the Colorado School of Mines since 2018. He was the 2024 Chair of the Environmental and Engineering Geology division of the Geological Society of America and is an active member in the American Geophysical Union, European Geophysical Union, and Japan Geophysical Union.

Nate Snorteland, P.E., is the Dams Practice Lead for HDR, responsible for strategic planning and all aspects of HDR's global dams practice. Nate has more than 25 years of experience in civil and geotechnical engineering with expertise in the evaluation, design, and construction of dams and levees. He has led several multi-disciplinary megaprojects and has experience with embankment and RCC dam design and construction. He has led the development of a variety of dam and levee safety policies worldwide and the development of risk assessment methods and tools. He previously worked at U.S. Army Corps of Engineers, where he most recently served as Director of the Risk Management Center and the Bureau of Reclamation.

Nina Stark is an Associate Professor and Director of the Center for Coastal Solutions at the University of Florida. Her research is focused coastal and marine geotechnics with focus on geotechnical aspects of erosion and geomorphodynamics, coastal storms and flooding, site investigation in challenging subaquatic environments, and naval applications such as trafficability, navigation, and unexploded ordnances risk assessment. She received her MS in Geophysics (2007) from the University of Muenster (Germany) and her PhD in Marine Geotechnics (2011) from the University of Bremen (Germany). She was a postdoc (2012-2013) at Dalhousie University , Canada, and faculty at Virginia Tech (2013-2023) before joining the University of Florida in 2023. She has received the NSF CAREER and ONR Young Investigator awards in 2018 and was leading the SERDP MR project of the year in 2022. She has been co-leading multiple extreme events reconnaissance missions after hurricanes and riverine floods for the Geotechnical Extreme Events Reconnaissance and the Nearshore Extreme Events Reconnaissance associations.

Dr. Rafael Tinoco is an Associate Professor at the Department of Civil and Environmental Engineering at the University of Illinois Urbana-Champaign. As Director of the Ecohydraulics and Ecomorphodynamics Laboratory, his work focuses on flow-biota-sediment interactions to better understand the underlying fundamental physical

processes involved on nature-based solutions for stream restoration, coastal protection, and control of invasive aquatic species. Dr. Tinoco earned his Civil Engineering degree at the National University of Mexico (UNAM) and obtained his MS and PhD degrees from Cornell University. He currently serves as Secretary of the Board of the River, Coastal and Estuarine Morphodynamics Symposium (RCEM) and as Vice-Chair of the technical committee on Ecohydraulics of the International Association for Hydro-Environment Engineering and Research (IAHR).

Dimitrios Zekkos, Ph.D, P.E., is a Professor in the Department of Civil and Environmental Engineering at the University of California at Berkeley. Dimitrios' research aims to advance the resiliency of critical infrastructure systems against natural hazards such as earthquakes, and climate hazards such as storms, hurricanes, and monsoons. His group has been developing novel integrated methodologies for field and laboratory characterization as well as numerical modeling that leverage recent technological and computational advances. Dimitrios has worked in more than 10 countries worldwide in natural disaster response, consulting or research roles. He was previously a member of the NASA Disasters team and is currently a member of the GEER steering committee and a co-PI of the NSF Center for Land Surface Hazards (CLaSH). His research has been funded by NSF, NASA, USGS, EPA, the World Bank, as well as industry partners and is recognized through awards from organizations such as the American Society of Civil Engineers (ASCE) and the International Society for Soil Mechanics and Geotechnical Engineering (ISSMGE), including Casagrande Award, Middlebrooks Award, and the Outstanding Innovator Award. Dimitrios can be reached at: https://dimitrioszekkos.org/