



PanAm Unsat 2021

3rd Pan-American Conference on Unsaturated Soils
PUC-Rio | Rio de Janeiro, Brazil
25-28, July 2021

Unsaturated Soil Mechanics and
Its Application to Geotechnical
and Geoenvironmental Engineering



PROGRAM



3rd Pan-American Conference on Unsaturated Soils

PROGRAM

All times are Brasilia Standard Time, GMT-3

FRIDAY, JULY 16TH, 2021

WARM-UP WEBINAR: TEACHING UNSATURATED SOIL MECHANICS AT THE UNDERGRADUATE LEVEL

FRIDAY, JULY 23RD, 2021

SHORT COURSE: APPLIED UNSATURATED SOIL MECHANICS

Start	July 23rd, 2021 (Friday)	Finish
1B 9h00	Slope stability - André Cavalcante (UnB, Brazil)	10h30
10h30	Break	11h00
11h00	Pavements - Bernardo Caicedo (UNIANDES, Colômbia)	12h30
12h30	Break	13h30
13h30	Design of barriers - Alexandre Cabral (Univ. Sherbrooke)	15h00
15h00	Break	15h30
15h30	Numerical modeling in mining - Murray Fredlund (Bentley)	17h00

MONDAY, JULY 26TH, 2021 – REGULAR PROGRAM

Start	July 26th, 2021 (Monday)	Finish	Chair	Secretary
10h00	Opening ceremony	10h30	Fernando Marinho (USP, BR)	
10h30	KN1 - Gerald Miller (University of Oklahoma, USA)	11h20		
11h20	STA1 - Laureano R. Hoyos (U.T.A., USA)	12h10		
12h10	Break	13h10		
13h10	Parallel session 1A - Fundamentals	14h10	L. Hoyos (UTA, USA)	Mariana Benessiuti (UNESP, BR)
13h10	Parallel session 1B - Fundamentals	14h10	R. Cardoso (IST, PT)	Giovana Georgetti (UFU, BR)
14h10	Break (40 min)	14h50		
14h50	KN2 - Xiong Zhang (Missouri U.S.T., USA)	15h40	Orçencio M. Vilar (USP-SC, BR)	
15h40	STA2 - John McCartney (U.C. at San Diego, USA)	16h30		
16h30	Break	17h00		
17h00	Parallel session 2A - Fundamentals	18h00	J. C. Rojas Vidovic (USFX, BO)	Manoel B. Neto (PUC-Rio, BR)
17h00	Parallel session 2B - Fundamentals	18h00	Willian Likos (UW-M, USA)	E. Oliveira (UFPR, BR)

TUESDAY, JULY 27TH, 2021 – REGULAR PROGRAM

Start	July 27th, 2021 (Tuesday)	Finish	Chair	Secretary
10h00	KN3 - Jose Camapum de Carvalho (UnB, Brazil)	10h50	Gilson Gitirana (UFG, BR)	
10h50	KN4 - Ward Wilson (University of Alberta, Canada)	11h40		
11h40	KN5 - Del Fredlund (University of Saskatchewan, CA)	12h30		
12h30	Break	13h30		
13h30	Parallel session 3A - USM practice	14h30	Jorge Zornberg (UTA)	T. Carnavale (PUC-Rio, BR)
13h30	Parallel session 3B - USM practice	14h30	Alfredo Satyanaga (Nazarbayev Univ, KZ)	A. Cirone (PUC-Rio, BR)
14h30	Break	15h10		
15h10	KN6 - Luciano Oldecop (Universidad Nacional de San Juan, AR)	16h00	André Cavalcante (UnB, BR)	
16h00	KN7 - Paul Simms (Carleton University, Canada)	16h50		
16h50	Break	17h20		
17h20	Parallel session 4A - Tailings	18h20	Luciano Oldecop (UNSJ, AR)	Carlos Béso (PUC-Rio, BR)
17h20	Parallel session 4B - Tailings	18h20	E. Rojas-González (UAQ, MX)	João Guilherme Rassi Almeida (UFG, BR)
18h20	TC-106 Meeting	18h50		

WEDNESDAY, JULY 28TH, 2021 – REGULAR PROGRAM

Start	July 28th, 2021 (Wednesday)	Finish	Chair	Secretary
10h00	KN8 - Fernando Jucá (UFPE, Brazil)	10h50	Heraldo Giacheti (UNESP, BR)	
10h50	KN8 - Leonardo Guimarães (UFPE, Brazil)	11h40		
11h40	Break	12h40		
12h40	Parallel session 5A - Modeling	13h40	Marcelo J. Sanchez (TAMU, USA)	Sandro L. Machado (UFBA, BR)
12h40	Parallel session 5B - Modeling	13h40	Hamed Sadeghi (SUT, IR)	F. H. M. Portelinha (UFSC, BR)
13h40	Break	14h20		
14h20	KN10 - Claudia Zapata (Arizona State Univ., USA)	15h10	Márcia Mascarenha (UFG, BR)	
15h10	STA3 - Sai Vanapalli (Univ. of Ottawa, CA)	16h00		
16h00	Break	16h20		
16h20	Parallel session 6A - USM practice	17h20	Katerina Tsiampousi (IC, UK)	Cristina de H. C. Tsuha (USP-SC, BR)
16h20	Parallel session 6B - USM practice	17h20	Bernardo Caicedo (Unianandes, CO)	Felipe de Nadai (USP, BR)
17h20	Break	17h40		
17h40	STA4 - Sandra Houston (Arizona State Univ., USA)	18h30	Tácio de Campos (PUC-Rio, BR)	
18h30	Closure	18h50		

PARALLEL SESSIONS

MONDAY, JULY 26TH, 2021

JULY 26TH, 2021. PARALLEL SESSION 1A. FUNDAMENTALS AND EXPERIMENTAL INVESTIGATIONS.

Thermal properties of a tropical unsaturated soil
T.S.O. Morais, C.H.C. Tsuha and O.M. Vilar

Soil-water retention of highly expansive clay stabilized with a bio-polymer
D. Manzanal, S. Orlandi, M. Fernandez, C. Laskowski, J.C. Barría, M. Codevila and T. Piqué

Performance of THM behavior of sand-bentonite mixtures considering thermal effect
T. Nishimura and J. Koseki

Swelling pressure of a sodium bentonite in solutions of different suction
S. Sato, S. Yamamoto and T. Nishimura

Effects of drying and shrinkage on the mechanical performance of unsaturated fine/medium- grained soils used as heat storage media
H. Hailemariam and F. Wuttke

Thermal and hydraulic effects on the mechanical behavior of coarse-grained soils used as heat storage media
H. Hailemariam and F. Wuttke

JULY 26TH, 2021. PARALLEL SESSION 1B. FUNDAMENTALS AND EXPERIMENTAL INVESTIGATIONS.

Evaluation of hydromechanical behavior and macro-structure of an expansive soil in the city of Paulista-PE Brazil
F.A.S. Barbosa, A.G.D. Araújo, T.C.R. Silva, I.M.L. Bezerra, A.C.D. Antonino and S.R.M. Ferreira

Effect of osmotic suction on the instability of microaggregations and aggregations in a lateritic soil
A.C. Pérez, R.V. Wanderley Neto, R.J.L. Ayala and J. Camapum de Carvalho

Determination of water retention curves for one residual soil and two distinct non-woven geotextiles
R. Graça, M. Almeida and L. Villar

Influence of the structure on the collapse potential and shear strength of a residual soil in the semiarid region of Northeast Brazil
V.S. Santos, A.B.S. Medeiros, R.S.A. Silva, O.F. Santos Jr., O. Freitas Neto and B.S. Lira

Microstructural analysis of collapsible soil before and after collapse and with loading and unloading cycle
I. Alves, L. Costa, A. Antonino, L. Costa and S. Ferreira

Soil water characteristic curve parameters of collapsible sand in Lambayeque, Peru
M. Isidro, P. Trejo and M. López

JULY 26TH, 2021. PARALLEL SESSION 2A. FUNDAMENTALS AND EXPERIMENTAL INVESTIGATIONS.

Soil-water resistivity curve of a tropical soil

T.S. Carnavale, A.C.C. Viana, P.M.C. Magalhães and T.M.P. de Campos

A comparative study of soil-water characteristic curves for compacted lateritic soil –
bacillus coagulans mixtures

K.J. Osinubi, P. Yohanna, A.O. Eberemu and T.S. Ijimdiya

Estimation of unsaturated flow parameters and hysteresis curve from field instrumentation

A. Ahmed, M.J.B. Alam, P. Pandey and M.S. Hossain

Instrumentation of soil columns for time-lapse monitoring of the phenomenon of capillary
rise through spontaneous potential, soil moisture sensor, electrical resistivity, and GPR
measurements

*M.S. Góis, M.M.O. Matos, N.O. Guimarães, K.R.C.B. Costa, G.R. Moreira, A.C.N. Silva and
A.L.B. Cavalcante*

Evaluation of installation procedures of volumetric water content and matric potential
probes: fundamentals for obtaining field and laboratory accordance

T.S. Carnavale, T.M.P. de Campos and H.D.A. Lopes

JULY 26TH, 2021. PARALLEL SESSION 2B. FUNDAMENTALS AND EXPERIMENTAL INVESTIGATIONS.

Soil cracking propagation due to dryness and its relation to suction

E.P. Oliveira, K. Soeckj, V.P. Faro and A.C.M. Kormann

Effects of compaction on the erodibility of a residual soil of gneiss

M. Heidemann, H.P. Nierwinski, B. Sell and P.V. da Silva

Evaluation of time response of GMS for soil suction measurement

D.L. Vettorello and F.A.M. Marinho

Suction effects on the tensile strength and unconfined compression of unsaturated soils

P. Roque, M. Motta, and T. de Campos

Influence of green's coconut fibers in the unsaturated behavior of compacted clayey soil

L.R.C. Gusmão and J.F.T. Jucá

Loading rate effect on mechanical properties of an unsaturated silty sand

C. Barahona, L. Sandi, J.C. Rojas, D.E. Gemmina, A. Bezuijen and W. Cornelis

TUESDAY, JULY 27TH, 2021

JULY 27TH, 2021. PARALLEL SESSION 3A. SLOPES, EMBANKMENTS, ROADS AND FOUNDATIONS.

Deterministic and probabilistic 3D analysis of slope rupture at BR 116 PR/SP highway in unsaturated soil

B. Riselo, L. Passini and A. Kormann

Analysis of water retention in soil horizons of two open trenches on a slope of Serra do Mar, Brazil, susceptible to landslides

C.V. Perdomo, L.C. Nogueira, M.G. Miguel and F.S.B. Ladeira

Moisture and soil strength monitoring of a railway embankment remediated with wicking geotextile

C. Alvarenga, P.H. Abdulrazagh and M.T. Hendry

Evaluation of antecedent rainfall effects in the analysis of the probability of transient failure in unsaturated slopes

A.P.N. Dantas and A.L.B. Cavalcante

2D stability and flow analysis of a slope in Recife - PE with Barreiras Formation soil in unsaturated conditions

T. Fontoura, R. Coutinho and B. Morais

Influence of soil-atmosphere interactions and unsaturated soil properties on slope stability

M.P.S. Conceição, C.M.T. Pinto, F.A.L.V. Lima and S.L. Machado

JULY 27TH, 2021. PARALLEL SESSION 3B. SLOPES, EMBANKMENTS, ROADS AND FOUNDATIONS.

Evaluation of settlement of shallow foundations laid on unsaturated soils

E.F. Lopes, M.M.R. Moreira, R.F. Leme and F.C. Silva Filho

Effect of soil moisture content on the bearing capacity of small bored piles in the unsaturated soil of Maringá, Paraná, Brazil

V. Ricken Marques, A. Belincanta, M.A. Beroya-Eitner, J.L. Augusto Almada, E. Guelssi and H. Zachert

Ground heave movement evaluation in shallow foundations for expansive soils in Tunja, Colombia

A. Ochoa, C. Sainea-Vargas and G.V. Ramana

Transient unsaturated shaft resistance of a single pile during water flow

D.B. Santos, M.A.C. Lemos and A.L.B. Cavalcante

Influence of degree of saturation in the dynamic stress transmission to a deep foundation

R. Baltodano-Goulding and L. Brenes-Garcia

JULY 27TH, 2021. PARALLEL SESSION 4A. TAILINGS AND WASTE DISPOSAL.

Estimation of percolation of water balance cover using field scale unsaturated soil parameters

M.J.B. Alam, A. Ahmed, M.S. Hossain and N. Rahman

Field monitoring and model predicted water balance of monolithic cover

M.J.B. Alam, A. Ahmed, M.A. Islam, N. Rahman and M.S. Hossain

Unsaturated hydraulic conductivity of compacted bio-cemented lateritic soil in municipal solid waste containment application

K.J. Osinubi, E. Gadzama, A.O. Eberemu and T.S. Ijimdiya

Numerical investigation of the performance of engineered barriers in reducing flood risk

A.L. Petalas, A. Tsiampousi, L. Zdravkovic and D.M. Potts

Plot test in a 50-year abandoned mine tailings dam

L.G. Libardi and L.A. Oldecop

Test plot study of a tailings stack final cover prototype

G.J. Rodari Gutierrez and L.A. Oldecop

JULY 27TH, 2021. PARALLEL SESSION 4B. TAILINGS AND WASTE DISPOSAL.

Non-isothermal moisture migration in a GCL composite liner system

M. Tincopa and G. Carnero-Guzman

Development of flume model of inclined capillary barrier (clay silt/CDW) in a subtropical climate scenario

T.C.F. Oliveira, B.G.S. Dezen and J.C. Bizarreta-Ortega

Study of mining tailings geotechnical parameters obtained from SCPTu tests carried on dry and saturated layers

H.P. Nierwinski, M. Heidemann, L.A. Lavalle and B. Sell

Obtaining resistance parameters in iron ore tailing from field (SPT and CPTu) and laboratory tests

G. Costa and L.F. Villar

Evaluation of sand-clay-anionic polyacrylamide blends for alternative compacted clay landfill liner design

M. Codevilla, C. Casagrande, M. Montoro, S. Orlandi, T. Piqué and D. Manzanal

Behavior of compacted Ca-bentonite subjected to HMC loading: observations and interpretation

T. Motoshima, S. Iso and T. Nishimura

WEDNESDAY, JULY 28TH, 2021

JULY 28TH, 2021. PARALLEL SESSION 5A. CONSTITUTIVE AND NUMERICAL MODELING.

Modeling the soil-water retention curves for highly deforming soils

E. Rojas, J. Horta and M.L. Pérez-Rea

A general mathematical framework for modelling soil-water retention behaviour

C. Pereira, J.R. Maranhã and R. Cardoso

Estimating soil-water characteristic curve based on soil type and best-fitting regressions derived from a simplified method using Aburra Valley dataset

J. Ramos-Rivera, D. Parra-Holguín, Y. Valencia-González and O. Echeverri-Ramírez

Numerical modeling of unsaturated soil behavior considering different constitutive models

R. Quevedo, C. Romanel and D. Roehl

A simple approach for predicting soil water characteristic curve of clayey soils using pore size distribution data

W. Yan, E. Birle and R. Cudmani

Effect of the particle-size distribution variability on the SWCC predictions of coarse-grained materials

R.D. Alves, G.F.N. Gitirana Jr. and S.K. Vanapalli

JULY 28TH, 2021. PARALLEL SESSION 5B. CONSTITUTIVE AND NUMERICAL MODELING.

Numerical study of a desaturation process by air injection in sandy soil

S. Sepulveda-Cano, E.F. Garcia-Aristizabal and C.A. Vega-Posada

Examining the predictive capabilities of a bounding surface plasticity-based hyperelastic constitutive model for unsaturated granular soils

M. Kadivar, K.N. Manahiloh and V.N. Kaliakin

Comparison of numerical modeling results from laboratory and field obtained unsaturated flow parameters

A. Ahmed, M.J.B. Alam, M.A. Islam and M.S. Hossain

Modelling of soil-water retention curve considering the effects of existing salt solution in the pore fluid

H. Sadeghi and A. Golaghaei Darzi

A constitutive model for hydromechanically coupled behavior of unsaturated soils with hydraulic hysteresis

M.M. Eyüpçiller, M.B. Kenanoğlu, M.B.C. Ülker and N.K. Toker

A lattice Boltzmann study of dynamic immiscible displacement mechanisms in pore doublets

M. Sadeghi, H. Sadeghi and C.E. Choi

JULY 28TH, 2021. PARALLEL SESSION 6A. SLOPES, EMBANKMENTS, ROADS AND FOUNDATIONS.

Deformation analysis of an unsaturated geosynthetic reinforced soil wall subjected to infiltration

F.H.M. Portelinha, J.G. Zornberg and O.M. Vilar

Performance estimation of a shallow foundation on an unsaturated expansive soil slope subjected to rainfall infiltration

M. Tan and S.K. Vanapalli

Analysis of the bearing capacity of continuous flight auger piles in terms of their excavation energy and of rainfall data

D.J. Ferrari de Campos, J. Camapum de Carvalho, G.F.N. Gitirana Jr., A.L.B. Cavalcante and L.C.S.M. Ozelim

Bearing capacity assessment of bored piles equipped with expander body systems using the mechanics of unsaturated soils

F.F. Monteiro, R.P. Cunha, M.F.P. Aguiar and C.M. Silva

A numerical technique for modelling the behavior of single piles in unsaturated soils

X. Cheng and S. K. Vanapalli

JULY 28TH, 2021. PARALLEL SESSION 6B. SLOPES, EMBANKMENTS, ROADS AND FOUNDATIONS.

Analysis of the resilience modulus of a subgrade soil front of humidity variations

C. Kern, W.Y.Y. Gehling and W.P. Núñez

Implementation of two-phase flow models for recycled materials in embankments

J.A.R. Machado, A. Vasquez, W.S. Kwan, J.M. Fuentes and G. Menezes

Matric suction effect on distribution of stresses caused by vehicle wheels on a bare silty sand

J.A. Torrico Bravo, S. Miranda, W. Cornelis, J.C. Rojas, A. Bezuijen and G. Di Emidio

Probabilistic geotechnical designs in rural road infrastructure in Costa Rica

R. Baltodano-Goulding

Performance of capillary barrier as a sustainable slope protection

A. Satyanaga, Q. Zhai, H. Rahardjo, G.F.N. Gitirana Jr., S.W. Moon and J. Kim