



ALERT Geomaterials

Alliance of Laboratories in Europe for Education, Research and Technology

<http://alertgeomaterials.eu>

35th ALERT Workshop and School

Aussois, 30th September to 5th October 2024

Final Program
(September 2024)



ALERT Geomaterials

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35th ALERT Workshop Program

Aussois, 30th September 2024

SESSION I: Emerging properties in geomaterials across the scales

Coordinators: Antoine WAUTIER (INRAE, France), Farhang RADJAI (Université Montpellier, France), Francesco FROILIO (Université de Lyon, FRANCE)

- 8:20 – 8:30 Opening of the 35th ALERT Workshop**
Cino VIGGIANI (Université Grenoble-Alpes, France), President of ALERT.
- 8:30 – 8:40 Opening Session**
Antoine WAUTIER (INRAE, France), Farhang RADJAI (Université de Montpellier, France), Francesco FROILIO (Université de Lyon, FRANCE).
- 8:40 – 9:20 Invited lecture**
Self-Organized Criticality in Quasistatic Granular Media and the Emergence of Plasticity
Mehdi POURAGHA¹, Jordi BARÓ I URBEA², Richard WAN³, Jörn DAVIDSEN³
¹Carleton Univ., Canada; ²Univ. de Barcelona, Spain; ³Univ. of Calgary, Canada
- 9:20 – 9:40 Microscale Modeling of Capillary Effects in Unsaturated Granular Soils during Wetting and Drying Cycles**
Nabil YOUNES^{1,2}, Richard WAN², Antoine WAUTIER³, Olivier MILLET¹, François NICOT⁴
¹La Rochelle Univ., France; ²Univ. of Calgary, Canada; ³INRAE, France; ⁴Univ. Savoie Mont Blanc, France
- 9:40 – 10:00 Enhancement of cohesive strength by the joint effects of interlocking and cohesive interactions in aggregates of nonconvex particles**
Saeid NEZAMABADI¹, Trieu-Duy TRAN², Jean-Philippe BAYLE², Lhassan AMARSID², Farhang RADJAI¹
¹Univ. of Montpellier, France; ²CEA, France
- 10:00 – 10:30 COFFEE BREAK**



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- 10:30 – 10:50** Influence of micro parameters and shape on macroscopic rotational quantities
Max WINKELMANN^{1,2}, Vanessa MAGNANIMO¹, Stefan LUDING¹, Stefanos-Aldo PAPANICOLOPULOS²,
¹Univ. of Twente, The Netherlands; ²The Univ. of Edinburgh, United Kingdom
- 10:50 – 11:10** From the macroscale to the mesoscale: how to define a mesoscopic second-order work?
Adriane CLERC¹, Antoine WAUTIER², Stéphane BONELLI², François NICOT³
¹INSA Lyon, France; ²INRAE, France; ³Univ. Savoie Mont Blanc, France
- 11:10 – 11:30** Analysis and interpretation of structures emerging from displacement fluctuations
Michail KOMODROMOS, Vincent RICHEFEU, Gioacchino VIGGIANI, Gaël COMBE
Univ. Grenoble Alpes, France
- 11:30 – 12:00** Digital Rock Physics framework for micro to macro homogenisation: case study on cyclic loading
Martin LESUEUR, Sijmen ZWARTS, Hadi HAJIBEYGI
Delft Univ. of Technology, The Netherlands
- 12:00 – 12:20** Uncovering the role of morphological descriptors in the upscaling of rock's structure-property relationships
Winston LINDQISTER, Martin LESUEUR, Manolis VEVEAKIS
Delft Univ. of Technology, The Netherlands
- 12:20 – 14:00** **LUNCH**
- 14:00 – 14:40** **Invited lecture**
A micromechanically derived elastoplastic model for granular materials incorporating fabric evolution
Eleni GEROLYMATOU
Technical Univ. of Clausthal, Germany
- 14:40 – 15:00** The emergence of propagating compaction bands in porous inelastic media
Lars BLATNY^{1,2,3}, Paul BERCLAZ⁴, François GUILLARD⁵, Itai EINAV⁵, Johan GAUME^{1,2,3}
¹ETH Zurich, Switzerland; ²WSL Institute for Snow and Avalanche Research SLF, Switzerland; ³Research Center CERC, Switzerland; ⁴Swiss Federal Institute of Technology, Lausanne, Switzerland; ⁵The Univ. of Sydney, Australia



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- 15:00 – 15:20** Effect of Particle Elongation on the Strain Localisation of Sand Subjected to Biaxial Shearing: A DEM Based Micromechanical Investigation
Madhu Sudan NEGI, Mousumi MUKHERJEE
Indian Institute of Technology Mandi, India
- 15:20 – 15:40** The combined effect of particle angularity and friction on the bulk properties of granular aggregates
Dominik KRENGEL¹, Jian CHEN², Takashi MATSUSHIMA¹
¹Univ. of Tsukuba, Japan; ²Japan Agency for Maritime-Earth Science and Technology, Japan
- 15:40 – 16:10** **COFFEE BREAK**
- 16:10 – 16:30** Elasto-Plastic behavior of granular materials composed of soft particles
Yohann TRIVINO¹, Vincent RICHEFEU², Farhang RADJAI¹, Komlanvi LAMPOH³, Jean-Yves DELENNE³
¹Univ. Montpellier, France; ²Univ. Grenoble Alpes, France; ³Institut Agro Montpellier, INRAE, France
- 16:30 – 16:50** Scaly clay as a paradigm of cross-scale interactions in real geomaterials: multi-scale experimental investigation of compression behaviour
Alessandro TARANTINO¹, Matteo PEDROTTI¹, Claudia VITONE², Antonio ANNESE³, Federica COTECCHIA²
¹Univ. of Strathclyde, United Kingdom
²Politecnico di Bari, Italy
³CASTIGLIA SRL, Italy
- 16:50 – 17:10** **Discussions, Perspectives and Closure**
- 17:30 – 18:00** **ALERT General Assembly (including the election of the Board)**
- 18:00 – 20:30** **Poster Session (intermediate level) and aperitif**
- 20:30** **DINNER**



35th ALERT Workshop Program

Aussois, 1st October 2024

SESSION II: Geomechanics in the submicron scale

Coordinators: Katerina IOANNIDOU (Université de Montpellier, France), Gilles PIJAUDIER-CABOT (Université de Pau et des Pays de l'Adour, France)

- 8:30 – 8:35 Session Opening**
Katerina IOANNIDOU (Université de Montpellier, France), Gilles PIJAUDIER-CABOT (Université de Pau et des Pays de l'Adour, France)
- 8:35 – 9:05 Invited Lecture**
Clay hydration and mechanics in the submicron scale
L. BROCHARD
Ecole des Ponts ParisTech, Université Gustave Eiffel
- 9:05 – 9:35** Multi-modal imaging for geomechanics at the nano-scale
G. PINZON
European Synchrotron Radiation Facility
- 9:35 – 10:05** Multiscale analysis of a lab seismic fault – asperity frictional system for the understanding of seismic fault behaviour
A. CLERC
INSA Lyon
- 10:05 – 10:30 COFFEE BREAK**
- 10:30 – 11:00** Nanoscale origin of cryogenic damage of cementitious materials: From the viewpoints of C-S-H and ice
X. ZHU
University of Montpellier
- 11:00 – 11:30** Towards a DFT approach to the Mechanical Properties of Nanoporous Materials
A. KAHLAL
Université de Pau et des Pays de l'Adour
- 11:30 – 12:00** Effect of disorder on the strength properties of porous, cellular, and granular materials
F. RADJAI
University of Montpellier



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12:00 – 14:30 LUNCH

15:00 – 17:00 ALERT Board of Directors

17:15 – 18:30 ALERT Poster and PhD Prizes 2024

18:30 – 19:30 ALERT Special Lecture 2024

The development of G-PFEM for the simulation of penetration problems.
Professor Antonio GENS (UPC, Spain).

20:00 BANQUET



35th ALERT Workshop Program

Aussois, 2nd October 2024

SESSION III: Continuum-based particle methods

Coordinators: Claudio TAMAGNINI (University of Perugia, Italy), Lorenzo SANAVIA (University of Padova, Italy), Matteo CIANTIA (University of Milano-Bicocca, Italy / University of Dundee, UK) and Antonia LARESE (University of Padova, Italy)

8:20 – 8:25 Opening Session

Claudio TAMAGNINI (University of Perugia, Italy), Lorenzo SANAVIA (University of Padova, Italy), Matteo CIANTIA (University of Milano-Bicocca, Italy / University of Dundee, UK) and Antonia LARESE (University of Padova, Italy)

8:25 – 9:05 Invited lecture

Stability of implicit material point methods for geotechnical analysis of large deformation problems
William M. COOMBS, Robert E. Bird, Giuliano PRETTI, Charles E. AUGARDE
Durham University, United Kingdom

9:05 – 9:25 An Implicit material point method for non-associated elasto-plastic Soil. Simulation using the bi-potential framework

Louis GUILLET, Vincent ACARY, Franck BOURRIER, Olivier GOURY
Univ. Grenoble Alpes, France

9:25 – 9:45 Modelling geotechnical failure with an elastoplastic Cosserat material point method

Ted O'HARE¹, Panos GOURGIOTIS², William COOMBS¹, Charles AUGARDE¹
¹Durham University, United Kingdom; ²National Technical University of Athens, Greece

9:45 – 10:05 Coupled multiphysics large deformation problems using MPM

Antonia LARESE^{1,2}, Veronika SINGER², Laura MORENO³, Roland WUECHNER³
¹Università di Padova, Italy; ²Technical University of Munich TUM, Germany; ³Technical University of Braunschweig TUBS, Germany

10:05 – 10:35 COFFEE BREAK



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- 10:35 – 10:55** The conundrum of integrating kinematics over time in the Material Point Method (MPM)
Jérôme DURIEZ, Sacha DUVERGER, Stéphane BONELLI, Pierre PHILIPPE
INRAE, Aix Marseille Univ, France
- 10:55 – 11:15** Wetting collapse and liquefaction of unsaturated soils with material point method
Gaia DI CARLUCCIO, Luís Ángel AVILÉS, Núria M. PINYOL
Universitat Politècnica de Catalunya Barcelona, Spain
- 11:15 – 11:35** Modeling the dynamics of cohesive granular flows with a depth-averaged Material Point Method
Johann KAMMHOLZ, Lars BLATNY^{1,2,3}, Louis GUILLET⁴, Johan GAUME^{1,2,3}
¹WSL Institute for Snow and Avalanche Research SLF, Switzerland; ²ETH Zürich, Switzerland; ³Research Center CERC, Switzerland; ⁴Univ. Grenoble Alpes, France
- 11:35 – 11:55** Application of the Lattice-Boltzmann model to granular flows and to flow-structure interaction
Alessandro LEONARDI, Andrea PASQUA, Marina PIRULLI
University of Sheffield, United Kingdom
- 12:00 – 14:00 LUNCH**
- 14:00 – 14:20** Simulating real landslides with MPM: an overview
Francesca CECCATO¹, Gaia DI CARLUCCIO², Alba YERRO³
¹Università di Padova, Italy; ²CIMNE, Spain; ³Virginia TEC, USA
- 14:20 – 14:40** A Material Point Method approach for pile installation
Michail SPYRIDIS¹, Stijn FRANÇOIS¹, Hadrien RATTEZ², George ANOYATIS¹
¹KU Leuven, Belgium; ²UC Louvain, Belgium
- 14:40 – 15:00** An adaptive material point method for hypoplastic materials
Cristian David Rodriguez LUGO^{1,4}, Luis Felipe PRADA SARMIENTO², Carlos E. GRANDAS TAVERA³, Torsten WICHTMANN^{1,4}
¹Bauhaus- Universität Weimar, Germany; ²Aarhus University, Denmark; ³Brandenburgische Technische Universität Cottbus-Senftenberg, Germany; ⁴Ruhr- Universität Bochum, Germany
- 15:00 – 15:20** Dynamic three-dimensional rigid body interaction with highly deformable solids, a material point approach
Robert E. BIRD¹, Giuliano PRETTI¹, William M. COOMBS¹, Charles E. AUGARDE¹, Yaseen U. SHARIF², Michael J. BROWN², Gareth CARTER³, Catriona MACDONALD³, Kirstin JOHNSON³
¹Durham University, United Kingdom; ²Dundee University, United Kingdom; ³British Geological Survey, United Kingdom



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- 15:20 – 15:40** Impacts of dry and saturated granular masses against rigid obstacles: DEM and MPM analyses
Matteo ZERBI, Pietro MARVEGGIO, Claudio DI PRISCO
Politecnico di Milano, Italy
- 15:40 – 16:10** **COFFEE BREAK**
- 16:10 – 16:40** **Invited lecture**
GPFEM: developing a numerical technology to support site-specific ground investigation
Lluís MONFORTE¹, Marcos ARROYO¹, Josep Maria CARBONELL², Antonio GENS¹
¹Universitat Politècnica de Catalunya, Spain; ²Universitat de Vic-Universitat Central de Catalunya, Spain
- 16:40 – 17:00** Numerical modelling of penetrometer tests for displacement pile design in soft rocks
Marco PREVITALI¹, Thomas RICCIO¹, Matteo CIANTIA^{1,2}
¹University of Dundee, United Kingdom; ²University of Milano-Bicocca, Italy
- 17:00 – 17:20** PFEM to simulate earthen dikes failure due to overtopping: A coupled surface-subsurface approach
Nathan DELPIERRE, Sandra SOARES-FRAZAO, Hadrien RATTEZ
UCLouvain, Belgium

20:00 **DINNER**



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35th ALERT Doctoral School

Aussois, 3rd October 2024

Numerical methods in Geomechanics

Coordinators:

Claudio TAMAGNINI, University of Perugia, Italy

Lorenzo SANAVIA, University of Padova, Italy

Manuel PASTOR, Universidad Politécnica de Madrid, Spain

DAY 1: Introduction to FEM, constitutive modelling and the numerical code

8:45 – 9:00 Introduction to the School

Claudio TAMAGNINI (University of Perugia, Italy), Lorenzo SANAVIA (University of Padova, Italy), Manuel PASTOR (Universidad Politécnica de Madrid, Spain)

9:00 – 10:00 Introduction to the Finite Element Method

Manuel PASTOR (Universidad Politécnica de Madrid, Spain)

10:00 – 11:00 Theory of Plasticity

Claudio TAMAGNINI (University of Perugia, Italy)

11:00 – 11:30 COFFEE BREAK

11:30 – 12:30 Time dependent problem: seepage and dynamics

Manuel PASTOR (Universidad Politécnica de Madrid, Spain)

12:30 – 14:00 LUNCH

14:00 – 15:00 Practical aspects of FEM

Pablo MIRA (Universidad Politécnica de Madrid and CEDEX, Spain)



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PRACTICAL SESSIONS:

Pablo MIRA, Diego MANZANAL, Manolo PASTOR (Universidad Politécnica de Madrid, Spain)

15:00 – 15:45 Introduction to GeHoMadrid and GID

15:45 – 16:15 **COFFEE BREAK**

16:15 – 17:00 FEM technology: bending and locking

17:00 – 18:00 Plasticity I: homogeneous specimen

17:00 – 18:00 Localization I: plane strain specimen

20:00 **DINNER**



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35th ALERT Doctoral School

Aussois, 4th October 2024

Numerical methods in Geomechanics

Coordinators:

Claudio TAMAGNINI, University of Perugia, Italy

Lorenzo SANAVIA, University of Padova, Italy

Manuel PASTOR, Universidad Politécnica de Madrid, Spain

DAY 2: Mathematical and numerical modelling

9:00 – 10:00 Coupled behaviour (saturated geomaterials)
Lorenzo SANAVIA (University of Padova, Italy)

10:00 – 11:00 Computational Plasticity (I)
Pablo MIRA (Universidad Politécnica de Madrid and CEDEX, Spain)

11:00 – 11:30 COFFEE BREAK

11:30 – 12:30 Thermo-hydro-mechanical coupling in variably saturated geomaterials
Lorenzo SANAVIA (University of Padova, Italy)

12:30 – 14:00 LUNCH

14:00 – 15:00 Viscoplasticity
Claudio DI PRISCO (Politecnico di Milano, Italy)

15:00 – 15:45 Computational Plasticity (II)
Claudio TAMAGNINI (University of Perugia, Italy)

15:45 – 16:15 COFFEE BREAK

PRACTICAL SESSIONS:

Pablo MIRA, Diego MANZANAL, Manolo PASTOR (UPM, Spain)

16:15 – 17:00 Footing on a cohesive soil

17:00 – 18:00 1D consolidation

18:00 – 19:00 Consolidation under a footing

20:00 DINNER



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35th ALERT Doctoral School

Aussois, 5th October 2024

Numerical methods in Geomechanics

Coordinators:

Claudio TAMAGNINI, University of Perugia, Italy

Lorenzo SANAVIA, University of Padova, Italy

Manuel PASTOR, Universidad Politécnica de Madrid, Spain

DAY 3: Computational modelling

9:00 – 10:00 Modelling of unsaturated soil with Generalized plasticity
Diego MANZANAL (Universidad Politécnica de Madrid, Spain)

10:00 – 11:00 FEM modelling of non-isothermal variably saturated soils (quasi-statics and dynamics)
Lorenzo SANAVIA (University of Padova, Italy)

11:00 – 11:30 COFFEE BREAK

11:30 – 12:30 Introduction to Isogeometric analysis & Closure of the School
Claudio TAMAGNINI (University of Perugia, Italy)

12:30 – 14:00 LUNCH