



ALERT Geomaterials

Alliance of Laboratories in Europe for Education, Research and Technology
<http://alertgeomaterials.eu>

32th ALERT Workshop and School

Aussois (and online), 27th September to 2th October 2021

Workshop and School Preliminary Program
(2nd July 2021)



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32th ALERT Workshop

Aussois/Online, 27th September 2021

Session 1: “Forecasting landslide displacements”

Coordinators:

Sabatino Cuomo, UniSa

Jean Vaunat, CIMNE

Núria M. Pinyol, UPC



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32th ALERT Workshop

Aussois/Online, 28th September 2021

Session 2: “Machine Learning and Geomechanics”

Coordinators:

Ioannis Stefanou, EC-Nantes

Felix Darve, 3SR



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32th ALERT Workshop

Aussois/Online, 29th September 2021

Session 3: “Bridging the gap between experiments and modelling: from laboratory testing to material models prediction”

Coordinators:

Béatrice Baudet, University College London

Federica Cotecchia, Politecnico di Bari

Cristina Jommi, Politecnico di Milano Delft University of Technology



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32th ALERT Doctoral School

Aussois/Online, 30th September - 2nd October 2021

Constitutive Modelling in Geomaterials: School Foreword

Irrespective of fast development of approaches for the analysis and design in geomechanics based on the methods for discontinuum (such as discrete element method), analysis of continua based on mesh or fast developing particle-based meshless methods still represents major means of numerical analysis in geomechanics. At the very core of such an analysis is a constitutive model: mathematical relationship converting the peculiar behaviour of particulate material, governed by the interactions between individual particles, into the behaviour of continua. As such, a properly selected and calibrated constitutive model has a critical effect on the outcomes of geotechnical simulations.

This school aims to introduce the students into the broad field of constitutive modelling of particulate materials with special emphasis on the behaviour of soils: after the introduction consisting of summary of basic features of soil behaviour, they will be introduced into fundamentals of constitutive modelling, followed by more detailed description of various modelling approaches - from the basic elastic and elasto-plastic models to more advanced frameworks of hardening plasticity, bounding surface plasticity, generalised plasticity and hypoplasticity. The second day will be focused on various specific more-advanced topics, such as simulation of small strain stiffness and cyclic loading, modelling of unsaturated soils, meta-stable structure, breakage, thermal effects, chemical effects and time and rate dependence, including formulation of finite-deformation plasticity and macroelement modelling. The last day is devoted to steps needed for adoption of models in numerical analysis tools, namely to their implementation in finite element codes. Finally, in practical hands-on sessions, students will train calibration using real experimental data themselves, using both manual and automatic freely-available calibration tools.

Claudio Tamagnini and David Mašín

NOTES: Intentionally, lectures do not include some relevant topics which were covered in ALERT doctoral schools in the recent past. Most notably, thermodynamics (ALERT Doctoral School 2018, Energetical methods in Geomechanics), particle-based discontinuum models (ALERT Doctoral School 2017, Discrete Element Modeling), bifurcation, strain-localisation, stability and controllability (ALERT Doctoral School 2016, Modelling of instabilities and bifurcation in Geomechanics).



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32th ALERT Doctoral School

Aussois/Online, 30th September 2021

Constitutive Modelling in Geomaterials

Coordinators:

Claudio Tamagnini, University of Perugia

David Mašín, Charles University

DAY 1: BASIC CONCEPTS

8:30 – 8:45 Introduction to the course

Claudio Tamagnini (University of Perugia) and David Mašín (Charles University)

8:45 – 10:30 Basic features of soil behaviour and soil testing

Cristina Jommi (Politecnico di Milano)

10:30 – 11:00 COFFEE BREAK

11:00 – 12:30 Fundamentals of constitutive modelling for soils

Ivo Herle (Technical University of Dresden)

12:30 – 14:00 LUNCH

14:00 – 15:30 The theory of plasticity in constitutive modelling of rate-independent soils

Claudio Tamagnini (University of Perugia)

15:30 – 16:00 COFFEE BREAK

16:00 – 17:30 Hypoplasticity and other incrementally non-linear modelling approaches

David Mašín (Charles University)

20:00 DINNER



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32th ALERT Doctoral School

Aussois/Online, 1st October 2021

Constitutive Modelling in Geomaterials

Coordinators:

Claudio Tamagnini, University of Perugia

David Mašín, Charles University

DAY 2: SPECIFIC PROBLEMS

8:30 – 10:30 Modelling non-linearity, small-strain stiffness and cyclic loading
David Mašín (Charles University)

10:30 – 11:00 COFFEE BREAK

11:00 – 12:30 General overview on modelling the coupled behaviour of unsaturated soils
Cristina Jommi (Politecnico di Milano)

12:30 – 14:00 LUNCH

14:00 – 15:00 Meta-stable structure, breakage and thermal effects
David Mašín (Charles University)

15:00 – 16:00 Time and rate dependence
Claudio di Prisco (Politecnico di Milano)

16:00 – 16:30 COFFEE BREAK

16:30 – 17:30 Finite deformation plasticity
Claudio Tamagnini (University of Perugia)

20:00 DINNER



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32th ALERT Doctoral School

Aussois/Online, 2nd October 2021

Constitutive Modelling in Geomaterials

Coordinators:

Claudio Tamagnini, University of Perugia

David Mašín, Charles University

DAY 3: STEPS TOWARDS APPLICATIONS

8:30 – 9:30 Numerical implementation of constitutive models
Claudio Tamagnini (University of Perugia)

9:30 – 10:30 Macroelement modelling
Claudio di Prisco (Politecnico di Milano) and Luca Flessati (Politecnico di Milano)

10:00 – 10:30 COFFEE BREAK

10:30 – 12:30 Hands-on calibration session (the use of calibration software)
David Mašín (Charles University) and Claudio Tamagnini (University of Perugia)

12:30 – 14:00 LUNCH