



# **ALERT GEOMATERIALS**

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

## **26<sup>th</sup> ALERT Workshop and School** Aussois, 28<sup>th</sup> September to 3<sup>rd</sup> October 2015

### **Preliminary Programme**

(10<sup>th</sup> August 2015)



## 26<sup>th</sup> ALERT Workshop Program

Aussois, 28<sup>th</sup> September 2015

### **Session I: From discrete methods to continuum methods: Applications, Problems and Solutions**

Coordinators: Yannis Dafalias (National Technical University of Athens, Greece), Luc Sibille and Edward Andò (Laboratoire 3SR, France)

**8:20 - 8:30 Opening of the 26<sup>th</sup> ALERT Workshop**

Manuel Pastor (Universidad Politécnica de Madrid, Spain), President of ALERT

**8:30 - 9:00 Invited Speaker**

The role of Internal Structure in Granular Plasticity  
Xia Li (University of Nottingham, UK)

**9:00 - 9:30** Upscaling in granular media: anisotropy, non-coaxiality and non uniformity effects

Eleni Gerolymatou (Karlsruhe Institute of Technology, Germany)

**9:30 - 10:00** On the determination and description of fabric in natural granular materials

Max Wiebicke (Technische Universität Dresden, Germany)

**10:00 - 10:30 COFFEE BREAK**

**10:30 - 11:00 Invited Speaker**

Micromechanical motivations of generalised continuum models  
Stefanos Papanicolopoulos (The University of Edinburgh, UK)

**11:00 - 11:30** Limits of discrete element modelling of wet granular soils

Jérôme Duriez (University of Calgary, Canada)

**11:30 - 12:00** Experimental characterisation of 3D force transmission in real granular materials linked to macroscopic property evolution

Stephen Hall (Lund University, Sweden)

**12:30 - 14:30 LUNCH**

- 14:30 - 15:00 Invited Speaker**  
From discrete to continuum approach of BVP in Geomechanics:  
FEMxDEM integrated approach.  
Jacques Desrues (Laboratoire 3SR, France)
- 15:00 - 15:30** Discrete Modeling of the Quasi-Brittle Response of Granular Rocks  
Shiva Esna Ashari (Northwestern University, USA)
- 15:30 - 16:00** Observing and quantitatively measuring breakage in sand in 3D  
Zeynep Karatza (University of Edinburgh, UK)
- 16:00 - 16:30 COFFEE BREAK**
- 16:30 - 17:00** A numerical investigation of the incremental behavior of crushable granular soils  
Matteo O. Ciantia (UPC Barcelona, Spain)
- 17:00 - 17:30** Definition of a continuous model of solid particle transport in a saturated granular assembly from discrete numerical experiments  
Ignacio G. Tejada (Laboratoire 3SR, France)
- 17:30 - 18:00 ALERT General Assembly**
- 18:00 - 20:00 Poster Session (intermediate level) and aperitif**
- 20:00 DINNER**



## 26<sup>th</sup> ALERT Workshop Program

Aussois, 29<sup>th</sup> September 2015

### Session II: How should we teach geomechanics?

Coordinators: Cino Viggiani (Laboratoire 3SR, France) and Ivo Herle (Technische Universität Dresden, Germany)

**8:30 - 8:40 Session Opening**

Cino Viggiani<sup>1</sup>, Ivo Herle<sup>2</sup> (<sup>1</sup>Laboratoire 3SR, France ; <sup>2</sup>Technische Universität Dresden, Germany)

**8:40 - 9:05** Introducing geomechanics to petroleum engineering: a review of the UNSW Australia experience

Manolis Veveakis, Klaus Regenauer-Lieb (University of New South Wales, Australia)

**9:05 - 9:30** Challenges and Future Directions of Geotechnical Engineering Education in Response to Emerging Multi-scale Soil-Environment Problems

Chloé Arson<sup>1</sup>, Giuseppe Buscarnera<sup>2</sup> (<sup>1</sup>Georgia Tech, Georgia, USA ; <sup>2</sup>Northwestern University, Evanston, USA)

**9:30 - 9:55** A survey on the teaching of Geotechnics in Italian Universities

Giulia Viggiani, Francesca Casini (Università di Roma Tor Vergata, Italy)

**9:55 - 10:20** How should we teach geomechanics?

David Muir Wood (University of Dundee, UK)

**10:20 - 10:50 COFFEE BREAK**

**10:50 - 11:15 Invited Speaker**

Benefitting from Discipline-Based Research on Engineering Education for Better Teaching and Learning in Geotechnical Engineering  
Marina Pantazidou (National Technical University of Athens, Greece)

**11:15 - 11:40** Developing soft soil engineering competency by problem-based learning using “Class B” and “Class C” settlement predictions

Minna Karstunen, Jelke Dijkstra, Mats Karlsson, Amardeep Amavasaï, Yanling Li, Georgios Birmopilis (Chalmers University of Technology, Gothenburg, Sweden)

- 11:40 - 12:05** Portable hand-on experiments for geotechnical education  
Wolfgang Fellin, Barbara Schneider-Muntau, Gertraud Medicus (University of Innsbruck, Austria)
- 12:05 - 12:30** Teaching and the Distinct Element Method  
Francesco Calvetti<sup>1</sup>, Manolis Vairaktaris<sup>2</sup> (<sup>1</sup>Politecnico di Milano, Italy ;  
<sup>2</sup>National Technical University of Athens, Greece)
- 12:30 - 14:30** **LUNCH**
- 15:00 - 17:00** **ALERT Board of Directors**
- 17:30 - 18:30** **ALERT PhD Prize 2015**
- 18:30 - 19:30** **ALERT Special Lecture 2015**  
Mechanical and hydraulic instabilities in Geomechanics  
Prof. Hans Muhlhaus (University of Queensland, Australia)
- 20:00** **BANQUET**



## 26<sup>th</sup> ALERT Workshop Program

Aussois, 30<sup>th</sup> September 2015

### Session III: Fracturing and fractured reservoirs

Coordinators: Euripides Papamichos (Aristotle University of Thessaloniki, Greece), Helen Lewis, Gary Couples (Heriot-Watt University, Scotland)

- 8:30 - 8:35** Opening  
Euripides Papamichos<sup>1</sup>, Helen Lewis<sup>2</sup>, Gary Couples<sup>2</sup> (<sup>1</sup>Aristotle University of Thessaloniki, Greece ; <sup>2</sup>Heriot-Watt University, Scotland)
- 8:35 - 9:15** **Keynote lecture**  
Modelling the coupled hydro-mechanical behaviour of rock discontinuities and masses  
SC Bandis (Aristotle University of Thessaloniki, Greece)
- 9:15 - 9:40** Ductile fracturing of shale gas reservoirs: the role of diagenetic reactions in high temperature/pressure environments  
M Veveakis<sup>1,2</sup>, T Poulet<sup>1,2</sup>, Klaus Regenauer-Lieb<sup>1</sup> (<sup>1</sup>Univ of New South Wales, Sydney, Australia ; <sup>2</sup>CSIRO Energy Flagship, Sydney, Australia)
- 9:40 - 10:05** Mechanics of cracks in poroelastic media  
APS Selvadurai (Mc Gill University, Canada)
- 10:05 - 10:30** A Discrete Element investigation of the effect of preexisting discontinuities on hydraulic fracturing  
E Gerolymatou<sup>1</sup>, S-A Galindo-Torres<sup>2</sup>, Th Triantafyllidis<sup>1</sup> (<sup>1</sup>Karlsruhe Institute of Technology, Karlsruhe, Germany ; <sup>2</sup>University of Queensland, Brisbane, Australia)
- 10:30 - 11:00** **COFFEE BREAK**
- 11:00 - 11:40** **Keynote lecture**  
The Brittleness Index in hydraulic fracturing and its influence on propagation and containment  
P Papanastasiou (Univ of Cyprus, Nicosia, Cyprus)
- 11:40 - 12:05** Hybrid continuum/discontinuum methods for geo-mechanical modelling of hydraulic fracture growth  
M AbuAisha, D Eaton, J Priest, R Wong (University of Calgary, Canada)

- 12:05 - 12:30** A microstructural model for hydraulic conductivity evolution due to brittle damage  
ML De Bellis, G Della Vecchia, A Pandolfi (Politecnico di Milano, Italy)
- 12:30 - 14:30** **LUNCH**
- 14:30 - 15:10** **Keynote Lecture**  
An “oily” structural geologist’s view of fractured reservoirs: A different perspective on geomechanics of fractures  
H Lewis, G Couples (Heriot Watt, Edinburgh, UK)
- 15:10 - 15:35** Modeling flow and fracture propagation in porous fractured media by joint-enriched finite element method  
A Pouya (CERMES, Laboratoire Navier, ParisTech, Marne-la-Vallée, France)
- 15:35 - 16:00** Fractured rocks: Nature’s challenge to comfortable theories  
G Couples (Heriot Watt, Edinburgh, UK)
- 16:00 - 16:30** **COFFEE BREAK**
- 16:30 - 16:55** Micro-mechanical investigation of rock fracturing  
J Duriez<sup>1</sup>, L Scholtès<sup>2</sup>, FV Donzé<sup>3</sup> (<sup>1</sup>University of Calgary, Canada ; <sup>2</sup>Université de Lorraine / CNRS / CREGU, GeoRessources, Vandoeuvre-lès-Nancy, France ; <sup>3</sup>Université Grenoble Alpes / CNRS, 3SR, Grenoble, France)
- 16:55 - 17:20** Hydraulic fracture propagation and stress field evolution during multi-stage injections: A 3D hydromechanical DEM approach  
E Papachristos<sup>1</sup>, L Scholtès<sup>2</sup>, FV Donzé<sup>1</sup>, B Chareyre<sup>1</sup>, H Pourpak<sup>3</sup> (<sup>1</sup>Université Grenoble Alpes / CNRS, 3SR, Grenoble, France ; <sup>2</sup>Université de Lorraine / CNRS / CREGU, GeoResources, Vandoeuvre-lès-Nancy, France ; <sup>3</sup>TOTAL E&P R&D, Pau, France)
- 17:20 - 17:45** Interactions between a propagating crack and an elasto-plastic damage joint within a lattice analysis  
O Nouailletas, V Lefort, D Grégoire, G Pijaudier-Cabot (Univ of Pau, Anglet, France)
- 20:00** **DINNER**



**25<sup>th</sup> ALERT Doctoral School**

**Aussois, 1<sup>st</sup> October 2015**

## **Coupled and multiphysics phenomena**

*Coordinators:*

*Bernhard Schrefler (Università degli Studi di Padova, Italy)*

*Lorenzo Sanavia (Università degli Studi di Padova, Italy)*

*Frederic Collin (Université de Liège, Belgium)*

**9:00 Introduction to the Course**

Bernhard Schrefler<sup>1</sup>, Lorenzo Sanavia<sup>1</sup>, Frederic Collin<sup>2</sup> (<sup>1</sup>Università degli Studi di Padova, Italy ; <sup>2</sup>Université de Liège, Belgium)

**9:00 - 10:30 Thermo-hydro-mechanical issues in geomaterials: physical mechanisms and experimental determination (1/2)**

Pierre Delage (Ecole des Ponts ParisTech, Navier/CERMES, France)

**10:30 - 11:00 COFFEE BREAK**

**11:00 - 12:30 Thermo-hydro-mechanical issues in geomaterials: physical mechanisms and experimental determination (2/2)**

Pierre Delage (Ecole des Ponts ParisTech, Navier/CERMES, France)

**12:30 - 14:00 LUNCH**

**14:00 - 15:30 Thermodynamically Constrained Averaging Theory (TCAT) to model the coupled behaviour of multiphase porous systems (1/2)**

William Gray (University of North Carolina, USA)

**15:30 - 16:00 COFFEE BREAK**

**16:00 - 17:30 Generalized plasticity modelling of geomaterials: the role of dilatancy**

Manuel Pastor (Universidad Politécnica de Madrid, Spain)

**20:00 DINNER**





**25<sup>th</sup> ALERT Doctoral School**  
**Aussois, 2<sup>nd</sup> October 2015**

**Coupled and multiphysics phenomena**

*Coordinators:*

*Bernhard Schrefler (Università degli Studi di Padova, Italy)*

*Lorenzo Sanavia (Università degli Studi di Padova, Italy)*

*Frederic Collin (Université de Liège, Belgium)*

**9:00 - 10:30 Thermodynamically Constrained Averaging Theory (TCAT) to model the coupled behaviour of multiphase porous systems (2/2)**

William Gray (University of North Carolina, USA)

**10:30 - 11:00 COFFEE BREAK**

**11:00 - 12:30 An introduction to numerical modelling of coupled problems in geomechanics**

Manuel Pastor (Universidad Politécnica de Madrid, Spain)

**12:30 - 14:00 LUNCH**

**14:00 - 15:30 General theory of mixtures. Physical chemistry of mixtures and swelling**

Jacques Huyghe (Bernal Institute, University of Limerick, Ireland)

**15:30 - 16:00 COFFEE BREAK**

**16:00 - 17:30 Finite deformation poromechanics with application to heart muscle and blood perfusion**

Jacques Huyghe (Bernal Institute, University of Limerick, Ireland)

**20:00 DINNER**



**25<sup>th</sup> ALERT Doctoral School**

**Aussois, 3<sup>rd</sup> October 2015**

## **Coupled and multiphysics phenomena**

*Coordinators:*

*Bernhard Schrefler (Università degli Studi di Padova, Italy)*

*Lorenzo Sanavia (Università degli Studi di Padova, Italy)*

*Frederic Collin (Université de Liège, Belgium)*

**9:00 - 10:30 Hydraulic fracture**

Bernhard Schrefler (Università degli Studi di Padova, Italy)

**10:30 - 11:00 COFFEE BREAK**

**11:00 - 12:30 Finite element analysis of non-isothermal multiphase porous media in dynamics**

Lorenzo Sanavia (Università degli Studi di Padova, Italy)

**12:30 - 14:00 LUNCH**

**14:00 - 15:30 Numerical modelling of a Municipal Waste Disposal as a Bio-Chemo-Thermo-hydro-Mechanical problem**

Frederic Collin (Université de Liège, Belgium)

**15:30 - 16:00 COFFEE BREAK**

**16:00 - 16:15 Closure**

Bernhard Schrefler<sup>1</sup>, Lorenzo Sanavia<sup>1</sup>, Frederic Collin<sup>2</sup> (<sup>1</sup>Università degli Studi di Padova, Italy ; <sup>2</sup>Université de Liège, Belgium)