



# ALERT Geomaterials

NEWSLETTER - June 2019  
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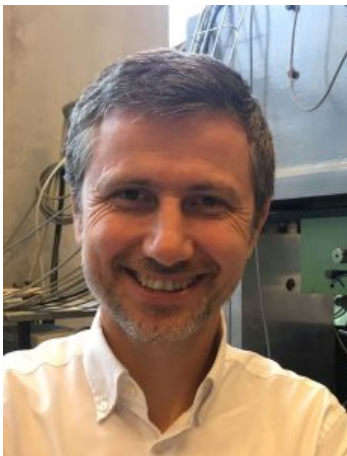
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ALERT President  
Gioacchino (Cino) Viggiani



ALERT Director  
Frédéric Collin

## EDITORIAL

Dear ALERT members,

at this end of Springtime, the annual Newsletter of ALERT Geomaterials provides you information about our past and future activities, and shows the scientific vitality of our network.

This year, ALERT welcomes two new institutions: the international joint CNRS-MIT unit "MultiScale Material Science for Energy and Environment" (MSE2), lead by Prof. Roland Pellenq, and Duke University (Prof. Manolis Veveakis). It has to be pointed out that, according to our statute, these two non-European institutions have the same rights as the others except for Election. Given the increasing number of ALERT non-European institutions, a possible evolution of status for non-European members will be discussed during the next Board of Directors.

Since October 2018, the Bureau has been working hard for ALERT: organizing the ALERT-PhD prize, three Workshop sessions, and a Doctoral School (held as usual in Aussois, France), together with the ALERT school - Olek Zienkiewicz Course, which will take place in Paris. We thank all the organizers for their efforts that allow our network to be the meeting point of so many researchers in Geomechanics. We take this opportunity to highlight the fact that this year the Doctoral School on "The

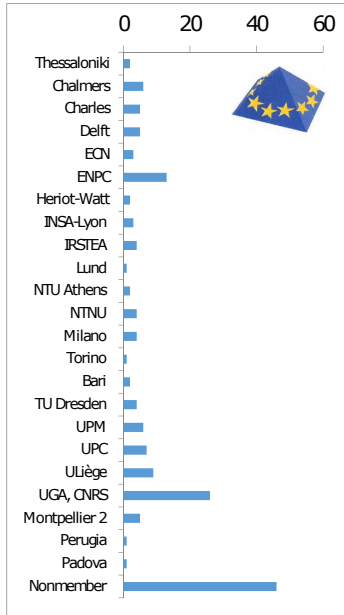
Legacy of Ioannis Vardoulakis to the mechanics of granular materials" will be organized for two days only (rather than three). This should avoid the progressive "erosion" of the number of attendants on Saturday morning; we expect therefore a participation of all the PhD students to the whole school – until Friday evening.

This year, the half-day session is devoted to "The mechanics of root-soil systems" and demonstrates the possible interaction of Geomechanics and bio-engineering. This could be an inspiring development of our research: how all our theoretical, experimental and numerical works can contribute to other scientific communities and cross-fertilize? We are strongly convinced that this is an important role of our association: to disseminate our knowledge in other scientific fields.

Besides all these activities, the Bureau tries also to improve our communication within the ALERT-network. We recently sent a post on the ALERT-Website asking for your feedback on the website. Please feel free to send us any comments or suggestions! Finally, we would take advantage of this Editorial to invite all of you to enrich this newsletter: all contributions for the next issues are welcome!

See you all in Aussois!

Frédéric Collin and Cino Viggiani



## ALERT Workshop 2018

In 2018 the annual ALERT Workshop was held from October 1st to October 3rd again in Aussois, France. The regional distribution of the participants from the institutional members of ALERT Geomaterials is shown on the left hand side. In total, 182 participants registered for the ALERT workshop 2018.

As always since 2013, the session on Tuesday lasted only half a day and was followed in the afternoon, by the Board of Directors meeting, the PhD-prize ceremony, and the Special lecture in the afternoon.

The three topics of the ALERT Workshop 2018 are listed below:

**1 Fluid flow and strain localization: fingering and fracture processes in partially saturated materials**

coord. F. Casini, G. Sciarra, & J. Vaunat

**2 Geomaterials under the nanoscope**

coord. R. Pellenq, F. Radjai, F.J. Ulm

**3 Offshore Geotechnics**

coord. K. Gavin, F. Pisano, & G. Eiksund

We thank all active participants and coordinators for their effort.

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Participants of the ALERT Workshop 2018



Hadrien Rattéz  
(Université Paris-Est)

## ALERT PhD Prize 2018

The jury of the ALERT PhD Prize 2018 was composed of the professors G. Viggiani (President of ALERT), R. Pellenq (ALERT Invited Lecturer for 2018), J.Dijkstra (chosen member) and P. Kotronis (chosen member). Only PhD students from one of the institutions belonging to ALERT are eligible candidates for the prize, which consists of a certificate and a reward of 1000 Euros.

The three finalists, Hadrien Rattéz (Université Paris-Est), Laura Gonzalez-Blanco (Universitat Politècnica de Catalunya) and Eleni Stavropoulou (Université Grenoble Alpes)

were chosen by the jury out of 10 applications.

The jury finally awarded the PhD student Hadrien Rattéz for his work entitled

**Thermo-hydro-mechanical couplings and strain localization in Cosserat continua : application to stability analysis of rapid shear in faults**

The abstract of this PhD thesis is available on the ALERT website.

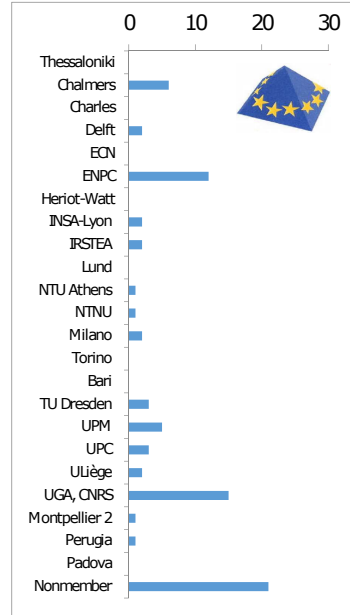
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### ALERT Doctoral School 2018

The ALERT Doctoral School 2018 lasted from Thursday, 4th October to Saturday, 6th October and was attended by 79 participants. The topic of the school was

stitutive models for soil and rock mechanics. In order to tackle this topic, the first two days of the school were divided into :



#### Energetical methods in geomechanics

This school was organized by Itai Einav (University of Sydney) and Eleni Gerolymatou (Chalmers University of Technology).

The lectures were presented by

- Mario Liu (University of Tübingen)
- Ioannis Stefanou (Ecole Nationale des Ponts et Chaussées, IFSTTAR, CNRS)
- François Guillard (University of Sydney)
- Itai Einav (University of Sydney)
- Eleny Gerolymatou (Chalmers University of Technology)
- Manolis Veveakis (Duke University)
- Yida Zhang (University of Colorado)

- Basic thermodynamic definitions
- Definition and uses of virtual power
- Energetics in granular media from the viewpoint of DEM
- Landau’s approach for advanced thermodynamics
- Hierarchal derivation of constitutive relationships using thermodynamics
- Energetical background of common approaches
- Multiphysics and multicomponent applications
- From Fracture to Breakage Mechanics

The school included topics ranging from basic concepts of energetical methods (Thermodynamics, Principle of virtual power), to specific examples and applications that illustrate how energetical methods lead development of con-

stitutive models for soil and rock mechanics. On Saturday, these lectures were followed up by exercise examples that evidenced the effect of constitutive choices on the energetics.

On behalf all the ALERT members we want to thank the lecturers and the organizers for their commitment.

Participants of the ALERT Doctoral School 2018

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The accompanying book, containing articles referring to the lectures, as well as some books of previously held doctoral schools can be downloaded from the ALERT website.  
<http://alertgeomaterials.eu/publications/>



### Special Lecture 2018: Prof. Rolland Pellenq

The ALERT Special lecture 2018 was delivered by Prof. Rolland Pellenq, Director of Research at CNRS and MIT Senior Research Scientist.

The title of the lecture was:

#### The potential of mean force: the tool to model dense colloidal systems

The lecture was recorded during the presentation and is available for downloading on the ALERT website.

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The ALERT Special Lecturer 2018  
Prof. R. PELLENQ



## ALERT Olek Zienkiewicz Course 2018

The 10th ALERT Olek Zienkiewicz Course was held for five days in November 2018 in Bari, Italy.

The school was coordinated by Federica Cotecchia (Politecnico di Bari), Jean Vaunat (Universitat Politècnica de Catalunya - BarcelonaTech), Claudia Vitone (Politecnico di Bari).

The topic of the Course was

**Natural versus compacted soils: from micro to macro behaviour and modelling**

Lectures and tutorials were held by:

- Eduardo Alonso, Antonio Gens, Enrique Romero Jean Vaunat (UPC, Spain)
- Angelo Amorosi (Sapienza University of Rome, Italy)
- Beatrice Baudet, Matthew Coop (UCL, UK)
- Federica Cotecchia, Francesco Cafaro, Gaetano Elia, Claudia Vitone (Politecnico di Bari, Italy)
- Pierre Delage (Ecole des ponts Paris Tech, France)
- Cristina Jommi (Politecnico di Milano, Italy)
- Cino Viggiani (Université Grenoble Alpes,

Laboratoire 3SR, France)

They covered several issues:

- Fundamentals about the genesis of clays and different scales of structures
- Consolidated unfissured clays: fundamentals to advanced analysis of the mechanical behaviour
- Compacted clays: fundamentals to advanced analysis of the mechanical behaviour
- Hard clays/weak claystones: analysis and modelling of the hydro-mechanical behaviour
- Transitional soils, fissured and weathered clays: analysis of the mechanical behaviour

The 10th ALERT Olek Zienkiewicz Course was attended by 43 PhD students, among which 26 coming from ALERT member institutions and 17 non-ALERT institutions. On behalf all the ALERT members, we want to thank the lecturers and the organizers for their commitment. For more information, please visit the post-school notes and info on the ALERT website.

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Organising Institutions of the ALERT OZ Course 2018



Participants to the ALERT OZ Course 2018



**POLITECNICO MILANO 1863**



**Università degli Studi di Perugia**



Organising Institutions of the ALERT Workshop & School 2019

### ALERT Workshop 2019

The ALERT Workshop in 2019 will be organized from Monday, 30th September to Wednesday, 2nd October. The workshop will again take place in the Centre Paul Langevin in Aussois, France.

The focus of the three workshop sessions and the responsible coordinators are listed below:

- 1 Upscaling in Geotechnical Engineering**  
coord. C. di Prisco, C. Jommi & C. Tamagnini  
claudio.diprisco@polimi.it  
cristina.jommi@polimi.it  
claudio.tamagnini@unipg.it

- 2 The mechanics of root-soil systems: from microscopic to macroscopic approaches**

coord. E. Kolb & L. Sibille  
evelyne.kolb@upmc.fr  
luc.sibille@3sr-grenoble.fr

- 3 Computational methods in snow and avalanche release mechanics**  
coord. J. Gaume, P. Hagenmuller, F. Nicot & G. Chambon

johan.gaume@epfl.ch  
pascal.hagenmuller@meteo.fr  
francois.nicot@irstea.fr  
guillaume.chambon@irstea.fr

All the sessions include invited speakers as well as contributions from the abstract submission process.

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The online registration for the ALERT Workshop & School will open in July and will be announced in <http://alertgeomaterials.eu/>.

### ALERT Doctoral School 2019



The workshop is followed by the ALERT Doctoral School which will be hosted from Thursday, 3rd October to Friday, 5th October also in Aussois. The topic of the ALERT School will be dedicated to

**The Legacy of Ioannis Vardoulakis to mechanics of granular materials**

and will be organized by Jean Sulem (Université Paris-Est) and Cino Viggiani (Université Grenoble Alpes).

Lectures will be held on two days and will include the following topics:

- Mechanics of granular materials I. Experimental approach
- Mechanics of granular materials II. Modelling

- Landslide mechanics and growth of slip surfaces
- Modelling of strain localization in geomaterials - Higher order continuum theories and regularization techniques
- Petroleum Geomechanics
- Hydro-mechanics of porous and granular material - Poroelasticity and beyond

The Lectures will be held by Edward Ando, Itai Einav, Euripides Papamichos, Panos Papanastasiou, Sasha Puzrin, Holger Steeb, Ioannis Stefanou, Jean Sulem and Cino Viggiani.

The online registration for the ALERT Workshop & School will be open on the ALERT website in July.

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Organising Institutions of the ALERT School 2019



11<sup>th</sup> Alert Olek Zienkiewicz course



Petroleum Geomechanics

28-31 October 2019  
Ecole des Ponts ParisTech, France



Ecole des Ponts  
ParisTech



ARISTOTLE  
UNIVERSITY OF  
THESSALONIKI

Organising Institutions of the  
ALERT Olek Zienkiewicz Course  
2019

The 11th edition of the ALERT Olek Zienkiewicz Course will be held from Monday, 28th October to Thursday, 31st October 2019 in Paris, France. The topic of the school is

Petroleum Geomechanics

The school is organised by Siavash Ghabezloo (Ecole des Ponts ParisTech, France), and Euripides Papamichos (Aristotle University of Thessaloniki, Greece).

**Abstract:** Petroleum Geomechanics is the engineering discipline which deals with the mechanical behavior and response of the geological formations, at the reservoir scale or at the well bore scale, during exploration and production of oil and gas, or injection and storage of fluids deep in the subsurface. It is tightly related to engineering geology, soil and rock mechanics and seismology. Ensuring safety, integrity and optimization of various operations in petroleum industry are highly dependent and based on geomechanical considerations and modellings. The progressive depletion of easily exploitable oil and gas resources during the past decades lead the petroleum industry to bore in deeper formations and more difficult conditions in terms of stress state, temperature, deformability and permeability. This leads to challenging operational conditions and the use of unconventional exploitation methods. Ensuring the safety, integrity and economical rentability of infrastructures in these conditions, in addition to the engineering challenges related to the integrity assessment of CO2 sequestration systems, lead to an increasingly important part for geomechanics for industry applications.

In this context, the 11th edition of the ALERT Olek Zienkiewicz Course is dedicated to Petroleum Geomechanics. The aim is to make PhD students familiar with the main problems of oil and gas exploration and production, related to geomechanics and show

them various analysis and design methods used to tackle them. A broad range of subjects will be covered by the instructors from the petroleum industry and the academic world. The course will begin with a presentation of main problems, challenges and perspectives in the petroleum industry in relation to geomechanics. A good understanding of these problems needs a knowledge of the geological conditions of subsurface and the structural composition of petroleum reservoirs. This is followed by a presentation of the exploitation and production methods for conventional reservoirs, drilling mechanics and completion technology, before moving to the exploitation of unconventional reservoirs by hydraulic fracturing. The analysis and design of these production methods need a presentation of the hydro-mechanical behavior of various rocks in the system and the experimental methods used for evaluation of their properties in the laboratory, which will be followed by a visit of the laboratory facilities of Ecole des Ponts ParisTech. The evaluation of rock properties deep in the subsurface is largely based on the interpretation of well logs and elastic wave propagation in rocks which will be presented before addressing the in-situ stress determination which is another important ingredient needed for every geomechanical analysis. The information concerning rock behavior and properties and the in-situ stress state will be used to calculate the borehole stresses for wellbore stability analysis and sand production prediction. The course will end with a presentation of the consequences of petroleum production or fluids injection in the reservoir and the overburden formations and the resulting stress changes in terms of ground movements or faults reactivation.

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More details and registration:

<http://alertgeomaterials.eu/category/oz-course>



## New Institutional Members of ALERT

During its meeting in Aussois, held in October 2018, there were two applications for the membership in ALERT Geomaterials and they have been accepted by the board of Directors.

MSE2  
represented by prof. Rolland Pellenq  
Duke University  
represented by prof. Manolis Veveakis

With these decisions, the present number of members of ALERT Geomaterials is 34!

It has been pointed out that, according to our status, these two non-European institutions have the same rights as the others except for Election.

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## Special Lecture 2019: Prof. Alexander Puzrin



The ALERT Special Lecturer 2019  
Prof. Alexander Puzrin

The Special lecture during the coming ALERT Workshop 2019 will be presented by Prof. Alexander Puzrin, Professor and Chair of Geotechnical Engineering at the ETH Zurich, Switzerland. He is engaged in the constitutive modeling of geomaterials and the analysis of progressive and catastrophic failure in soils, with applications to onshore and offshore slope stability problems. He will talk about

Growth of slip surfaces  
(life is dangerous)

Growing slip surfaces are commonly encountered in the mechanisms of many natural

geo-hazards, such as earthquakes, landslides, snow avalanches, tsunamis, etc.. The talk will explore the basic mechanics of progressive and catastrophic slip surface growth in a slope using recent advances in experimental, analytical and numerical approaches. Importance of the proper understanding of this phenomenon will be illustrated via the following three novel applications: (i) defining influence zones for terrestrial landslides, (ii) relating geomorphology of submarine landslides to their tsunami generating potential, and (iii) exploring plausibility of a delayed release for earthquake-triggered snow avalanches. In the process, it will be demonstrated how the slip surface growth can negatively affect life of an ordinary citizen. [Back to Contents](#)

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