



ALERT Geomaterials

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EDITORIAL

Dear ALERTmember,

As you will already know, 2009 was a difficult year for our Association. Two very sad events shocked all of us. They concerned our friends Roberto Nova and Iannis Vardoulakis. Roberto is still battling with illness and I know you will want to assure him our thoughts are with him and his family at this time. Sadly, Iannis died in September and left a huge space in our lives. During the last annual ALERT meeting in Aussois we tried to fill this space by commemorating him, and Euripides did a marvellous job in reminding us of the enormous heritage he has left to our scientific community. This prompted the ALERT Board of Directors to dedicate the

next School to Iannis's memory. I am sure it will be a very stimulating occasion, which will explore his way of thinking and his innovative theories. I warmly thank Jean and Euripides for having so enthusiastically agreed to organise this unusual initiative to bring alive his brilliant, penetrating and human perspective on the scientific horizon. I think next year will be for many of us a period of reflection and, I hope, a fruitful year for all.

Yours sincerely
Claudio di Prisco

New ALERT members

During the last Board meeting, held in Aussois on 13 October 2009, one European university, one Research Institution and one extra-European University were accepted as new ALERT members: the University of Bochum (Germany), Cemagref (France) and the Ecole Nationale d'Ingénieurs de Tunis (Tunisia), respectively. This latter institution has been accepted as an Associate Member. The success of the association is gradually increasing and the number of ALERT members is now 26. You can find the updated list of ALERT members at <http://alert.epfl.ch>.

We now report briefly on the research activities of these three members.

The **University of Bochum** (team leaders: Prof. Tom Schanz and Prof. Holger Steeb) is composed of seven permanent researchers, three post-docs and ten PhD students. The main research activities of this group concern the experimental, theoretical and numerical analysis of several geomechanical issues with particular focus on coupled problems,

such as the hydromechanics of unsaturated soils, thermo-plasticity, continuum analysis of large-strain processes and localisation, damage and fracture phenomena in cohesive-frictional geomaterials.

Cemagref (team leader: F. Nicot) is a very well-known French research Institution very active on the evaluation of natural risk. The research group is composed of eleven senior researchers. The main research fields of Cemagref deal with the constitutive behaviour of geomaterials, micromechanics, homogenisation and multiscale approaches applied to geohazards and instability and bifurcation analysis. Other important research topics are the study of internal erosion processes, hydrodynamics, granular avalanches and geohazard protection structures.



المدرسة الوطنية للمهندسين بتونس
Ecole nationale d'ingénieurs de Tunis



The logos of new members
of ALERT Geomaterials



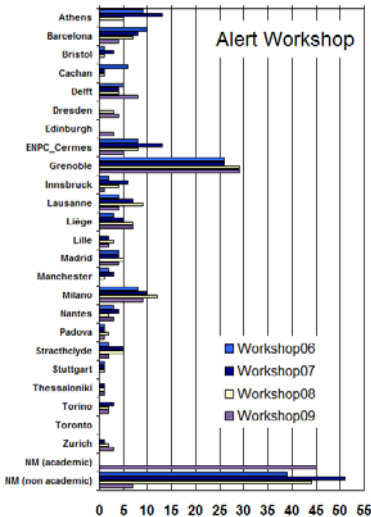


The research group of the **Ecole National d'Ingénieurs** de Tunis (team leader: Prof. Hedi Hassis) is composed of twenty-four permanent researchers. Their main research fields are the mechanical behaviour of concrete and concrete structures, with additional reference to the development of new cementitious materials starting from local (Tunisian) mixture. Other interests are related

to the field of geotechnical engineering, such as the analysis of shallow foundations on rocks and slope stability problems.

Further details of the research topics tackled by these groups are now available at:

<http://alert.epfl.ch/history/aboutus.html>



Workshop 2009

This year, the ALERT Workshop lasted three days with a large number of participants: this is the best proof of the interest in the topics proposed by the association and tackled by the speakers.

On the left, the regional distribution of participants from institutional members of ALERT Geomaterials is reported. There were also 52 participants from non-ALERT institutions (both academic and non-academic). The total number of participants was 144. Data for the ALERT Workshops held in 2006 and 2007 are also reported. The three topics of the ALERT Workshop 2009 were:

1. Modelling of natural hazard and vulnerability of structures in geomechanics

coord. M. Pastor and P. Kotronis

2. Geomechanics on a small scale

coord. D.M. Wood and P. Delage

3. Erosion in geomaterials

coord. I. Vardoulakis and S. Bonelli

The programme was very rich, collecting 17 contributions in session 1, 15 in session 2, and 15 in session 3. All the active participants and particularly the coordinators are warmly acknowledged!

Participants in Workshop '09 from ALERTmember Institutions

Invited Lecture 2009

It was a great pleasure for all of us to host **Dr Suzanne Lacasse**, Managing Director of NGI, as special guest lecturer during the 2009 ALERT Workshop. In recognition of her contributions to scientific research in geomechanics,

In Aussois, Dr Lacasse presented a learned dissertation titled 'Hazard and Risk Assessment for Landslides and Tsunamis'.

This lecture, in video and audio, is now available on the ALERT Geomaterials web site. This gives you the opportunity to attend a very interesting lecture while sitting comfortably in your office.

The lecture starts by highlighting the importance of improved material models for the analysis of progressive failure phenomena: in particular, the case of sensitive clays (e.g. quick clays) is considered by addressing the problem of the experimental/theoretical evaluation of the

shear band thickness in the presence of localised ruptures. The dependence of such thickness on the deformation rate is illustrated.

The important concepts of hazard, vulnerability and risk assessment are introduced and critically discussed. The enormous relevance of mitigation measures is also stressed, distinguishing between physical (structural) measures and non-structural ones (related to land-use planning, monitoring systems and emergency preparedness).

In the last part of the lecture several problems related to tsunami waves are introduced, from the difficulties of physical simulations to the conception of practical interventions for the reduction of human/economic losses. Finally, the roles of geomechanicians and engineers clearly merge, and need to be recognised for 'reducing risk and protecting people'.



Dr Suzanne Lacasse
Norwegian Geotechnical Institute



The importance of geohazards: the phenomenon of landslides

ALERT Doctoral School 2009

The ALERT Doctoral School 2009, organised by Prof. L. Laloui (EPFL, Lausanne), Prof. F. Collin (Université de Liège) and Prof. V. De Gennaro (formerly ENPC Paris), was devoted to the problem of 'Failure in multiphase materials'.

On behalf of the ALERT Association, it is our pleasure to thank the organisers and teachers (R. Charlier, F. Collin, F. Darve, V. De Gennaro, A. Gens, T. Hueckel, L. Laloui, G. Pijaudier-Cabot and J. Sulem) for the effort devoted and for the quality of their

contributions.

There were 76 participants from ALERT members (see the graph on the previous page) and 21 participants from non-ALERT institutions. The total number of participants was 97!

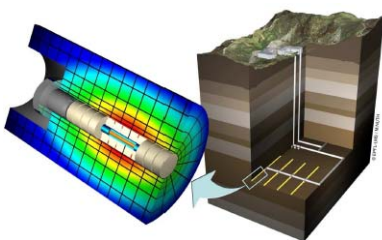
The School lectures started from the definition of the classical concepts of failure and instability by first considering the simple case of fully saturated or dry soils. The effect of multi-physical environmental actions was



European Journal of Environmental and Civil Engineering: 'Failure in Multiphase Geomaterials'



Dr Bertrand François
École Polytechnique Fédérale de
Lausanne



3D modelling of nuclear waste
repository

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alertydirector@stru.polimi.it
Only files in PDF format will be accepted for transmission.

addressed next, from both an experimental and a theoretical viewpoint. For this purpose a number of lectures was devoted to the role of hydraulic, thermal and chemical processes on the mechanical response of geomaterials.

The second part of the School was focused on the behaviour of rock-like geomaterials. An overview of damage mechanics approaches was provided, with particular reference to their coupling with chemical processes. Other related topics were presented by Prof. Sulam and Dr De Gennaro, who discussed the effect of multi-physical actions on seismic slip and advanced techniques for laboratory testing of soft rocks, respectively.

ALERT Phd Prize 2009

The Jury of the ALERT Phd Prize 2009 was composed of Suzanne LACASSE (*Norwegian Geotechnical Institute*), Ivo HERLE (*University of Dresden*), Gioacchino VIGGIANI (*Université J. Fourier de Grenoble*), and Félix DARVE (*Institut National Polytechnique de Grenoble* - ALERT President) as duty member. The prize was awarded to **Dr Bertrand François** from the École Polytechnique Fédérale de Lausanne for his thesis entitled '*Thermo-plasticity of fine-grained soils at various saturation states: Application to nuclear waste disposal*'. A PDF version of the thesis is available on the ALERT website.

The thesis tackles the relations existing between the thermo-plastic behaviour of clayey soils (saturated and unsaturated) and their relevance with reference to nuclear waste storage applications. The research of Dr. François can be said to be a very rich and complete work, covering all the main levels of investigation in geomechanics, i.e. the experimental study, the constitutive modelling and the numerical simulation of real boundary

Finally, the last sessions of the School were mainly focused on the description of challenging engineering applications. It was shown that, starting from a convenient theory and experimental laboratory evidence, it is possible to address very complex technical problems which are governed by the coupling of a variety of environmental phenomena. Applications of geomechanical modelling in the analysis of underground nuclear waste storage (Prof. Gens) and shrinkage phenomena in clayey soils (Prof. Laloui) were presented.

value problems.

The experimental programme (series of oedometric compression tests at different temperatures and suctions) has been designed in order to answer some constitutive questions about the stress-strain-temperature-suction behaviour of clays. The constitutive model, developed within the consolidated framework of hardening elastoplasticity, considers a series of interconnections between thermal, mechanical and water retention behaviours. In particular, it reproduces the most critical behaviours such as thermal and wetting collapses.

The model has been implemented in an advanced finite element code capable of dealing with multiphysics-coupled problems: a numerical investigation of several boundary value problems relating to nuclear waste disposal has been performed, resulting in a tool for assessing and understanding the thermo-hydro-mechanical behaviour of a multibarrier system.

In memory of Prof. Ioannis Vardoulakis

Prof. Vardoulakis had a terrible accident on 6 September at his house outside Athens. He was rushed to hospital but suffered massive cranio-cerebral injuries and despite immediate and extensive surgery he never regained consciousness.

He passed away peacefully at the hospital two weeks later on 19 September 2009. His funeral was held three days later at the First Cemetery of Athens and was attended by many, from Greece and all over Europe.

Ioannis was born on 22 March 1949 in the city of Chania in Crete. He grew up in Athens and he obtained his Diploma in Civil Engineering from the National Technical University of Athens (NTUA) in 1972. He continued his studies at the University of Karlsruhe in Germany and in particular at IBF (Institut für

Bodenmechanik und Felsmechanik), the Institute for Soil and Rock Mechanics, under the guidance of Prof. Gerd Gudehus. He obtained his PhD degree in 1977 and after his military service in Greece in 1980 he became Assistant Professor in the Department of Civil Engineering at the University of Minnesota, in Minneapolis. He quickly rose to the level of Professor of Geomechanics in 1986 and stayed in Minnesota until 1990. At the University of Minnesota, Ioannis played a major role, contributing to research in geomechanics with his ideas, energy, enthusiasm and persistence. In 1990 he became Professor of Mechanics in the Department of Applied Mathematics and Physics at the National Technical University of Athens (NTUA).



Prof. Vardoulakis was a leading international scientist and engineer who greatly influenced modern solid mechanics and especially the field of geomechanics. He considered himself a mathematical geomechanics modeller. His contributions span many areas, including experimental geomechanics, constitutive theory for static and dynamic thermo-visco-poro-plasticity, computational geomechanics, bifurcation and localisation theory for geomaterials, liquefaction, fluidisation, internal erosion and sand production and multiphase flows in porous media and fractional moisture diffusion.

Ioannis wrote over 150 papers in refereed journals and accumulated over 3100 citations. He was a Member of 13 International Professional and Academic

Societies and a reviewer for 32 international journals and 17 international organisations. He had been a core member of ALERT Geomaterials since 1993 and a strong supporter and contributor to the endeavour of developing a European School of Thinking in the field of Mechanics of Geomaterials. Above all, Ioannis was a devoted teacher. He simply loved to teach and interact with students and researchers at all levels. Ioannis was a true gentleman and an enthusiastic friend to his personal, academic and professional acquaintances and to his students and family alike. We will always remember him and his contributions.

Euripides Papamichos



Prof. Ioannis Vardoulakis

ALERT Olek Zienkiewicz Course: 2nd edition

After the successful launch of the 1st ALERT Geomaterials Local Doctoral Course (held last year in Madrid), the ALERT Geomaterials Association is very glad to announce the

2nd ALERT Olek Zienkiewicz Course on 'Mechanics of Unsaturated Geomaterials'

This second edition, organised by Prof. L. Laloui, will be hosted by the Swiss Federal Institute of Technology (EPFL) in Lausanne on 5 to 9 July 2010.

It will have an interdisciplinary approach, offering lectures in the areas of the mechanics of soils, cement-based materials and rocks. The objective is to supply the participants with an extensive overview, starting from the basics and covering the most recent theories and applications (i.e. natural disasters,

nuclear waste disposal, oil and agricultural engineering). The course will include lectures at different levels, ranging from basic topics to more advanced issues, the latter aimed at presenting the current researches developed within ALERT.

The course will be a very fruitful opportunity for each participant, not only from scientific but also social standpoints, since some social events have been organised.

Practical details

The organisation will provide advice on inexpensive hotels and student accommodation in Lausanne. Students from ALERT institutions are not required to pay a course fee.

Further information and updates can be found at the course web site:

<http://lmswww.epfl.ch/ALERT/index.html>

ALERT Olek Zienkiewicz Course 'Mechanics of Unsaturated Geomaterials'

Lecturers:

- R. Borja
(Stanford University)
- L. Boutonnier
(Egis and Guyancourt Cedex)
- R. Charlier
(Université de Liège)
- F. Collin
(Université de Liège)
- O. Coussy
(Ecole de Ponts - Paris Tech)
- P. Delage
(Ecole de Ponts - Paris Tech)
- A. Ferrari
(Ecole Polytechnique Fédérale de Lausanne)
- B. François
(Université de Liège)
- A. Gens
(Universitat Politecnica de Catalunya)
- R. Horn
(Christian-Albrechts-Universität)
- T. Hueckel
(Duke University)
- R. Horn
(Christian-Albrechts-Universität)
- C. Jommi
(Politecnico di Milano)
- Koliji
(STUCKY LTD Consulting Company)
- L. Laloui
(Ecole Polytechnique Fédérale de Lausanne)
- M. Nuth
(Ecole Polytechnique Fédérale de Lausanne)
- S. Salager
(Ecole Polytechnique Fédérale de Lausanne)
- K. Soga
(University of Cambridge)
- A. Tarantino
(Università degli Studi di Trento)

ALERT Workshop & School 2010

The **ALERT Workshop 2010** will be held in Aussois from 4 to 6 October 2010. The titles of the sessions chosen by the ALERT Board of Directors and the relative coordinators are listed below.

1. Chemo- and bio-mechanical couplings

coord. J.F. Shao and B. Garitte
jian-fu.shao@polytech-lille.fr
benoit.garitte@upc.edu

2. Mechanics of clay rocks

coord. P. Besuelle and R. Charlier
Pierre.Besuelle@grenoble-inp.fr
Robert.Charlier@ulg.ac.be3

3. Engineering geostructures

coord. I. Herle and A. Gens
ivo.herle@tu-dresden.de
antonio.gens@upc.edu

the ALERT web site (<http://alert.epfl.ch>).

The deadline for abstract submission is 30 April 2010.

The **ALERT Doctoral School 2010** will be devoted to the memory of Professor Ioannis Vardoulakis, and will be organised by Jean Sulem (Ecole Nationale des Ponts et Chaussées) and Euripides Papamichos (Aristotle University of Thessaloniki). As usual, the programme covers three days, from 7 to 9 October.

Online registration for the Workshop and the School will be opened in May 2010 on the ALERT website, and a notice will be posted in the next issue of the newsletter and through the ALERT mailing list. Please do not forget to fill in your online registration form with all the requested data (date and time of arrival and departure, email, address and affiliation, etc.), in order to help us to meet your needs!!

Please do not forget to submit your abstracts by email directly to the coordinators using the abstract form that can be downloaded from