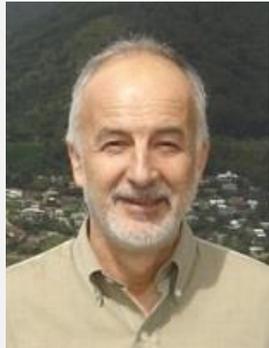




December 11 – Session Géomécanique

- 14:00 **Eduardo Alonso** (Universidad Politécnica de Cataluña, Spain): **Coarse granular soils. Long term behaviour**
- 14:45 **Claudio di Prisco** (Politecnico di Milano, Italy): **Extension of controllability theory to viscoplastic constitutive relationships**
- 15:30 *COFFEE BREAK*
- 16:00 **Patrick Selvadurai** (McGill University, Canada): **Dilatancy and Rupture of Elastically Constrained Geological Interfaces**
- 16:45 **Manuel Pastor** (Universidad Politécnica de Madrid, Spain): **Modeling of two-phase landslides**
- 17:30 intervention and closure by **Félix Darve**: **Félix in Geomechanics Wonderland**



Two-day workshop in the honor of Félix Darve and Jacky Mazars



11-12 December 2018, Grenoble, France

Jacky Mazars, formerly Deputy Director of ENS de Cachan (1995-2000) and Director of Laboratoire 3SR (2003-2009), is internationally known for his work on the application of Damage and Fracture Mechanics to model the nonlinear behavior of concrete structures.

Félix Darve is the former director of ENSHMG of INP Grenoble (1987-1992), of GRECO CNRS/MRT Géomatériaux (1986-1993) and of the European network ALERT Geomaterials (1989-2008). He is internationally recognized for his research work on incrementally non-linear constitutive relations, bifurcations/instabilities and micromechanics of geomaterials.



December 12 – Session Risques et Vulnérabilité des structures de génie civil

- 08:30 **Gilles Pijaudier-Cabot** (UPPA, France): **Discrete approaches for the hydromechanical response of concrete**
- 09:15 **Frédéric Ragueneau** (LMT Cachan, France): **On the identification and modeling of structures and masonry**
- 10:00 *COFFEE BREAK*
- 10:30 **Shahrohk Ghavamian** (SIXENSE NECS, France): **Génie Civil, Recherche et Développement, Moyens de Simulation (...)**
- 11:15 **Patrick Paultre** (Université de Sherbrooke, Canada): **Experimental evaluation of inelastic higher mode effects (...)**
- 12:00 intervention and closure by **Jacky Mazars**: **Regards sur un parcours universitaire : entre formation et recherche**

This event is organized by Pascal Forquin, head of the research team RV, and Cino Viggiani, member of the research team GéoMécanique, together with the direction of Laboratoire 3SR

The event will take place in the **amphithéâtre Kilian** (1381 rue de la Piscine, Campus Universitaire de Saint Martin d'Hères)

Eduardo Alonso – Coarse granular soils. Long term behaviour

Short (“Compressibility”) and long term (“Creeping”) behaviour of rockfill is explained by the propagation of defaults in grains, their breakage and the subsequent structural re-arrangement. A theoretical framework inspired in linear fracture mechanics helps to establish a simple but accurate short-long term relationship. The lecture will describe also a DEM approach, based on the same framework, capable of reproducing scale, time and relative humidity effects.

Claudio di Prisco – Extension of controllability theory to viscoplastic constitutive relationships

Time plays a dominant role in many areas of geomechanics, such as in the assessment of landslide hazard and territorial vulnerability. In this context, the reliable description of the temporal evolution of both soil mass movements and their dependence on loading rate effects is deemed crucial. From a theoretical standpoint, the time-dependent behaviour of geomaterials can be described by means of visco-plastic constitutive relationships, also beneficial to foster the objectivity of numerical results from strain localisation simulations. However, not all the aspects of visco-plastic modelling have been so far clearly addressed in the literature. For this reason, in this presentation the mechanical conditions to be satisfied for tertiary creep to occur will be analyzed in detail and two practical applications will be discussed: one concerning localized failures in cemented materials under simple shear conditions, the other one referred to the inception of liquefaction in saturated loose sand triaxial specimens.

Patrick Selvadurai – Dilatancy and Rupture of Elastically Constrained Geological Interfaces

The presentation will focus on dilatancy processes at a rough circular patch that is located at the interface between pre-compressed elastic halfspace regions. The mathematical analysis examines the influence of the elastic compliance of the domains and the evolution of the dilatancy angle on the relative shear response of the circular patch. The modelling has applications in the study of geomechanics of stability of rock masses and in the modelling of contact regions in earthquake fault zones.

Manuel Pastor – Modelling of two-phase landslides

The talk will deal with a set of hierarchically structured models which can be applied to describing landslide propagation, from debris flows with two phases and pore pressure, following with flowslide modelling where we use a set of SPH nodes having each one a finite difference mesh incorporated. Regarding constitutive modelling, we will present a law based on the Inertia number. Several applications will illustrate the applicability of the proposed models.

Gilles Pijaudier-Cabot – Discrete approaches for the hydromechanical response of concrete

The lecture will review results obtained with discrete approaches dealing with the hydromechanical response of concrete. First, the mechanical response described with lattice models will be considered. Insight in the failure process and comparisons with experiments including acoustic emission data will be provided, with a view towards the description of structural size effect. Then, discrete hierarchical approaches for the description of the coupled effect between damage and permeability will be considered in order to capture the increase of permeability due to damage. In addition, prediction of relative (gas/fluid) permeabilities will also be considered.

Frédéric Ragueneau – On the identification and modelling of structures and masonry

L'analyse de la vulnérabilité des ouvrages maçonnés historiques présentent des difficultés de différents ordres : méconnaissances du comportement des matériaux en place, complexité géométrique, incertitudes de l'histoire des chargements... Des stratégies numériques particulières doivent être mises en œuvre afin de traiter de la réponse statistique de ces ouvrages et familles d'ouvrages, se basant sur des comportements de matériaux complexes nécessitant des approches d'identifications virtuelles à deux échelles. L'objet de cette présentation sera de dégager des éléments de modélisation mécanique permettant de répondre tout ou partie à ces attentes.

Shahrohk Ghavamian – Génie Civil, Recherche et Développement, Moyens de Simulation Numérique : quelques réflexions sur le métier d'ingénieur d'étude de structure

On entend régulièrement dire que le progrès met beaucoup de temps avant d'atteindre le monde de la construction. Pourtant les besoins sont là : projets complexes, coût élevé de la maintenance des ouvrages, techniques et produits innovants, exigences sévères, etc. La recherche avance et les moyens de modélisation numérique, tant logiciel que puissance de calcul ne sont plus des obstacles aux ingénieurs d'étude. Quelles peuvent être des pistes de progrès ?

Patrick Paultre – Experimental evaluation of inelastic higher mode effects on the seismic behavior of reinforced concrete structural walls

Most mid- and high-rise reinforced concrete (RC) buildings rely on RC structural walls as their seismic force resisting system. The contribution of higher lateral modes to the elastic response of RC structural walls produces base shear forces significantly larger than those resulting from the static code procedure. The relative contribution of higher lateral modes increases due to an additional dynamic effect occurring while the RC wall is yielding at the base. This presentation describes an original pseudo-dynamic hybrid test programme that has been used to experimentally measure the shear amplification during an earthquake excitation of a model shear wall structure. Experimental results show that recently implemented amplification factors to account for the inelastic effects of higher modes are not conservative.

Jacky Mazars

Professeur émérite à l'Institut Polytechnique de Grenoble – France

Jacky Mazars graduated from *Ecole Normale Supérieure (ENS) de Cachan* - France (1972) and obtained a “*Doctorat es Sciences Physiques*“ from *Université Pierre and Marie Curie* - Paris (1984).

He spent much of his career at ENS de Cachan. He was appointed successively *Maître de Conférences* (1979) and *Professeur* (1989). He joined the *Laboratoire de Mécanique et Technologie* and was the creator of the Civil Engineering research team (1979). Appointed chairman of the Civil Engineering department in 1990, he was then invited to join the management of ENS de Cachan (1995-2000) as Deputy Director of this institution.

The researcher Jacky Mazars is best known for his work on the application of Damage and Fracture Mechanics to model the nonlinear behavior of concrete structures. The "Mazars" damage model (1984) is integrated in computer codes used particularly for nuclear engineering (code CAST3M and ASTER-EDF in France), defense (code Abaqus) or within foreign university codes (FideasLab, University of Berkeley – Lagamine, University of Liège – EfiCos, University of Sherbrooke, ...).

In 2002, Jacky Mazars joined the *Institut Polytechnique de Grenoble* as a Professor. In 2003, he became director of the *Laboratoire Sols, Solides, Structures, Risques* and created the research federation *Vulnérabilité des Ouvrages aux Risques* (VOR), which brings together 12 research laboratories in Rhône-Alpes. The central subject is the analysis of large structures under severe loadings, associated with natural risks (earthquakes, gravitational risks) or technological risks (blasts, impacts). Damage is still at the heart of modeling, but the velocity and high confinement effects have enriched the models and new versions have been proposed: "Pontiroli, Rouquand, Mazars" (2005) or "Mazars, François, Grange" (2014).

He has published about 200 publications (articles, books, papers in international conferences). He is, or was, expert with many international organizations (FRS Belgium, NSRC Canada, NSC Poland, ANR France, European Commission, ...) and member of several editorial committees (IJNAMG, EJECE, JACT, M & S Rilem, ...). He has received number of awards (AFC, FNTP, DGA in France, IA-FraMCoS), he is *Docteur d'Honneur* of the University of Sherbrooke and *Officier des Palmes Académiques*.



Félix Darve

Professeur émérite à l'Institut Polytechnique de Grenoble – France

Félix Darve, born in 1947, graduated from *Ecole Centrale Paris* in 1971, He defended his PhD in Grenoble in 1974 and his *Doctorat ès Sciences* in 1978 in the field of computational geomechanics. In the early 1980s, he was among the founders of geomechanics, whose aim is to apply the methods and tools of mechanics to the study of geomaterials. He received in 1998 the promotion to professor of exceptional rank from the *Comité National des Universités*. He is *Commandeur* dans l'*Ordre des Palmes Académiques*.

Félix Darve founded and directed the Groupement de Recherches Coordonnées (GRECO) “Géomatériaux” of CNRS with 250 members. He directed the *Ecole Nationale Supérieure d'Hydraulique et de Mécanique de Grenoble* (ENSHMG) and, in 1989, he founded the European network ALERT Geomaterials, which is today a School of Thought in geomechanics with more than 30 research units. He was Deputy Director of the Department of Engineering Sciences in the French Ministry of Research.

He was or is a member of the editorial boards of several international journals like *Granular Matter*, *Computers and Geotechnics*, *Computational Particle Mechanics*, *CRAS Mécanique*, He co-founded the journal “*Mechanics of Cohesive-Frictional Materials*” (Wiley), which subsequently merged with the “*International Journal for Numerical and Analytical Methods in Geomechanics*” (Wiley). Since then, he is co-editor in chief of this journal. He co-founded also the “*European Journal for Environmental and Civil Engineering*” (Taylor and Francis).

Felix Darve is the author of more than 250 papers, with more than 4500 citations. He has edited or co-edited 15 books (Elsevier, Springer, Wiley, ...). His fields of interest include (i) the development of incrementally non-linear constitutive relations for geomaterials, (ii) the analysis of bifurcations and instabilities in non-conservative elasticity and in non-associate plasticity and (iii), more recently, the application of micromechanics and numerical homogenisation techniques to granular materials.

