

Laboratory of Soil Mechanics - Chair «Gaz Naturel» Petrosvibri

Prof. Lyesse Laloui, Director

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YEARLY REPORT 2013

Soil Mechanics Laboratory - Chair “Gaz naturel” Petrosvibri

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LMS | ACTIVITY REPORT 2013

Courses taught

BA, MA and Doctoral level at EPFL

Spring semester 2013

Teacher(s)	Code	Course title	Section / Semester	Credits	Student number
Ferrari, Alessio	ME-705	Experimental Geomechanics	EDME-	1	3
Laloui, Lyesse Vulliet, Laurent	CIVIL-203	Mécanique des sols et écoulements souterrains	GC-BA4	5	131
Profs divers, *	CIVIL-490	Projet de construction	GC-MA2	4	41
Profs divers, *	CIVIL-491	Projet de systèmes civils	GC-MA2	4	39
Profs divers, *	CIVIL-492	Laboratoire GC	GC-MA2	4	32

Autumn semester 2013

Teacher(s)	Code	Course title	Section / Semester	Credits	Student number
Laloui, Lyesse Koliji, Azad	CIVIL-402	Géomécanique	GC-MA1, GC-MA3	3	13
Tacher, Laurent	CIVIL-403	Géologie de la construction et de l'environnement	GC-MA1, GC-MA3	3	119
Haldi, Pierre-André Vulliet, Laurent	CIVIL-438	Analyse de risques	GC-MA1, GC-MA3	3	88
	CIVIL-490	Projet de construction	GC-MA1, GC-MA3	4	38
	CIVIL-491	Projet de systèmes civils	GC-MA1, GC-MA3	4	47
	CIVIL-492	Laboratoire GC	GC-MA1, GC-MA3	4	38
Profs divers, *	CIVIL-493	Projet interdisciplinaire à option	GC-MA1, GC-MA3	3	17
Profs divers, *	CIVIL-598	Pré-étude projet de master	GC-MA1, GC-MA3	3	74

Additional teaching

Instructor	Course, level, credits, student number	Institution
Laloui, Lyesse	with Ferrari, Alessio "Introduction to the Geomechanical Characterization and Modelling" EAGE Short Course, Lausanne, 25 November 2013	EAGE

Advising

Students and PostDocs supervision

Advisee	Type of project	Project title/Description, Duration	Completion year	Supervisor(s)	Institution, Laboratory

Aili, Abudushalamu	PhD thesis	Geomechanical constitutive model for Bio-improved soils		Prof. Laloui Lyesse, Advisor	EPFL, LMS
Bandara, Samila Sanjeevanie	Post doctoral work	Numerical code development for Material Point Method (MPM), since July 2013	2014	Prof. Laloui Lyesse, Advisor	EPFL, LMS
Di Donna, Alice	PhD thesis	Constructive recommendations for optimized and reliable heat exchanger pile systems, since May 2010	2014	Prof. Laloui Lyesse, Advisor	EPFL, LMS
Dupray, Fabrice	Post doctoral work	Numerical modelling of deep nuclear waste disposals, since 2009	2013	Prof. Laloui Lyesse, Advisor	EPFL, LMS
Favero, Valentina	PhD thesis	Thermo-Hydro-Mechanical characterization of shales, since May 2012	2016	Prof. Laloui Lyesse, Advisor Dr. Ferrari Alessio, Co- advisor	EPFL, LMS
Gököç, Timur Oscar	PhD thesis	Behaviour of geomaterials in contact with CO2 in the framework of carbon sequestration, 4 years	2017	Prof. Laloui Lyesse, Advisor	EPFL, LMS
Li, Chao	PhD thesis	Multiphase Thermo-Hydromechanical Processes induced by CO2 injection into deep saline aquifers, since January 2012	2015	Prof. Laloui Lyesse, Advisor	EPFL, LMS
Makhnenko, Roman	Post doctoral work	Geological sequestration of carbon dioxide, since July 2013	2017	Prof. Laloui Lyesse, Advisor	EPFL, LMS
Manca, Donatella	PhD thesis	Gas flow propagation and related Chemo-Hydro-Mechanical response of sand bentonite mixture, since December 2011	2015	Prof. Laloui Lyesse, Advisor Dr. Ferrari Alessio, Co- advisor	EPFL, LMS
Mimouni, Thomas	PhD thesis	Energy pile foundations: group effect and long term behaviour, since March 2011	2014	Prof. Laloui Lyesse, Advisor	EPFL, LMS
Minardi, Alberto	PhD thesis	Gas testing in Shales, since October 2013	2016	Prof. Laloui Lyesse, Advisor Dr. Ferrari Alessio, Co- advisor	EPFL, LMS
Parisio, Francesco	PhD thesis	Hydro-mechanical damage model for anisotropic shales (Opalinus Clay): Constitutive modelling and numerical, since August 2012	2016	Prof. Laloui Lyesse, Advisor	EPFL, LMS
Rotta Loria, Alessandro	PhD thesis	Geo-structural behaviour of energy piles under large and long- term cyclic actions, since November 2013	2016	Prof. Laloui Lyesse, Advisor	EPFL, LMS
Samat, Sergio Luis	Post doctoral work	THM-Modelling of the FE Experiment as part of de FE-Modelling Task Force, since June 2013	2014	Prof. Laloui Lyesse, Advisor	EPFL, LMS
				Prof. Laloui Lyesse,	

Seiphoori, Ali	PhD thesis	Coupled Thermo-Hydro-Mechanical-Chemical processes in active clays, since May 2010	2014	Advisor Dr. Ferrari Alessio, Co- advisor	EPFL, LMS
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Research

Funded and pending research projects

Project Title	Principal Investigator	Funding Source	Amount (CHF)	Start Date	Duration (Months)	Status
GREAT - Geotechnical and geological responses to climate change: exchanging approaches and technologies on a worl-wide scale	Ferrari Alessio	FP7 - PCRD People	56537CHF out of 1099907CHF	01.01.2014	48	Pending
Extension Opalinus Clay	LALOU Lyesse	TTO Non lucr. TTO - recherche ind.	50000CHF out of 50000CHF	01.11.2013	12	Pending
Effect of Heating/Cooling Cycles on the Thermomechanical Performance of Energy Piles	LALOU Lyesse	Non lucr.-Recherche US NSF	10500CHF out of 337457CHF	01.10.2013	36	Pending
PhD thesis SHARC II	LALOU Lyesse	TTO Non lucr. TTO - recherche ind.	195000CHF out of 195000CHF	01.09.2013	36	Pending
From in-situ tests to numerical simulations: the response of an energy pile foundation	LALOU Lyesse	Entr. commerciales Ctr Recherche	20000CHF out of 20000CHF	01.09.2013	10	Pending
Extension Opalinus Clay	LALOU Lyesse	TTO Non lucr. Other TTO non lucr.	20000CHF out of 20000CHF	01.03.2013	5	Pending
FORGE Phase 2	LALOU Lyesse	TTO Non lucr. Other TTO non lucr.	75000CHF out of 75000CHF	01.03.2013	13	Pending
Analysis of the hydro-mechanical behavior of gas shales	LALOU Lyesse	Entr. commerciales Ctr Recherche	123000CHF out of 123000CHF	21.02.2013	19	Pending
Hydro-mechanical damage model for anisotropic shales (Opalinus Clay): Constitutive modelling and numerical implementation	LALOU Lyesse	Off. Conf. Divers Confédération	210000CHF out of 210000CHF	01.02.2013	36	Granted
THM-Modelling of the FE Experiment as part of the FE-Modelling Task Force	LALOU Lyesse	Non lucr.-Recherche NAGRA	50000CHF out of 50000CHF	01.01.2013	12	Granted
Sensitivity of thermo-hydro-mechanical evolution of the SF/HLW near-field after waste emplacement	LALOU Lyesse	Non lucr.-Recherche NAGRA	50000CHF out of 50000CHF	01.01.2013	5	Granted
GRETEL II ? Geotechnical RELiability of Thermo-piles Energy storage in soils	LALOU Lyesse	Off. Conf. Divers Confédération	20000CHF out of 20000CHF	15.10.2012	24	Ongoing
Experimental analysis of gas and water transport properties of Opalinus Clay	LALOU Lyesse	Non lucr.-Recherche NAGRA	48000CHF out of 48000CHF	01.08.2012	6	Ongoing

Evaluation of an advanced geomechanical model for the simulation of Opalinus Clay	LALOUI Lyesse	Off. Conf. Divers Confédération	50000CHF out of 50000CHF	01.08.2012	9	Ongoing
Geo-mechanical investigations of bio-improved soils	LALOUI Lyesse	FNS FNS-Basic research Division 2 - Mathématiques, sciences naturelles et de l'ingénieur	181401CHF out of 181401CHF	01.07.2012	18	Ongoing
GOALI : Long-Term Thermo-Mechanical Performance and Group Effect Considerations for Design of Energy Piles	Olgun Guney (Co-applicant: LALOUI Lyesse)	Non lucr.-Recherche US NSF	13155CHF out of 498931CHF	01.07.2011	36	Ongoing
WANDLAND: Effects of wetting and drying cycles on landslide activity	LALOUI Lyesse	FP7 - PCRD People	67950CHF out of 67950CHF	01.06.2010	36	Ongoing
Optimized and reliable heat exchanger pile systems	LALOUI Lyesse	Off. Conf. Divers Confédération	237000CHF out of 237000CHF	01.01.2010	54	Ongoing
COGEAR - Coupled GeoHazards in Alpine Regions	LALOUI Lyesse	Fonds budg. Autres centres de co	290000CHF out of 290000CHF	01.02.2009	48	Ongoing

Awards

Empty category

Research facilities

Research facilities
In 2013, the LMS has strongly expanded its research facilities in the field of gas and water transport properties in shales (within the research project SHARC 2)

Publications & Presentations

Books

Data	Key	Comments / Explanation
Laloui, Lyesse (Ed.); Di Donna, Alice (Ed.); Energy Geostructures: Innovation in Underground Engineering. , Wiley-ISTE, Hoboken, NJ, 9781848215726, 2013.	✓	

Book Chapters

Data	Key	Comments / Explanation
Dupray, Fabrice; Mimouni, Thomas; Laloui, Lyesse; Alternative uses of heat exchanger geostructures , in Energy Geostructures: Innovation in Underground Engineering , p.119-137, 2013.		
Mimouni, Thomas; Laloui, Lyesse; Full-scale in situ testing of energy piles , in Energy Geostructures: Innovation in Underground Engineering , p.23-42, 2013.		
Di Donna, Alice; Laloui, Lyesse; Soil response under thermomechanical conditions imposed by energy geostructures , in Energy Geostructures: Innovation in Underground Engineering , 2013.		
Mimouni, Thomas; Laloui, Lyesse; Thermo-pile: a numerical tool for the design of energy piles , in Energy Geostructures: Innovation in		

Underground Engineering, p.265-278, 2013.

Journal articles

Data	Peer reviewed	Key	Comments / Explanation
Battiato, A.; Diserens, E.; Laloui, Lyesse; Sartori, L.; A mechanistic approach to topsoil damage due to slip of tractor tyres , in <i>Journal of Agricultural Science and Applications</i> , vol. 2, num. 3, p.160-168, 2013.	✓		
Witteveen, Paul Joost; Ferrari, Alessio; Laloui, Lyesse; An experimental and constitutive investigation on the chemo-mechanical behaviour of a clay , in <i>Geotechnique - London-</i> , vol. 63, num. 3, p.244-255, 2013.	✓		
Salager, Simon; Nuth, Mathieu; Ferrari, Alessio; Laloui, Lyesse; An investigation into the water retention behaviour of deformable soils , in <i>Canadian Geotechnical Journal</i> , vol. 2, num. 50, p.200-208, 2013.	✓		
Dupray, Fabrice; François, Bertrand; Laloui, Lyesse; Analysis of the FEBEX multi-barrier system including thermo-plasticity of unsaturated bentonite , in <i>International Journal for Numerical and Analytical Methods in Geomechanics</i> , vol. 37, num. 4, p.399-422, 2013.	✓		
Laloui, Lyesse; Bio- and chemo-mechanical processes in geotechnical engineering , in <i>Geotechnique -London-</i> , vol. 63, num. 3, p.189-190, 2013.	✓		
dejong, JT; Fauriel, Suzanne; Laloui, Lyesse; Biogeochemical processes and geotechnical applications: progress, opportunities and challenges , in <i>Geotechnique -London-</i> , vol. 63, num. 4, p.287-301, 2013.	✓		
Salager, Simon; François, Bertrand; Nuth, Mathieu; Laloui, Lyesse; Constitutive analysis of the mechanical anisotropy of Opalinus Clay , in <i>Acta Geotechnica - Springer Verlag-</i> , vol. 8, num. 2, p.137-154, 2013.	✓		
Hu, Liangbo; Péron, Hervé; Hueckel, Tomasz; Laloui, Lyesse; Desiccation shrinkage of non-clayey soils: a numerical study , in <i>International Journal for Numerical and Analytical Methods in Geomechanics</i> , vol. 37, p.1782-1800, 2013.	✓		
Hu, Liangbo; Péron, Hervé; Hueckel, Tomasz; Laloui, Lyesse; Desiccation shrinkage of non-clayey soils: multi-physics mechanisms and a microstructural model , in <i>International Journal for Numerical and Analytical Methods in Geomechanics</i> , vol. 37, p.1761-1781, 2013.	✓		
Eichenberger, John; Ferrari, Alessio; Laloui, Lyesse; Early warning thresholds for partially saturated slopes in volcanic ashes , in <i>Computers and Geotechnics</i> , p.79-89, 2013.	✓		
Péron, Hervé; Laloui, Lyesse; hu, liangbu; Hueckel, Tomasz; Formation of drying crack patterns in soils : a deterministic approach , in <i>Acta Geotechnica -Springer Verlag-</i> , vol. 8, num. 2, p.215-221, 2013.	✓		
Ferrari, A.; Eichenberger, J.; Laloui, L.; Hydromechanical behaviour of a volcanic ash , in <i>Geotechnique</i> , vol. 63,	✓		

num. 16, p.1433-1446, 2013.			
Ferrari, Alessio; Eichenberger, John; Laloui, Lyesse; Hydro-mechanical behaviour of a volcanic ash , in <i>Geotechnique -London-</i> , vol. 63, num. 16, p.1433-1446, 2013.	✓		
Hu, LB; Péron, Hervé; Hueckel, Tomasz; Laloui, Lyesse; Mechanisms and critical properties in drying shrinkage of soils: experimental and numerical parametric studies , in <i>Canadian Geotechnical Journal</i> , vol. 50, num. 5, p.536-549, 2013.	✓		
Laloui, Lyesse; Salager, Simon; Rizzi, Marta; Retention behaviour of natural clayey materials at different temperatures , in <i>Acta Geotechnica -Springer Verlag-</i> , vol. 8, num. 5, p.537-546, 2013.	✓		
Dupray, Fabrice; Li, Chao; Laloui, Lyesse; THM coupling sensitivity analysis in geological nuclear waste storage , in <i>Engineering Geology -Amsterdam-</i> , vol. 163, p.113-121, 2013.	✓		
Dupray, Fabrice; Li, Chao; Laloui, Lyesse; THM coupling sensitivity analysis in geological nuclear waste storage , in <i>Engineering Geology -Amsterdam-</i> , vol. 163, p.113-121, 2013.	✓		

Conference papers

Data	Peer reviewed	Key	Comments / Explanation
Laloui, Lyesse; Mimouni, Thomas; Dupray, Fabrice; Advances in the analysis of thermo-active foundations , International symposium on Coupled Phenomena in environmental Geotechnics, Torino, Italy, July 1-3, 2013,	✓		
Favero, Valentina; Ferrari, Alessio; Laloui, Lyesse; An Insight into the Fluid Retention Capabilities of Shales , International Workshop on Geomechanics and Energy, Lausanne, Switzerland, 26-28 November 2013,	✓		
Eichenberger, John; Ferrari, Alessio; Laloui, Lyesse; Analyses géo-mécaniques des glissements de terrain superficiels , Les dagers naturels en Suisse: pratique et développements, Lausanne, Février 2011,	✓		
Seiphoori, Ali; Ferrari, Alessio; Laloui, Lyesse; Characterization of THM Behaviour of Compacted MX-80 Granular Bentonite Using an Advanced Double-wall Triaxial Cell , International Workshop on Geomechanics and Energy, Lausanne, Switzerland, November 26-28, 2013,	✓		
Ferrari, Alessio; Witteveen, Paul; Laloui, Lyesse; Chemo-mechanical behaviour of a low activity clay , International symposium on Coupled Phenomena in environmental Geotechnics, Torino, Italy, July 1-3, 2013,	✓		
Li, Chao; Paul, Barès; Laloui, Lyesse; Coupled semi-analytical solution for CO2 injection-induced surface uplift and caprock deflection , 47th US Rock Mechanics/Geomechanics Symposium, San Francisco, USA, June, 23-26, 2013,	✓		

Dupray, Fabrice; Baehler, Mélanie; Laloui, Lyesse; Effect of groundwater flow on the THM behavior of an energy pile , International symposium on Coupled Phenomena in environmental Geotechnics, Torino, Italy, July 1-3, 2013,	✓		
Ferrari, Alessio; Favero, Valentina; Laloui, Lyesse; Experimental analysis of the retention behavior of shales , 47th US Rock Mechanics/Geomechanics Symposium, San Francisco, USA, June, 23-26, 2013,	✓		
Mimouni, Thomas; Dupray, Fabrice; Laloui, Lyesse; Geotechnical aspects of heat production through foundation structures , Swiss society for soils and rocks mechanics, Bienne, November 7, 2013,			
Hu, liangbu; Monfared, Mohammad; Mielniczuk, B.; Laloui, Lyesse; Hueckel, Tomasz; El Youssoufi, Said; Multi-Scale Approach to Cracking Criteria for Drying Silty Soils , Geo-Congress 2013, San Diego, 2013,	✓		
Di Donna, Alice; Dupray, Fabrice; Laloui, Lyesse; Numerical study of the heating-cooling effects on the geotechnical behaviour of energy piles. , International symposium on Coupled Phenomena in environmental Geotechnics, Torino, Italy, July 1-3, 2013,	✓		
Mimouni, Thomas; Dupray, Fabrice; Laloui, Lyesse; On Using Tunnel Anchors and Bolts as Heat Exchangers with the Ground , International Workshop on Geomechanics and Energy, Lausanne, Switzerland, November 26-28, 2013,			
Dupray, Fabrice; Li, Chao; Laloui, Lyesse; Significance of rock THM parameters in geological nuclear waste storage simulation , 47th US Rock Mechanics/Geomechanics Symposium, San Francisco, USA, June, 23-26, 2013,			
Ferrari, Alessio; Favero, Valentina; Manca, Donatella; Laloui, Lyesse; Volumetric behavior and consolidation of shales at high confining stresses , 47th US Rock Mechanics/Geomechanics Symposium, San Francisco (USA), 26-29 June 2013,			

Presentations & Talks

Data	Key	Comments / Explanation
Di Donna, Alice; Laloui, Lyesse; Advancements in the Geotechnical Design of Energy Piles , International workshop on Geomechanics and energy, Session: Geothermal Energy - Shallow, EPFL, Lausanne, Switzerland, 26-28 November 2013, 2013.		

Posters

Data	Key	Comments / Explanation
Seiphoori, Ali; Ferrari, Alessio; Laloui, Lyesse; An Innovative Technique for Water Retention Characterization of Highly Swelling Geomaterials , International Workshop on Geomechanics and Energy, Lausanne, Switzerland, November 26-28, 2013, 2013.		
Di Donna, A.; Dupray, F.; Laloui, L.; Effects of soil thermo-plasticity on energy piles , Géotechnique Symposium in Print, ICE, Institution of Civil Engineers, London, UK., 3 June 2013, 2013.		

Manca, Donatella; Monfared, Mohammad; Ferrari, Alessio; Laloui, Lyesse; Gas injection tests on a Sand Bentonite Mixture: Investigation on the effects of pore water chemistry, FORGE Symposium 2013, Luxembourg, February 5–7, 2013, 2013.

Technical Reports

Data	Key	Comments / Explanation
Mimouni, Thomas; Dupray, Fabrice; Minon, Sophie; Laloui, Lyesse; Heat Exchanger Anchors for Thermo-active Tunnels, 2013.		

Theses

Data	Key	Comments / Explanation
Eichenberger, John; Laloui, Lyesse (Dir.); Geomechanical modelling of rainfall-induced landslides in partially saturated slopes, Thèse EPFL, n° 5580 (2013).		

Outreach

New collaborations

Partner type	Partner(s)	Responsible	Project topic/Description, Financial support (CHF) if any
Industry & Private sector	Sinopec	Laloui, Lyesse	Geomechanics for unconventional energy sources
Industry & Private sector	Sharc II consortium	Laloui, Lyesse	Advanced testing and modelling of shales

Innovation

Empty category

Appointments at other institutions

Name	Title	Institution
Laloui, Lyesse	Distinguished Adjunct Professor	King Abdulaziz University, Jeddah, Saudi Arabia
Laloui, Lyesse	Adjunct professor	School of Civil and Environmental Engineering, Duke University, USA

Visiting scholars

Visitor	Home Institution	Aim of visit, Duration
Alshibli, Khalid	The University of Tennessee, Knoxville (UTK)	Prof. Khalid gave a presentation entitled "Micro-Characterization of Sand Behavior Using Synchrotron Computed Tomography and 3D X-ray Diffraction", 1 day
Chiu Chung-Fai, Abraham	Hohai University	Prof. Chung-Fai gave two presentations on the water retention behaviour and the effect of hydraulic hysteresis on shear strength as well as on cracking induced by dessication and plant, 4 days
Hoyos, Laureano	University of Texas at Arlington	Prof. Hoyos delivered a seminar on unsaturated soil mechanics testing and discussed with LMS PhD students, 1 week
Hueckel, Tomasz	Duke University	Prof. Hueckel delivered courses to the doctoral school, 1 month
Labuz, Joseph F.	University of Minnesota	Prof. Labuz held a presentation on experiments with rock and observations of fracture, 1 day
Manassero, Mario	Politecnico di Torino	Prof. Manassero delivered a presentation entitled "Coupled Osmotic and Swelling Phenomena within Sodium Bentonites for Pollutants Containment Barriers: Theoretical Aspects and Potential

		Applications", 4 days
Oka, Fusao	Kyoto University	During his stay Prof. Oka gave a presentation entitled "MPM analysis of a water saturated elastoplastic soil and its application to dynamic analysis of embankment", 1 month

Alumni

Alumnus	Level	Year of departure	First position out of lab	Country	Sector of activity
Bertrand, François	PhD	2008	Postdoctoral Researcher, Institut National Polytechnique de Grenoble – Laboratoire 3S-R	France	Academia
Dupray, Fabrice	Post doc	2013	De Cérenville Géotechnique	Switzerland	Industry
Eichenberger, John	PhD	2013	Stucky Ltd.	Switzerland	Industry
Fauriel, Suzanne	PhD	2012	CSD Engineers SA	Switzerland	Industry
Koliji, Azad	PhD	2008	Postdoctoral Scholar, Structural Engineering and Geomechanics Group, Stanford University	USA	Academia
Nuth, Mathieu	PhD	2009	Adjunct professor, Department of Civil Engineering, Faculty of engineering, Université de Sherbrooke	Canada	Academia
Obrzud, Rafal Filip	PhD	2009	Zace Service Ltd., Lecturer	Switzerland	Industry
Péron, Hervé	PhD	2008	CSD Ingénieurs SA	Switzerland	Industry
Rascol, Emilie	PhD	2009	Bureau Tissières SA	Switzerland	Industry
Salager, Simon	Post doc	2009	Assistant professor at the Joseph Fourier University, Grenoble	France	Academia

Distinguished alumni

Alumnus	Achievement / Distinction
Bertrand, François	Prof. François co-organized together with Prof. Laloui the EAGE International Workshop on Geomechanics and Energy, EPFL, 26-28 November 2013

Events

Date / period	Venue	Title	Description / URL
26-28 November 2013	EPFL	EAGE International Workshop on Geomechanics and Energy in 2013	http://memento.epfl.ch/event/eage-international-workshop-on-geomechanics-and-3/
25-27 March 2013	EPFL	International Workshop on Thermoactive Geotechnical Systems for Near-Surface Geothermal Energy	http://memento.epfl.ch/epfl/?keywords=International+Workshop+on+Thermoactive+Geotechnical+Systems+for+Near-Surface+Geothermal+Energy&period=1&date=2013-01-01
		Bio- and chemo-	

3 June 2013	Institution of Civil Engineers (ICE), London	mechanical processes in geotechnical engineering, Geotechnique symposium in print 2013	http://www.ice.org.uk/ICE_Web_Portal/media/Events/Lyesse-Laloui.pdf
25 November 2013	EPFL	Course - Introduction to the Geomechanical Characterization and Modelling	http://www.eage.org/events/index.php?evp=8875&ActiveMenu=15&Opendivs=s3

Services

Committees

Name	Type	Service	Role	Role in funding allocation
Ferrari, Alessio	external	EAGE International Workshop "Geomechanics and Energy", 26 - 28 November 2013, Lausanne, Switzerland	Committee member and debate moderator	no
Ferrari, Alessio	external	International Society of Soil Mechanics and Geotechnical Engineering ISSMGE	Member of the technical committee TC 308 "Energy Geotechnics"	no
Ferrari, Alessio	external	Géotechnique Symposium in Print 2013 "Bio- and Chemo-Mechanical Processes in Geotechnical Engineering"	Committee member	no
Laloui, Lyesse	external	King Abdulaziz University (KAU), Jeddah, Saudi Arabia	Distinguished Adjunct professor	no
Laloui, Lyesse	external	Geomechanics and Geomaterials – Hermes Science Publishing Limited (WILEY-ISTE, London)	Book Series Editor	no
Laloui, Lyesse	external	Acta Geotechnica: Thermoactive Geotechnical Systems, 201	Guest Editor (Special Issue)	no
Laloui, Lyesse	external	Géotechnique: Symposium in Print – Bio- and Chemo-Mechanical processes in geotechnical engineering: Vol. LXIII N° 2, 2013, Vol. LXIII N° 3, 2013	Guest Editor (Special Issue)	no
Laloui, Lyesse	external	Acta Geotechnica	Member of Editorial Board	no
Laloui, Lyesse	external	Chinese Journal of Geotechnical Engineering	Member of Editorial Board	no
Laloui, Lyesse	external	European Journal of Environmental and Civil Engineering	Member of Editorial Board	no
Laloui, Lyesse	external	Géotechnique	Member of Editorial Board	no
Laloui, Lyesse	external	Journal of Coupled Systems and Multiscale Dynamics	Member of Editorial Board	no
Laloui, Lyesse	external	Environmental Geotechnics	Advisory Board Member	no
Laloui, Lyesse	external		Member of Editorial Board	no

Laloui, Lyesse	external	International Journal for Numerical and Analytical Methods in Geomechanics	Member of Editorial Board	no
Laloui, Lyesse	external	Sixth International Symposium on Deformation Characteristics of Geomaterials Buenos-Aires, Argentina 2015	Member of the International Advisory Committee	no
Laloui, Lyesse	external	VI International Conference on Computational Methods for Coupled Problems in Science and Engineering (COUPLED PROBLEMS 2015), 18 - 20 May 2015, Island of San Servolo, Venice, Italy	Member of the Scientific Committee	no
Laloui, Lyesse	external	48th U.S. Rock Mechanics/Geomechanics Symposium ARMA 2014, University of Minnesota, June 1-4, 2014	Member of the Scientific Advisory Committee	no
Laloui, Lyesse	external	1st International Workshop on the Finite Element Code LAGAMINE, Liège (Belgium), 9-12 September 2013	Member of the international scientific committee	no
Laloui, Lyesse	external	UNSAT2014, Sydney, Australia, July 2-4, 2014	Member of the international scientific committee	no
Laloui, Lyesse	external	IACMAG2014, Kyoto, Japan, September 22-25, 2014	Member of the international scientific committee	no
Laloui, Lyesse	external	4th Canadian Conference on Nonlinear Solid Mechanics, (CanCNSM2013), Montreal, Canada, July 23-26, 2013	Member of the international scientific committee	no
Laloui, Lyesse	external	Y. Ouyang "Geotechnical behavior of energy piles", Ph.D. Dissertation, Cambridge University, 2013	Expert member of the dissertation committee	no
Laloui, Lyesse	external	M. Schwager "Development, analysis and applications of an inclinometer device for earth pressure measurements", Ph.D, Dissertation, ETH Zürich, 2013	Expert member of the dissertation committee	no
Laloui, Lyesse	external	M.E. Suryatriyastuti "Numerical study of the thermo-active piles behavior in cohesionless soils", Ph.D. Dissertation, University of Lille 1, 2013	Expert member of the dissertation committee	no
Laloui, Lyesse	external	G. Preisig "Regional simulations of coupled hydro-mechanical processes in fractured and granular porous aquifer using effective stress-dependent parameters", Ph.D. Dissertation, University of Neuchâtel, 2013	Expert member of the dissertation committee	no
Laloui, Lyesse	external	Vice-Chair of the TC101 "Laboratory Stress Strain Strength - Testing of Geomaterials" of the International Society for Soil Mechanics and Geotechnical Engineering.	Member of the selection committee for the Bishop Lecture	no
Laloui, Lyesse	external	Alliance of Laboratories in Europe for Research and Technology (ALERT-Geomaterials)	Member of the Board of Directors	no
Laloui, Lyesse	EPFL	Civil Engineering Section	Director	no
Laloui, Lyesse	EPFL	Direction of the School of Architecture, Civil and Environmental Engineering (ENAC)	Member	no
Laloui, Lyesse	EPFL	Committee of the Doctoral Program in Mechanics	Member	no
Laloui, Lyesse	external	Faculty Search Committee for position of Full Professor in Deep Geothermal Energy and Geological Reservoirs at EHT Zurich	Member	no
Laloui, Lyesse	EPFL	Faculty Search Committee for position of Full Professor in Rock Mechanics at EPFL	Chairman	no

Vision

Highlights

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Goals

Goals
The LMS activities are designed to promote engineering solutions in the field of the alternative sources of energy, including nuclear waste disposal, geothermal energy and CO₂ sequestration. The LMS activities will continue to cover education, research and technology transfer in the large field of Geomechanics. My vision aims at contributing to a sustainable development of our built and natural environment by addressing selected key questions with the highest possible academic standard, within transdisciplinary internal and international collaborations and through contacts with industry with long-term research focuses. The research activities will focus on problems involving a variable environment and new and advances in existing technologies of energy production. These two areas: environment and energy are expected to dominate technological agenda for forthcoming years. The reason for that is two-fold: first there is world-wide crisis of environment endangerment related to the geosphere: soil and groundwater pollution by accidental spills, CO₂ emission driven reduction of fossil fuel usage and/or inadequate isolation of pollutants, and second there is a host of new sources of energy related to geosphere. In both cases, there is an emerging new fundamental research concerning the effects of chemical, thermal and biological variables on mechanical properties and mechanical variables of soils and shales, and vice versa the effects of mechanical variables as stress, strain, damage affecting chemical and biological, physical or thermal processes and properties that require a multi-disciplinary approach. The levels of these couplings are multiple and often poorly recognized. Especially with nascent technologies related to the energy production it is rational to include the environmental considerations early in the phase of development rather than seek remedies post factum, or after the damage has been induced. This clearly may refer to production of natural gas from shales, the techniques of hydraulic and chemical fracturing, CO₂ sequestration technologies, nuclear waste isolation (long and short term), heat and fuel storage in the underground and under structures, geothermal fluid energy, energy from methane hydrates, oil production from high temperature, high pressure deposits, and many others. Effects of chemical and biological pollution on isolation geo-structures constitute a separate class of problems. Finally, technologies of chemical and biological improvement of mechanical and hydraulic quality of soils and shales involve knowledge and methods based on the same principles. The figure below indicates the link between some of those topics. The intrinsic nature of coupling of chemical, biological, thermal and mechanical properties, variables and fields distinguishes the related problems from those in classical geomechanics. It is believed that continuing and establishing new research activities dedicated to these issues of Energy and Environmental Geomechanics is a great opportunity for LMS and ENAC. Some examples of activities for the coming years would be in the following areas: Geothermal Energy Advanced theoretical, experimental and computational knowledge was developed in the recent years at the LMS for assessing and predicting the behaviour of geomaterials subjected to changes in temperature and at different states of saturation. This state of the art expertise has

been mainly applied in the fields of underground nuclear waste storage as well as the geothermal use of the building foundations. The research activities are now devoted to (i) the enhancement of the understanding of the thermo-hydro-chemical-mechanical behaviour of shales (including gas shales and host rock formations for waste disposal) and bentonites and the prediction of their long term behaviour, and (ii) the development of computational design tools for geo-energy structures.

Several highly sophisticated and unique experimental tools were developed at the lab in the recent three years with an investment of about 1000.- Kfrs (from FNS, EPFL and industry). It is planned to develop the knowledge and the understanding on the behaviour of soils and shales in the light of the extreme loading conditions that the equipment allows. There is a huge room for fundamental research on the running of coupled thermo (until 150°C)–hydro (until 400 MPa of suction)–mechanical (until 30 MPa) testing as well as on the behaviour of the materials in such conditions. I would like also to extend the laboratory facilities serving the research to micro scale observations (i.e. neutron tomography) for a better insight on the fundamental physical mechanism governing the thermo-hydro-mechanical behaviour of the involved materials.

Also an effort will be developed in the area of deep geothermal energy.

Environmental Geomechanics

Efforts will be devoted to maintain the current research activities in the area of multi-physical coupling processes in soils at leading edge of knowledge with expertise in the fundamentals of Soil Mechanics. The developments of early warning systems for large landslides as well as the climate change effects on the soil stability constitute the major applications.

CO2 storage

The financial support of Petrosvibri to the Chair allows the development of a deep knowledge in the area of CO2 storage. Experimental facilities devoted to this topic are developed. Also computational tools at the basin scale will be introduced for the analysis of the various scenarios.

These objectives would help the ENAC to strengthen its research and teaching profile and to play an important national and an international role in the most advanced and strategically important areas of research in Energy and Environmental Geomechanics.

Other

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*Printed 18.06.2014 by **Ferrari, Alessio***