Laboratory of Soil Mechanics – Chair « Gaz Naturel » Petrosvibri

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ÉCOLE POLYTECHNIQUE
FÉDÉRALE DE LAUSANNE

YEARLY REPORT 2014

Soil Mechanics Laboratory - Chair "Gaz naturel" Petrosvibri

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LMS | ACTIVITY REPORT 2014

Courses taught

BA, MA and Doctoral level at EPFL

Spring semester 2014

Teacher(s)	Code	Course title	Section / Semester	Credits	Student number
Laloui, Lyesse **Vulliet**, Laurent	CIVIL-203	Mécanique des sols et écoulements souterrains	GC-BA4	5	150

Fall semester 2014

Teacher(s)	Code	Course title	Section / Semester	Credits	Student number
Tacher, Laurent	CIVIL-403	Géologie de la construction et de l'environnement	GC-MA1, GC-MA3	3	46
Laloui, Lyesse **Koliji**, Azad	CIVIL-402	Géomécanique	GC-MA1, GC-MA3	3	18
Gnansounou, Edgard **Laloui**, Lyesse **Nussbaumer**, Alain **Profs divers**, * **Wienold**, Jan	CIVIL-474	UE génie civil: Construction durable	GC-MA1, GC-MA3	4	61

Additional teaching

Instructor	Course, level, credits, student number	EPFL Lab(s)	Other institution
Ferrari, Alessio	EAGE short course "Introduction to the Geomechanical Characterisation and Modelling", 19 November 2014, Moscow, Russia	**LMS**	EAGE
Ferrari, Alessio	Earthsystem Doctoral School, University of Modena and Reggio Emilia (Italy), "Geomechanical characterization of partially sautéed soils", 6-7 February 2014	**LMS**	
Ferrari, Alessio	Earthsystem Doctoral School, University of Modena and Reggio Emilia (Italy), "Advanced geomechanical modelling applied to landslides", 23-24 June 2014	**LMS**	
Laloui, Lyesse	with Ferrari, Alessio "Introduction to the Geomechanical Characterization and Modelling" EAGE Short Course, Lausanne, 25 November 2013	**LMS**	EAGE

Advising

Student projects (direct link to InfoScience)

Empty category

Semester projects (completed in 2014)

Advisee	Project title	Section-Semester	Tutor(s)	Supervisor(s)	EPFL Lab(s)	Other institution
Del Drago, Filippo Marcello Clemente	Behaviours of soil in CO2 sequestration process	GC-BA6	**Laloui**, Lyesse		**LMS**	
Grangier, Samuel	Testing of remolded shale for the purposes of safe geologic CO2 sequestration	GC-MA3	**Laloui**, Lyesse	**Makhnenko**, Roman	**LMS**	
Grangier, Samuel	Laboratory investigation of geomaterials in the framework of CO2 sequestration	GC-MA1	**Laloui**, Lyesse	**Makhnenko**, Roman	**LMS**	
Jüstrich, Stefan	Analyse et simulation du comportment d'ouvrages souterrains de stockage de déchets nuclaires	GC-MA3	**Laloui**, Lyesse	**Qiao**, Yafei **Bandara**, Samila Sanjeevanie **Ferrari**, Alessio	**LMS**	
Kivell, Samuel James Armstrong	CO2 sequestration storage injectivity and capacity assessment	GC-MA3	**Laloui**, Lyesse	**Li**, Chao	**LMS**	
Kivell, Samuel James Armstrong	From centrifuge tests to numerical simulations: the response of an energy pile foundation	GC-MA2	**Laloui**, Lyesse	**Rotta Loria**, Alessandro	**LMS**	
Montbarbon, Thibaut	Mechanisms of caprock fracturing	GC-MA2	**Laloui**, Lyesse	**Makhnenko**, Roman	**LMS**	
Taha, Hani	Biologically induced change in permeability of sands	GC-MA1	**Laloui**, Lyesse	**Terzis**, Dimitrios	**LMS**	
Wiseman, Camilla Elizabeth Clio Bérengère	Microimaging techniques in characterization of limestone as a possible host rock for CO2 sequestration	CG-MA2	**Laloui**, Lyesse	**Makhnenko**, Roman	**LMS**	

Master diploma projects (completed in spring/fall 2014)

Advisee	Project title	Advisor(s)	Co-advisor(s)	EPFL Lab(s)	Other institution

Advisee	Project title	Advisor(s)	Co-advisor(s)	EPFL Lab(s)	Other institution
Abdelhak, Nicolas Elie	Thermal processes during CO2 geological storage: a dimensionless analysis	**Laloui**, Lyesse		**LMS**	
Chardonnens, Jean-Côme	Effect of changing boundary conditions on cost and time of large infrastructure projects	**Laloui**, Lyesse		**LMS**	

PhD thesis (completed in 2014 or ongoing)

Advisee	Thesis title	Completion year	Advisor(s)	Co-advisor(s)	Other(s)	EPFL Lab(s)	Other institution
Cassini, Etienne André	Coupled Thermo-Hydro-Chemo-Mechanical modeling of bentonite in the context of nuclear waste storage	2017	**Laloui**, Lyesse			**LMS**	
Di Donna, Alice	Thermo-mechanical aspects of energy piles	2014	**Laloui**, Lyesse			**LMS**	
Favero, Valentina	Thermo-Hydro-Mechanical characterization of shales	2015	**Laloui**, Lyesse	**Ferrari**, Alessio		**LMS**	
Gökok, Timur Oscar	Behaviour of geomaterials in contact with CO2 in the framework of carbon sequestration	2017	**Laloui**, Lyesse			**LMS**	
Li, Chao	Multiphase Thermo-Hydro-Mechanical Processes induced by CO2 injection into deep saline aquifers	2015	**Laloui**, Lyesse			**LMS**	
Manca, Donatella	Gas flow propagation and related Chemo-Hydro-Mechanical response of sand bentonite mixture	2015	**Laloui**, Lyesse	**Ferrari**, Alessio		**LMS**	
Mimouni, Thomas	Thermomechanical Characterization of Energy Geostructures with Emphasis on Energy Piles	2014	**Laloui**, Lyesse			**LMS**	
Minardi, Alberto	Gas testings in shales	2017	**Laloui**, Lyesse	**Ferrari**, Alessio		**LMS**	

Advisee	Thesis title	Completion year	Advisor(s)	Co-advisor(s)	Other(s)	EPFL Lab(s)	Other institution
Parisio, Francesco	Hydro-mechanical damage model for anisotropic shales (Opalinus Clay): Constitutive modelling and numerical	2015	**Laloui**, Lyesse			**LMS**	
Qiao, Yafei		2016		**Laloui**, Lyesse		**LMS**	Tongi University, Shanghai
Rotta Loria, Alessandro	On the geo-structural behaviour of thermo-active pile groups under mechanical and thermal cyclic actions	2017	**Laloui**, Lyesse			**LMS**	
Seiphoori, Ali	Thermo-hydro-mechanical characterisation and modelling of MX-80 granular bentonite	2014	**Laloui**, Lyesse	**Ferrari**, Alessio		**LMS**	
Terzis, Dimitrios	Geomechanical constitutive model for bio--improved soils	2017	**Laloui**, Lyesse			**LMS**	

Postdoc works (completed in 2014 or ongoing)

Advisee	Research topic	Completion year	Supervisor(s)	EPFL Lab(s)	Other institution
Bandara, Samila Sanjeevanie	Material Point Method geomechanical applications	2014	**Laloui**, Lyesse	**LMS**	
Makhnenko, Roman	Reservoir Modelling and Validation in Geo-Energies		**Laloui**, Lyesse	**LMS**	
Samat, Sergio Luis	THM-Modelling of the FE Experiment as part of de FE-Modelling Task Force	2014	**Laloui**, Lyesse	**LMS**	
Vilarrasa Riano, Victor	Coupled THM analysis of CO2 storage in deep saline formations		**Laloui**, Lyesse	**LMS**	

Other

Advisee	Work topic	Completion year	Supervisor(s)	EPFL Lab(s)	Other institution
Batini, Niccolò	Energy and geotechnical performance of thermo-active piles, visiting master student	2014	**Rotta Loria**, Alessandro	**LMS**	University of Pisa (Italy)

Advisee	Work topic	Completion year	Supervisor(s)	EPFL Lab(s)	Other institution
Billot, Juliette	Testing quartz properties for the characterization of cap rock response, visiting bachelor student	2014	**Makhnenko**, Roman	**LMS**	École des ponts ParisTech, France
Bontorin, Jacopo	Investigations on the chemo-mechanical behavior of shales, visiting master student	2014	**Ferrari**, Alessio	**LMS**	University of Padua (Italy)
Boucharouit, Hicham	Influence of water content on the mechanical behavior of shales, visiting bachelor student	2014	**Minardi**, Alberto	**LMS**	École des ponts ParisTech, France
Brede, Swann	2nd year apprentice, laborant en physique	2016	**Dubey**, Patrick	**LMS**	
Collombin, Maxime Sylvain	Civiliste	2014	**Dubey**, Patrick	**LMS**	
Cousin, Benoît Claude Henri	Experimental characterization of an 80/20 sand/bentonite mixture - Laboratory assistanship	2014	**Manca**, Donatella	**LMS**	
Crisci, Eleonora	"Hydro-mechanical behaviour of volcanic ashes", visiting master student	2014	**Ferrari**, Alessio	**LMS**	Università di Napoli Federico II (Italy)
Grangier, Samuel	MS pre-study "Glissement-coulée de Pont-Bourquin (CH): analyse du comportement hydromécanique de l'instabilité et des risques associés"	2014	**Laloui**, Lyesse **Ferrari**, Alessio	**LMS**	
Nessi, Jonas Jérémy	Civiliste	2014	**Dubey**, Patrick **Gruaz**, Gilbert	**LMS**	
Nocera, Julien Wahid	4th year apprentice, laborant en physique	2014	**Gruaz**, Gilbert	**LMS**	
Pasquier, Bastien	3rd year apprentice, laborant en physique	2015	**Gruaz**, Gilbert	**LMS**	
Puech, Valentin	Experimental investigations on the thermo-chemo-mechanical behavior of shales, visiting bachelor student	2014	**Favero**, Valentina	**LMS**	École des ponts ParisTech, France
Robert, Guillaume Noël Jérôme	CO2 sequestration storage injectivity and capacity assessment from a thermo-chemo-hydro-mechanical perspective, visiting master student	2014	**Li**, Chao	**LMS**	Ecole Nationale des Travaux Publics de l'Etat, France

Advisee	Work topic	Completion year	Supervisor(s)	EPFL Lab(s)	Other institution
Wiseman, Camilla Elizabeth Clio Bérengère	MS pre-study: Experimental assessment of host rock response due to CO2 injection	2014	**Laloui**, Lyesse **Makhnenko**, Roman	**LMS**	

Research

Funded and submitted research projects

Project Title	Principal Investigator	Co-applicant	Funding Source	Amount (CHF)	Start Date	Duration (Months)	Status
PhD thesis Advanced Opalinus Clay	LALOUI Lyesse		TTO - recherche ind.	0 out of 0	12.12.2014		Pending
GTS Phase VI - GAST Forge Project Phase II	LALOUI Lyesse		TTO - recherche ind.	0 out of 0	14.11.2014		Pending
Novel methodologies to avoid felt seismic events induced by geologic carbon storage: a thermo-hydro-mechanical-chemical approach	Vilarrasa Victor		FNS-Ambizione	483,727 out of 483,727	11.11.2014		Pending
Thermo-mechanical performance of energy piles group	LALOUI Lyesse		FNS-Basic research	209,995 out of 209,995	01.10.2014		Pending
FRAC^3 - Fracking, Fracture Mechanics and Fractals	LALOUI Lyesse		Excellent Science	210,504 out of 311,471	11.09.2014		Pending
Advanced studies of the Structure and Safety of High Level Waste storage in deep geological formations	LALOUI Lyesse		Industrial grants	319,000 out of 319,000	03.09.2014		Pending
X-ray CT imaging / High resolution X-ray radioscopy and computed tomography system for geomaterials	LALOUI Lyesse		FNS-R'Equip	430,000 out of 430,000	14.05.2014		Pending
CIXE - ENAC Interdisciplinary centre for X-ray CT imaging	LALOUI Lyesse		VPAA-DAR	860,000 out of 860,000	31.01.2014		Pending
Publication « Eaux souterraines et changements climatiques »	LALOUI Lyesse	Tacher Laurent	Divers Confédération	8,000 out of 8,000	01.12.2014	6	Granted
CAPROCK_Evaluation expérimentale de la géomécanique de la séquestration profonde du dioxyde de carbone	LALOUI Lyesse	Makhnenko Roman	Divers Confédération	103,000 out of 103,000	01.12.2014	32	Granted
SoE - Supply of Electricity	Giardini Domenico	Perona Paolo; AVELLAN François; LALOUI Lyesse;	CTI / KTI	206,250 out of 15,486,000	01.11.2013	38	Granted

Project Title	Principal Investigator	Co-applicant	Funding Source	Amount (CHF)	Start Date	Duration (Months)	Status
		Lehning Michael; SCHLEISS ANTON					
Hydro-mechanical damage model for anisotropic shales (Opalinus Clay): Constitutive modelling and numerical implementation	LALOUI Lyesse		Divers Confédération	210,000 out of 210,000	01.02.2013	36	Ongoing
Geothermal Reservoir Processes: Towards the implementation of research into the crea- tion and sustainable use of Enhanced Geothermal Systems	Maréchal François	LALOUI Lyesse	ETH Domain	30,000 out of 2,027,000	01.02.2013	36	Ongoing
GRETEL II ? Geotechnical REliability of Thermo-piles Energy storage in soiLs	LALOUI Lyesse		Divers Confédération	20,000 out of 20,000	15.10.2012	24	Ongoing
GOALI : Long-Term Thermo-Mechanical Performance and Group Effect Considerations for Design of Energy Piles	Olgun Guney	LALOUI Lyesse	US NSF	13,155 out of 498,931	01.07.2011	36	Ongoing
Optimized and reliable heat exchanger pile systems	LALOUI Lyesse		Divers Confédération	273,370 out of 237,000	01.01.2010	54	Ongoing

Funded equipments

Empty category

Awards

Awardee	Name of prize / Competition	Place / Organization	Award description / URL
Laloui, Lyesse	12th G.A. Leonards Lecture	University of Purdue, USA	http://memento.epfl.ch/event/12th-gerald-a-leonards-lecture-2/

Research facilities

Empty category

Publications & Presentations

Books (direct link to InfoScience)

Data	Key	Comments / Explanation
Editor(s): Laloui, Lyesse ; ***Bio- and Chemo-Mechanical Processes in Geotechnical Engineering***, ICE Publishing, 9780727760531, 2014.		
Editor(s): Laloui, Lyesse ; ***Bio- and Chemo- Mechanical Processes in Geotechnical Engineering***, ICE Publishing, London, 9780727760531, 2014.		
Laloui, Lyesse; **Di Donna, Alice**; *Editor(s): Laloui, Lyesse* ; *Di Donna, Alice* ; ***Géostructures énergétiques***, Hermes Science Publications, Paris, 978-2-7462-4577-8, 2014.		

Book Chapters (direct link to InfoScience)

Data	Key	Comments / Explanation
Witteveen, Paul; **Ferrari, Alessio**; **Laloui, Lyesse**; ***An experimental and constitutive investigation on the chemo-mechanical behaviour of a clay***, in Bio- and Chemo- Mechanical Processes in Geotechnical Engineering, p.32-43, 2014.		
fern, james; **eichenberger, John**; **ferrari, alessio**; **Laloui, Lyesse**; ***One-dimensional transient analysis of rainfall infiltration in unsaturated volcanic ash***, in Recent advances in modelling landslides and debris flows, p.107-118, 2014.		
Ferrari, Alessio; **Quan Luna, Byron**; **Spikerman, Anke**; **Travelletti, Julien**; **Krzeminska, Dominika**; **Eichenberger, John**; **van Asch, Theo**; **van Beek, Rens**; **Bogaard, Thom**; **Malet, Jean-Philippe**; **Laloui, Lyesse**; ***Techniques for the Modelling of the Process Systems in Slow and Fast-Moving Landslides***, in Mountain Risks: From Prediction to Management and Governance, p.83-129, 2014.		

Journal articles (direct link to InfoScience)

Data	Peer reviewed	Key	Comments / Explanation
Katzenbach, R.; **Olgun, C. G.**; **Loveridge, F. A.**; **Sutman, M.**; **Bowers, G. A.**; **McCartney, J. S.**; **Laloui, Lyesse**; **Mimouni, Thomas**; **Dupray, Fabrice**; **Spitler, J. D.**; **Clauss, F.**; **Meyer, L. L.**; **Akrouch, G.**; ***New technologies and applications: materials and equipment in near surface geothermal systems***, in DFI Journal: The Journal of the Deep Foundations Institute, vol. 8, num. 2, p.97-107, 2014.	✓		

Data	Peer reviewed	Key	Comments / Explanation
Laloui, Lyesse; **Olgun, C.G.**; **Sutman, M.**; **McCartney, J.S.**; **Coccia, C.J.**; **AbuelNaga, H.M.**; **Bowers, G.A.**; ***Issues involved with thermoactive geotechnical systems: characterization of thermomechanical soil behavior and soil-structure interface behaviour***, in DFI Journal: The Journal of the Deep Foundations Institute, vol. 8, num. 2, p.108-120, 2014.	✓		
Keller, Lukas M.; **Seiphoori, Ali**; **Gasser, Philippe**; **Lucas, Falk**; **Holzer, Lorenz**; **Ferrari, Alessio**; ***The Pore Structure Of Compacted And Partly Saturated Mx-80 Bentonite At Different Dry Densities***, in Clays And Clay Minerals, vol. 62, num. 3-4, p.174-187, 2014.	✓		
di donna, Alice; **Laloui, Lyesse**; ***Numerical analysis of the geotechnical behaviour of energy piles***, in International Journal for Numerical and Analytical Methods in Geomechanics, 2014.	✓		
Hueckel, Tomasz; **Mielniczuk, Boleslaw**; **El Youssoufi, Moulay S.**; **Hu, Liang B.**; **Laloui, Lyesse**; ***A three-scale cracking criterion for drying soils***, in Acta Geophysica, vol. 62, num. 5, p.1049-1059, 2014.	✓		
Ng, WWC; **Shi, C.**; **Gunawan, A.**; **Laloui, Lyesse**; ***Centrifuge modelling of energy piles subjected to heating and cooling cycles in clay***, in Geotechnique letters, vol. 4, p.310-316, 2014.	✓		
Ferrari, Alessio; **Favero, Valentina**; **Marschall, Paul**; **Laloui, Lyesse**; ***Experimental analysis of the water retention behaviour of shales***, in International Journal of Rock Mechanics and Mining Sciences, vol. 72, p.61-70, 2014.	✓		
Seiphoori, Ali; **Ferrari, Alessio**; **Laloui, Lyesse**; ***Water retention behaviour and microstructural evolution of MX-80 granular bentonite during wetting and drying cycles***, in Geotechnique, vol. 64, num. 9, p.721-734, 2014.	✓		
Abe, Keita; **Soga, Kenichi**; **Bandara, Samila**; ***Material Point Method for Coupled Hydromechanical Problems***, in Journal Of Geotechnical And Geoenvironmental Engineering, vol. 140, num. 3, 2014.	✓		
Mimouni, Thomas; **dupray, fabrice**; **Laloui, Lyesse**; ***Estimating the geothermal potential of heat exchanger anchors on a cut and cover tunnel***, in Geothermics, vol. 51, p.380-387, 2014.	✓		
Senger, Rainer; **Romero, Enrique**; **Ferrari, Alessio**; **Marschall, Paul**; ***Characterization of gas flow through low-permeability claystone: laboratory***	✓		

Data	Peer reviewed	Key	Comments / Explanation
experiments and two-phase flow analyses, in Geological Society Special Publications, vol. 400, p.531-543, 2014.			
Dupray, Fabrice; **Li, Chao**; **Laloui, Lyesse**; ***Heat-exchanger piles for the de-icing of bridges***, in Acta Geotechnica -Springer Verlag-, vol. 9, num. 3, p.413-423, 2014.	✓		
Ferrari, Alessio; **Seiphoori, Ali**; **Rüedi, Jörg**; **Laloui, Lyesse**; ***Shot-clay MX-80 bentonite: an assessment of the hydro-mechanical behaviour***, in Engineering Geology -Amsterdam-, vol. 173, p.10-18, 2014.	✓		
Dupray, Fabrice; **Laloui, Lyesse**; **Kazangba, Albin**; ***Numerical analysis of seasonal heat storage in an energy pile foundation***, in Computers and Geotechnics, vol. 55, p.67-77, 2014.	✓		
Mimouni, Thomas; **Laloui, Lyesse**; ***Towards a secure basis for the design of geothermal piles***, in Acta Geotechnica -Springer Verlag-, vol. 9, num. 3, p.355-366, 2014.	✓		

Conference papers (direct link to InfoScience)

Data	Peer reviewed	Key	Comments / Explanation
Sanavia, L.; **Bonetto, A.**; **Laloui, Lyesse**; *Editor(s): Onate, E* ; *Oliver, X* ; *Huerta, A* ; ***Multi-Physics Modelling Of The Consolidation Processes In Variably Saturated Elasto-Plastic Soils Due To High-Temperature***, [u'11th World Congress on Computational Mechanics (WCCM) / 5th European Conference on Computational Mechanics (ECCM) / 6th European Conference on Computational Fluid Dynamics (ECFD)', u'11th World Congress on Computational Mechanics (WCCM) / 5th European Conference on Computational Mechanics (ECCM) / 6th European Conference on Computational Fluid Dynamics (ECFD)'],	✓		
Salager, S.; **Nuth, M.**; **Ferrari, A.**; **Laloui, L.**; *Editor(s): Khalili, N* ; *Russell, Ar* ; *Khoshghalb, A* ; ***Water retention behavior of deformable soils-experiment and modeling***, [u'6th International Conference on Unsaturated Soils (UNSAT)', u'6th International Conference on Unsaturated Soils (UNSAT)'],	✓		
Bista, H.; **Hu, L. B.**; **Mielniczuk, B.**; **El Youssoufi, M. S.**; **Laloui, L.**; **Hueckel, T.**; *Editor(s): Khalili, N* ; *Russell, Ar* ; *Khoshghalb, A* ; ***Multi-scale study of***	✓		

Data	Peer reviewed	Key	Comments / Explanation
desiccation shrinkage in granular soils, 6th International Conference on Unsaturated Soils (UNSAT)', 6th International Conference on Unsaturated Soils (UNSAT)'],			
Laloui, Lyesse; **Li, Chao**; ***Hydromechanical coupling in CO2 geological injection processes***, 7th international congress on environmental geotechnics, Melbourne, Nov. 11-14, 2014,			
Li, Chao; **Barès, Li**; **Laloui, Lyesse**; ***Coupled semi-analytical approach of CO2 injection induced caprock deflection***, 14th International Conference on Computer Methods and Advances in Geomechanics, Kyoto, Japan, 22-25 September 2014,			
Li, Chao; **Barès, P.**; **Laloui, Lyesse**; ***Coupled Approach to Assess Caprock Deformation Caused by CO2 Injection***, GeoShanghai International Conference, Shanghai, China, 26-28 May 2014,	✓		
Hu, L. B.; **Bista, H.**; **Mielniczuk, B.**; **Laloui, L.**; **Hueckel, T.**; **El Youssoufi, M. S.**; ***Multi-Scale Approach for Modeling Desiccation Shrinkage in Granular Soils***, GeoShanghai International Conference, Shanghai, China, 26-28 May 2014,	✓		
Favero, Valentina; **Ferrari, Alessio**; **Laloui, Lyesse**; ***On the Fluid Retention Properties of Shales***, GeoShanghai International Conference, Shanghai, China, 26-28 May 2014,	✓		
Ferrari, Alessio; **Seiphoori, Ali**; **Laloui, Lyesse**; ***Pore structure evolution of compacted granular bentonite during wetting and drying cycles***, The 6th International Conference on Porous Media and Annual Meeting of the International Society of Porous Media, Milwaukee, USA, 27-30 May 2014,	✓		
Makhnenko, Roman; **Labuz, Joseph**; **Laloui, Lyesse**; ***Poroelastic behavior of Calcarenite for the purposes of geologic CO2 storage***, The 6th International Conference on Porous Media and Annual Meeting of the International Society of Porous Media, Milwaukee, USA, 27-30 May 2014,	✓		
Makhnenko, R. Y.; **Labuz, J. F.**; ***Calcarenite as a possible host rock for CO2 sequestration***, 48th US Rock Mechanics/Geomechanics Symposium, Minneapolis, USA, 1-4 June 2014,			
Favero, Valentina; **Ferrari, Alessio**; **Laloui, Lyesse**; ***On the water retention behaviour of shales***, 48th US Rock Mechanics/Geomechanics Symposium,	✓		

Data	Peer reviewed	Key	Comments / Explanation
Minneapolis, USA, 1-4 June 2014,			
Parisio, Francesco; **Samat, Sergio**; **Laloui, Lyesse**; ***An elasto-plastic-damage model for quasi-brittle shales***, 48th US Rock Mechanics/Geomechanics Symposium, Minneapolis, USA, 1-4 June 2014,	✓		
Favero, Valentina; **Ferrari, Alessio**; **Laloui, Lyesse**; ***Water retention behaviour of shales***, Fourth EAGE Shale Workshop, Porto, Portugal, April 7-9, 2014,	✓		
Seiphoori, Ali; **Ferrari, Alessio**; **Laloui, Lyesse**; ***An insight into the microstructural evolutions of MX-80 bentonite during wetting/drying cycles***, International Conference on the Performance of Engineered Barriers: Backfill, Plugs & Seals, Hannover, Germany, Feb 6-7, 2014,	✓		

Presentations & Talks (direct link to InfoScience)

Data	Key	Comments / Explanation
Mimouni, Thomas; **Laloui, Lyesse**; ***Pieux géothermiques, test au Swiss Tech Convention Center***, Congrès de la SUVA, Swiss Tech Convetion Center, Lausanne, Suisse, 7 mai 2014, 2014.		
Giger, Silvio; **Marschall, Paul**; **Laloui, Lyesse**; **Ferrari, Alessio**; **Favero, Valentina**; ***Overview of geomechanical test results from Opalinus Clay core samples***, Rock Mechanics and Rock Engineering of Geological Repositories in Opalinus Clay and Similar Claystones, ETH Zurich, Friday, 14 February 2014, 2014.		

Theses (direct link to InfoScience)

Data	Key	Comments / Explanation
Mimouni, Thomas; *Advisor(s): Laloui, Lyesse* ; ***Thermomechanical Characterization of Energy Geostructures with Emphasis on Energy Piles***, Thèse EPFL, n° 6452 (2014).		
Di Donna, Alice; *Advisor(s): Laloui, Lyesse* ; ***Thermo-mechanical aspects of energy piles***, Thèse EPFL, n° 6145 (2014).		
Seiphoori, Ali; *Advisor(s): Laloui, Lyesse* ; *Ferrari, Alessio* ; ***Thermo-hydro-mechanical characterisation and modelling of MX-80 granular bentonite***, Thèse EPFL, n° 6159 (2014).		

Outreach

Current ongoing collaborations

Partner type	Partner(s)	Responsible	Project topic/Description, Financial support (CHF) if any
Industry & Private sector	GazNAt	**Ferrari**, Alessio	Effects of the depth of urban pipelines on the behaviour of a rupture event
Industry & Private sector	Sinopec	**Laloui**, Lyesse	Geomechanics for uncoventional energy sources
Industry & Private sector	Sharc II consortium	**Laloui**, Lyesse	Advanced testing and modelling of shales
Governmental agencies	SWISSTOPO	**Laloui**, Lyesse	Hydro-mechanical modelling of the Opalinus Clay in Mont Terri
Industry & Private sector	NAGRA	**Laloui**, Lyesse	Experimental and constitutive analysis of the Opalinus Clay shale

Innovation

Empty category

Distinguished work

Empty category

Appointments at other institutions

Name	Title	Institution
Ferrari, Alessio	Visiting Professor	University of Modena and Reggio Emilia (Italy)
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
Bourne-Weeb, Peter	Technical University of Lisbon	27-28 March 2014, CIVIL ENGINEERING SEMINAR SERIES on "Understanding energy foundations"
Hueckel, Thomas	Duke University	10-19 July 2014
Klubertanz, Georg	Eidgenössisches Institut für Geistiges Eigentum, Berne	
Mogilevskaya, Sonia	University of Minnesota, USA	Seminar "Lost in Translation: Crack Problems in Different Languages" 16 April 2014
Murad, Marcio	National Laboratory for Scientific Computing LNCC/MCTI	Prof. Murad gave tow seminars, on 16 September 2014 " A New Class of Locally Conservative Numerical Schemes for Coupling Multiphase Flows and Reservoir Geomechanics", on 17 September 2014 "A New Multi-scale Computational Model for Flow and

Visitor	Home Institution	Aim of visit, Duration
		Transport in Shale Gas Reservoirs"

Alumni

Alumnus	Level	First position out of lab	Country	Sector of activity
Cekerevac, Cane	PhD	Stucky SA	Switzerland	Industry
Di Donna, Alice	PhD	Teknema Progetti s.r.l. and Turin University	Italy	Industry | Academia
Dupray, Fabrice	Post doc	De Cérenville Géotechnique	Switzerland	Industry
Eichenberger, John	PhD	Stucky Ltd	Switzerland	Industry
Fauriel, Suzanne	PhD	CSD Engineers	Switzerland	Industry
François, Bertrand	Post doc	Université de Liège	Belgium	
Geiser, Françoise	PhD	GeoMod & De Cérenville	Switzerland	
Klubertanz, Georg	PhD	Emch+Berger AG	Switzerland	
Koliji, Azad	Post doc	Swiss Institute of Technology Lausanne & Stucky LTD	Switzerland	Industry | Academia
Mayoraz, Frédérioc	PhD	De Cérenville Géotechnique	Switzerland	Industry
Nuth, Mathieu	Post doc	Sherbrooke University	Canada	Academia
Obrzud, Rafal Filip	PhD	GeoMod & BG	Switzerland	Industry
Péron, Hervé	PhD	CSD Ingénieurs SA	Switzerland	Industry
Rascol, Emilie	PhD	Bureau Tissières SA	Switzerland	Industry
Salager, Simon	PhD	Joseph Fourier Univesrity	France	Industry
Seiphoori, Ali	PhD	Massachusetts Institute of Technology (MIT)	US	Academia

Distinguished alumni

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Events

Date / period	Venue	Title	Description / URL
22 November 2014	Fribourg (CH)	Symposia session "Geothermal Energy, CO2 Sequestration and Shale Gas"	http://memento.epfl.ch/event/12th-swiss-geoscience-meeting-4/
1 June 2014	University of Minnesota	Multiphysical geomechancis	Short course at the ARMA 2014 symposium organised by Prof. Lyesse Laloui and Dr. Alessio Ferrari

Services

EPFL committees and services

Name	Service	Role	Role in funding allocation
Laloui, Lyesse	Civil Engineering Section	Director	no
Laloui, Lyesse	Direction of the School of Architecture, Civil and Environmental Engineering (ENAC)	Member	no
Laloui, Lyesse	Committee of the Doctoral Program in Mechanics	Member	no
Laloui, Lyesse	Faculty Search Committee for position of Full Professor in Rock Mechanics at EPFL	Chairman	no
Laloui, Lyesse	Faculty search committee for position of professor in Geo-Energy at EPFL	Chairman	no
Laloui, Lyesse	Faculty search committee for position of Professor in Structures & Materials	Member	no
Laloui, Lyesse	Faculty search committee Professor position in “Renewable Energy in Buildings”	Member	no
Laloui, Lyesse	ENAC Academic Promotion Comittee CPA	Member	no

Other committees and services (national including the EPF domain, international...)

Name	Service	Role	Role in funding allocation
Ferrari, Alessio	International Society of Soil Mechanics and Geotechnical Engineering ISSMGE	Member of the technical committee TC 308 “Energy Geotechnics”	no
Laloui, Lyesse	Geomechanics and Geomaterials – Hermes Science Publishing Limited (WILEY-ISTE, London)	Book Series Editor	no
Laloui, Lyesse	Acta Geotechnica: Thermoactive Geotechnical Systems, 2014	Guest Editor (Special Issue)	no
Laloui, Lyesse	Acta Geotechnica	Member of Editorial Board	no
Laloui, Lyesse	Chinese Journal of Geotechnical Engineering	Member of Editorial Board	no
Laloui, Lyesse	European Journal of Environmental and Civil Engineering	Member of Editorial Board	no
Laloui, Lyesse	Journal of Coupled Systems and Multiscale Dynamics	Member of Editorial Board	no

Name	Service	Role	Role in funding allocation
Laloui, Lyesse	Environmental Geotechnics	Advisory Board Member	no
Laloui, Lyesse	International Journal for Numerical and Analytical Methods in Geomechanics	Member of Editorial Board	no
Laloui, Lyesse	Sixth International Symposium on Deformation Characteristics of Geomaterials Buenos-Aires, Argentina 2015	Member of the International Advisory Committee	no
Laloui, Lyesse	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	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	UNSAT2014, Sydney, Australia, July 2-4, 2014	Member of the international scientific committee	no
Laloui, Lyesse	IACMAG2014, Kyoto, Japan, September 22-25, 2014	Member of the international scientific committee	no
Laloui, Lyesse	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	Alliance of Laboratories in Europe for Research and Technology (ALERT-Geomaterials)	Member of the Board of Directors	no
Laloui, Lyesse	Faculty Search Committee for position of Full Professor in Geotechnical Engineering at EHT Zurich	Member	no
Laloui, Lyesse	EU-ERC Consolidator Grants panel dealing with Products and Processes Engineering	Member	yes
Laloui, Lyesse	TC101 “Laboratory Stress Strain Strength - Testing of Geomaterials” of the International Society for Soil Mechanics and Geotechnical Engineering	Vice-Chair	no
Laloui, Lyesse	International journal Geomechanics for Energy and the Environment	Editor-in-Chief	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.

Goals

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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