

LMS | ACTIVITY REPORT 2017

Courses taught

BA, MA and Doctoral level at EPFL

The column "Credits / Coeff." indicates Coefficient for first-year students (BA1-2), Credits for the others

Spring semester 2017

Teacher(s)	Code	Course title	Section-Semester / Coeff.	Credits	Student number
Laloui , Lyesse (LMS); Bernier-Latmani , Rizlan (EML); Ferrer Rizzo , Ignacio (SUB); Ferrari , Alessio (LMS); Perrault , Dominique (SUB); Fernandez Andrino , Juan (SUB); Nguyen , Richard (SUB)	PENS-211	Terra Epidermis	ENAC-BA4	4	25
Vulliet , Laurent (LMS)	CIVIL-203	Mécanique des sols et écoulements souterrains	GC-BA4	5	55
Laloui , Lyesse (LMS)	CIVIL-444	Energy geostructures	GC-MA2, GC-MA4	2	21
Laloui , Lyesse (LMS); Ferrari , Alessio (LMS)	CIVIL-530	Slope stability	GC-MA2, GC-MA4	3	32

Fall semester 2017

Teacher(s)	Code	Course title	Section-Semester / Coeff.	Credits	Student number
Vulliet , Laurent (LMS); Defert , Raphaël (SGC-ENS)	CIVIL-438	Analyse et gestion de risques	GC-MA1, GC-MA3	3	55
Tacher , Laurent (SGC-ENS)	CIVIL-403	Géologie de la construction et de l'environnement	GC-MA1, GC-MA3	3	78
Laloui , Lyesse (LMS); Koliji , Azad (SGC-ENS)	CIVIL-402	Geomechanics	GC-MA1, GC-MA3	3	83

Additional teaching

Empty category

Advising

Postdoc works (completed in 2017 or ongoing)

Advisee	Research topic	Starting (month/year)	End, if known (month/year)	Supervisor(s)	Institution(s) involved (if not EPFL)	Additional information on external institution(s) involved
Arroyo Chávez, Hiram	Constitutive modelling of unsaturated soils to predict cracking phenomena	08/2016	07/2017	Laloui, Lyesse (LMS)		
Baryla, Patrycja Ewelina (LMS)	Laboratory investigations of the influence of granulation and compaction method on HM characteristic of granular bentonite	12/2017		Laloui, Lyesse (LMS); Ferrari, Alessio (LMS)		
Dieudonné, Anne-Catherine (LMS)	Numerical modelling of geological disposal for nuclear waste	12/2015	04/2017	Laloui, Lyesse (LMS)		
Favero, Valentina (LMS)	CO2 sequestration in the context of the SCCER-SoE	04/2017	09/2017	Laloui, Lyesse (LMS)		
Li, Chao (LMS)	THM coupled modelling of barriers for nuclear waste disposal	07/2016	06/2017	Laloui, Lyesse (LMS)		
Madaschi, Aldo (LMS)	Modelling activities on buffer and host rock materials for High Level Waste geologic repositories	10/2016		Laloui, Lyesse (LMS)		
Sutman, Melis (LMS)	Experimental and numerical investigation of thermo-active piles	10/2016		Laloui, Lyesse (LMS)		
Terzis, Dimitrios (LMS)	Bio-cemented soils	11/2017		Laloui, Lyesse (LMS)		

PhD thesis (completed in 2017 or ongoing)

Advisee	Thesis title	Doctoral Program	Completion year	Advisor(s)	Co-advisor(s)	Other(s)	Institution(s) involved (if not EPFL)	Additional information on external institution(s) involved
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Advisee	Thesis title	Doctoral Program	Completion year	Advisor(s)	Co-advisor(s)	Other(s)	Institution(s) involved (if not EPFL)	Additional information on external institution(s) involved
Bocco, Matteo (LMS)	THCM modeling of CO2 injection in deep geological formations	EDME	2020	Laloui, Lyesse (LMS)				
Bosch Llufriu, Jose Antonio (LMS)	Constitutive modelling of active soils under environmental actions	EDME		Laloui, Lyesse (LMS)	Ferrari, Alessio (LMS)			
Cassini, Etienne André (LMS)	Coupled Thermo-Hydro-Chemo-Mechanical modeling of bentonite in the context of nuclear waste storage	EDME	2017	Laloui, Lyesse (LMS)				
Crisci, Eleonora (LMS)	Advanced constitutive law for Opalinus Clay	EDME	2019	Laloui, Lyesse (LMS)	Ferrari, Alessio (LMS)			
Favero, Valentina (LMS)	Multiphysical behaviour of shales from Northern Switzerland	EDME	2017	Laloui, Lyesse (LMS)	Ferrari, Alessio (LMS)			
Fryer, Barnaby Padraig (LMS)	Hazard and Risk Assessment of Large Seismic Events Owing to Fluid Injection	EDME		Laloui, Lyesse (LMS)	Siddiqi, Gunter (EDME-ENS)			
Garbellini, Cristiano (LMS)	Soil-structure interaction in the context of piled-raft foundations with groups of energy piles	EDME	2020	Laloui, Lyesse (LMS)				
Grangier, Samuel (LMS)	Effect of desiccation cracks on the stability of slopes	EDME	2019	Laloui, Lyesse (LMS)				

Advisee	Thesis title	Doctoral Program	Completion year	Advisor(s)	Co-advisor(s)	Other(s)	Institution(s) involved (if not EPFL)	Additional information on external institution(s) involved
Minardi, Alberto (LMS)	Gas testings in shales	EDME	2017	Laloui, Lyesse (LMS)	Ferrari, Alessio (LMS)			
Ravera, Elena (LMS)	Cyclic thermo-mechanical behaviour of energy piles	EDME		Laloui, Lyesse (LMS)				
Rotta Loria, Alessandro Francesco (LMS)	On the geo-structural behaviour of thermo-active pile groups under mechanical and thermal cyclic actions	EDME	2017	Laloui, Lyesse (LMS)				
Speranza, Gianluca (LMS)	Methods for carbon footprint assessment of geostructures	EDME	2020	Laloui, Lyesse (LMS)	Ferrari, Alessio (LMS)			
Tadlaoui, Houda (LMS)	Experimental characterisation of mechanical properties and sealing capacity of shales for CO2 storage	EDME	2020	Laloui, Lyesse (LMS)	Ferrari, Alessio (LMS)			
Terzis, Dimitrios (LMS)	Geomechanical constitutive model for bio--improved soils	EDME	2017	Laloui, Lyesse (LMS)				
Tuttolomondo, Angelica (LMS)	Constitutive and numerical modeling of the coupled thermo-hydro-chemo-mechanical behaviour of shales	EDME	2019	Laloui, Lyesse (LMS)	Ferrari, Alessio (LMS)			
Zannin, Jacopo (LMS)	Shallow geothermal energy for renovated civil engineering	EDME	2019	Laloui, Lyesse (LMS)	Ferrari, Alessio (LMS)			

Advisee	Thesis title	Doctoral Program	Completion year	Advisor(s)	Co-advisor(s)	Other(s)	Institution(s) involved (if not EPFL)	Additional information on external institution(s) involved
	structures: a geomechanical and environmental approach							

Master diploma projects in Civil Engineering, Environmental Engineering and other programs (completed in spring 2017)

Advisee(s)	Project title	Section-Semester	Advisor(s)	Co-advisor(s)	Institution(s) involved (if not EPFL)	Additional information on external institution(s) involved
Achich , Aymen (GC-PMH)	Deck de icing using energy piles	GC-PMH	Laloui , Lyesse (LMS)			
Denis Du Peage , Victoire Francoise Jacqueline Marie (GC-PME)	Exploring mechanisms leading to large induced seismic events during hydraulic stimulations in Engineered Geothermal Systems (EGS) and Hydrocarbon Extraction	GC-PME	Laloui , Lyesse (LMS)			
Duparc , Thibaut (GC-PME)	Etude géotechnique de l'extension d'une station de métro existante, avec ouvrages géothermiques	GC-PME	Laloui , Lyesse (LMS)			
Hartmann , Pia Stephanie (GC-PME)	Etude géotechnique des travaux spéciaux d'un complexe immobilier	GC-PME	Laloui , Lyesse (LMS)			
Kaufmann , Lea Tabea (GC-PME)	Etude de stabilité de fonds et enceintes de fouille	GC-PME	Laloui , Lyesse (LMS)			
Moser , Etienne (GC-PME)	Etude géotechnique de l'enceinte de fouille du portail Est du tunnel de Loveresse	GC-PME	Laloui , Lyesse (LMS)			

Advisee(s)	Project title	Section-Semester	Advisor(s)	Co-advisor(s)	Institution(s) involved (if not EPFL)	Additional information on external institution(s) involved
Pagani, Paolo (GC-PME)	Stage cycle master génie civil	GC-PME	Laloui, Lyesse (LMS)			
Rezzonico, Mirko Giuseppe Gerolamo (GC-PME)	Etude géotechnique d'un tunnel en terrain meuble	GC-PME	Laloui, Lyesse (LMS)			

Master diploma projects in Architecture (completed in spring 2017, direct link to Infoscience)

Empty category

Prestudies of master projects in Civil Engineering (completed in fall 2017)

Advisee(s)	Project title	Section-Semester	Tutors(s)	Supervisors(s)	Institution(s) involved (if not EPFL)	Additional information on external institution(s) involved
Aguettant, Grégoire Marie Maxime (GC-MA3)	étude du washboard	GC-MA3	Laloui, Lyesse (LMS)			
Cingari, Stefano Giovanni Pierre (GC-MA3)	Etude de faisabilité de géostructures énergétiques dans des gares	GC-MA3	Laloui, Lyesse (LMS)			
Cousin, Benoît Claude Henri (GC-MA3)	Étude de faisabilité de géostructures énergétiques dans des tunnels	GC-MA3	Laloui, Lyesse (LMS)			
De Saussure, Arabelle Calliope (GC-MA3)	A comparison of induced seismic events caused by hydraulic fracturing in Engineered Geothermal Systems (EGS) and shale reservoirs exploitation	GC-MA3	Laloui, Lyesse (LMS)			
Delessert, Nicolas (GC-MA3)	Tranchée couverte d'une ligne de chemin de fer à Monthey et dans l'agglomération	GC-MA3	Laloui, Lyesse (LMS)			

Advisee(s)	Project title	Section-Semester	Tutors(s)	Supervisors(s)	Institution(s) involved (if not EPFL)	Additional information on external institution(s) involved
Harran, Ray (GC-MA3)	Tunneling in shales: the main concerns (squeezing, swelling, supports etc.) and optimized excavation methods	GC-MA3	Laloui, Lyesse (LMS)			
Peltier, Margaux Marie Valérie (GC-MA3)	GSHP Application for Heating and Cooling at 'City Scale'	GC-MA3	Laloui, Lyesse (LMS)			
Schmid, Nicola Matias (GC-MA3)	Etude géotechnique de l'extension de l'aménagement hydroélectrique de Lavey	GC-MA3	Laloui, Lyesse (LMS)			

Theoretical statements of master projects in Architecture (completed in january 2017, direct link to Infoscience)

Empty category

Semester projects (completed in 2017)

Advisee(s)	Project title	Section-Semester	Tutor(s)	Supervisor(s)	Institution(s) involved (if not EPFL)	Additional information on external institution(s) involved
Arumugam, Suvakar Sansaj (GC-MA3)	Projet de systèmes civils: les risques en bureau d'étude	GC-MA2	Vulliet, Laurent (LMS)			
Caldi, Simon (GC-MA3)	Projet de systèmes civils: Gestion des risques gravitationnels - ECA, bâtiments et risques naturels	GC-MA3	Vulliet, Laurent (LMS)			
Cingari, Stefano Giovanni Pierre (GC-MA3)	Projet de construction: Surface settlement resulting from solution mining of salt rock, Project n. 16456	GC-MA2	Laloui, Lyesse (LMS)			
De Saussure, Arabelle Calliope (GC-MA3)	Projet de construction: Effect of high frequency cycling of gas storage	GC-MA2	Laloui, Lyesse (LMS)			

Advisee(s)	Project title	Section-Semester	Tutor(s)	Supervisor(s)	Institution(s) involved (if not EPFL)	Additional information on external institution(s) involved
	caverns					
Dumas , Delphine (GC-MA3); Yilmaz , Fikret Can (GC-MA3); Barbé , Nolwenn Mathilde Marie (GC-MA3); Pâris , Alexandre Louis Marie (GC-MA1); Dussouchet , Martin (GC-MA3)	Projet de systèmes civils: Les risques en gestion de projet	GC-MA2	Vulliet , Laurent (LMS)			
Fessler , Yannick (GC-MA3)	Projet de construction: Grande fouille en site urbain	GC-MA2	Vulliet , Laurent (LMS)			
Harran , Ray (GC-MA3)	Projet de construction: Parking souterrain	GC-MA3	Vulliet , Laurent (LMS)			
Hartmann , Stéphane (GC-MA1)	Projet de systèmes civils: Gestion des risques gravitaires	GC-MA1	Vulliet , Laurent (LMS)			
Louhichi , Iskander (GC-MA3); Casanova , Michela (GC-MA1)	Projet de systèmes civils: Les risques en bureau d'étude	GC-MA2	Vulliet , Laurent (LMS)			
Mark , Angela Lina (GC-PMH)	Laboratoire GC: Technique de mesure des variations de volume de sols partiellement saturés	GC-MA2	Laloui , Lyesse (LMS)			
Savoy , Romain (GC-MA1)	Projet de systèmes civils: Suisse 2050 - Megatrends et impacts sur les infrastructures	GC-MA1	Vulliet , Laurent (LMS)			
Spinelli , Camille (GC-MA3); Dussouchet , Martin (GC-MA3)	Projet de construction: Projet Vortex - UNIL	GC-MA2	Vulliet , Laurent (LMS)			
Vicari , Hervé (GC-E)	Laboratoire GC: Swelling capacity of a	GC-E	Ferrari , Alessio (LMS)			

Advisee(s)	Project title	Section-Semester	Tutor(s)	Supervisor(s)	Institution(s) involved (if not EPFL)	Additional information on external institution(s) involved
	sedimentary geomaterial					
Vicari, Hervé (GC-E); Barnoud, Mathieu Pierre Guy (GC-MA3)	Projet de systèmes civils: Gestion des risques gravitationnels	GC-E	Vulliet, Laurent (LMS)			

Other supervisions

Advisee	Type of supervision	Work topic	Starting (month/year)	End, if known (month/year)	Supervisor(s)	Institution(s) involved (if not EPFL)	Additional information on external institution(s) involved
Brede, Swann	Apprenticeship	3rd year apprentice, laborant en physique	08/2013	07/2017	Laloui, Lyesse (LMS); Dubey, Patrick (LMS)		
Lotrecchiano, Michela (LMS)	Apprenticeship	Apprenti employé de commerce	08/2014	08/2017	Laloui, Lyesse (LMS); Turielle, Rosa Ana (LMS)		
Ly, Tony (LMS)	Apprenticeship	Apprenti employé de commerce	08/2017	08/2020	Laloui, Lyesse (LMS); Turielle, Rosa Ana (LMS)		
Romann, Erwan (LMS)	Apprenticeship	1st year apprentice, laborant en physique	08/2016	07/2020	Laloui, Lyesse (LMS); Dubey, Patrick (LMS)		

Research

Funded and submitted research projects

Project Title	Principal Investigator	Co-applicant	Funding Source	Amount (CHF)	Start Date	Duration (Months)	Status
BIOGEOS - Bio-mediated Geo-material Strengthening for engineering applications	LALOUI Lyesse		Excellent Science	2,855,776 out of 2,855,776	30.08.2017		Pending
Cyclic Thermo-Mechanical Behaviour of Energy Piles	LALOUI Lyesse		FNS; FNS-Project Funding	450,000 out of 450,000	01.11.2017	42	Ongoing
Seismic resistance of embankment dams with asphalt facing	LALOUI Lyesse		Off. Conf.; Divers Confédération	50,000 out of 50,000	01.10.2017	6	Ongoing
BEACON - Bentonite Mechanical Evolution	Ferrari Alessio	LALOUI Lyesse	Autres EU; Euratom	268,193 out of 4,131,368	01.06.2017	48	Ongoing
SoE - Supply of Electricity	AVELLAN François	Lehning Michael; Violay Marie; LALOUI Lyesse; Lecampion Brice; SCHLEISS ANTON	Off. Conf.; CTI / KTI	310,000 out of 18,200,120	01.01.2017	48	Ongoing
Thermo-mechanical performance of energy pile groups	LALOUI Lyesse		FNS; FNS-COST	180,000 out of 180,000	01.01.2016	36	Ongoing
TERRE - Training Engineers and Researchers to Rethink geotechnical Engineering for a low carbon future	Tarantino Alessandro		H2020; Excellent Science	371,318 out of 4,745,934	01.11.2015	48	Ongoing
Hostling the Greenhouse Gas Technology Conference GHGT-13 at the Swlss Tech Centre of EPFL	LALOUI Lyesse		Off. Conf.; Divers Confédération	350,000 out of 350,000	01.11.2013	98	Ongoing
3D Simulation of the sequential excavation of the new mine-by test at the Mont Terri Laboratory	LALOUI Lyesse		Off. Conf.; Divers Confédération	27,000 out of 27,000	01.08.2017	4	Completed

Project Title	Principal Investigator	Co-applicant	Funding Source	Amount (CHF)	Start Date	Duration (Months)	Status
Upn. Vennes - Chexbres + PUN	LALOUI Lyesse	Violay Marie	Off. Conf.; Divers Confédération	53,913 out of 53,913	01.11.2016	9	Completed
Large-scale implementation of soil bio-improvement for a series of engineering applications	LALOUI Lyesse	Terzis Dimitrios	Non lucr.- Recherche; Lombardi Engineering	20,000 out of 20,000	01.10.2016	7	Completed
Numerical improvement of EPFL-APD constitutive law	LALOUI Lyesse		Off. Conf.; Divers Confédération	32,400 out of 32,400	01.09.2016	6	Completed
Thermo-mechanical performance of energy piles group	LALOUI Lyesse		FNS; FNS-Project Funding	166,038 out of 166,038	01.04.2015	31	Completed
CAPROCK_Evaluation expérimentale de la géomécanique de la séquestration profonde du dioxyde de carbone	LALOUI Lyesse	Makhnenko Roman	Off. Conf.; Divers Confédération	103,000 out of 103,000	01.12.2014	32	Completed
Geo-mechanical investigations of bio-improved soils	LALOUI Lyesse	BERNIER-LATMANI Rizlan	FNS; FNS-Project Funding	176,401 out of 181,401	01.09.2014	38	Completed
GREAT - Geotechnical and geological responses to climate change: exchanging approaches and technologies on a world-wide scale	Ferrari Alessio	LALOUI Lyesse	FP7 - PCRD; People	153,720 out of 1,078,560	01.01.2014	48	Completed
Study on effective stress definition for gas shales in partially water saturated conditions	LALOUI Lyesse		Ctr Recherche	150,000 out of 150,000	19.12.2017		Industrial contract
THM-modelling appraisal on buffer	LALOUI Lyesse		TTO - recherche ind.	90,000 out of 90,000	30.11.2017		Industrial contract
Beacon Plus	LALOUI Lyesse		Ctr Recherche	40,000 out of 40,000	30.11.2017		Industrial contract
In-situ stress state evaluation of Opalinus Clay based on suction and swelling pressure measurements	LALOUI Lyesse		TTO - recherche ind.	50,000 out of 50,000	29.08.2017		Industrial contract
Advanced studies of the Structure and Safety of High Level Waste storage in deep geological formations	Lyesse LALOUI		Swissnuclear	319,000 out of 319,000	01.10.2014	39	Industrial contract

Funded equipment

Empty category

Awards

Awardee	Name of prize / Competition	Place / Organization	Award description / URL	Prize sum (CHF)
Laloui , Lyesse (LMS)	30th Roberval Award	Paris, French Academy of Science	https://actu.epfl.ch/news/le-tgc-18-est-l-oeuvre-laureate-de-la-30e-edition/	
Rotta Loria , Alessandro Francesco (LMS)	Earth Sciences and Engineering	EPFL ENAC Award 2017		
Terzis , Dimitrios (LMS)	Climate KIC's Launchpad 2017	Basel, Swiss	https://actu.epfl.ch/news/an-epfl-project-wins-the-swiss-final-of-climate-ki/	
Terzis , Dimitrios (LMS)	Climate Launchpad (Second place)	Cyprus	https://actu.epfl.ch/news/cleantech-medusoil-wins-a-prestigious-prize-2/	

Research facilities

Research facilities
X-Ray Radioscopy and Tomography Platform PIXE (ULTRATOM system, RX-SOLUTIONS) - Shared facility

Publications & Presentations

Books (direct link to InfoScience)

Data	Key
Ferrari A., Laloui L., Advances in Laboratory Testing and Modelling of Soils and Shales¹ , Springer International Publishing, 2017, 978-3-319-52772-7, Springer Series in Geomechanics and Geoengineering, Abstract: yes, Status: published	

Book chapters (direct link to InfoScience)

Data	Key
Terzis D., Laloui L., On the Application of Microbially Induced Calcite Precipitation for Soils: A Multiscale Study , in Advances in Laboratory Testing and Modelling of Soils and Shales (ATMSS) . ATMSS 2017. Springer Series in Geomechanics and Geoengineering. Springer, Cham, p.388-394 , 2017, Abstract: yes, Status: published	

Journal articles (direct link to InfoScience)

Data	Not produced at EPFL	Peer reviewed	Key
Favero V., Ferrari A., Laloui L., Anisotropic behaviour of Opalinus Clay through consolidated and drained triaxial testing in saturated conditions , in Rock Mechanics and Rock Engineering , 2017, Abstract: yes, Status: accepted		✓	
Rotta Loria A. F., Laloui L., Group action effects caused by various operating energy piles , in Geotechnique -London- , 2017, Abstract: yes, Status: published		✓	
Parisio F., Laloui L., On the formulation of anisotropic-polyaxial failure criteria: a comparative study , in Rock Mechanics and Rock Engineering , 2017, Abstract: yes, Status: published		✓	
Vilarrasa V., Laloui L., Impacts of Thermally Induced Stresses on Fracture Stability During Geological Storage of CO₂ , in Energy Procedia , vol. 114, p.411-419 , 2017, Abstract: yes, Status: published		✓	
Räss L., Makhnenko R., Podladchikov Y., Laloui L., Quantification of Viscous Creep Influence on Storage Capacity of Caprock , in Energy Procedia , vol. 114, p.3237-3246 , 2017, Abstract: yes, Status: published		✓	
Makhnenko R., Vilarrasa V., Mylnikov D., Laloui L., Hydromechanical Aspects of CO₂ Breakthrough into Clay-rich Caprock , in Energy Procedia , vol. 114, p.3219-3228 , 2017, Abstract: yes, Status: published		✓	
Vilarrasa V., Makhnenko R., Laloui L., Potential for Fault Reactivation Due to CO₂ Injection in a Semi-Closed Saline Aquifer , in Energy Procedia , vol. 114, p.3282-3290 , 2017, Abstract: yes, Status: published	✓	✓	
Li C., Laloui L., Coupled Thermo-hydro-Mechanical Effects on Caprock Stability During Carbon Dioxide Injection , in Energy Procedia , vol. 114, p.3202-3209 , 2017, Abstract: yes, Status: published		✓	
Rotta Loria A. F., Laloui L., The equivalent pier method for energy pile groups , in Geotechnique , vol. 67, num. 8, p.691-702 , 2017, Abstract: yes, Status: published		✓	

Data	Not produced at EPFL	Peer reviewed	Key
Zhou H., Kong G., Laloui L., Similarity Solution for Cavity Expansion in Thermoplastic Soil , in International Journal for Numerical and Analytical Methods in Geomechanics , 2017, Abstract: no, Status: accepted	✓	✓	
Zou Y., Li J., Laloui L., Zhao J., Analytical Time-Domain Solution of Plane Wave Propagation Across a Viscoelastic Rock Joint , in Rock Mechanics and Rock Engineering , 2017, Abstract: yes, Status: published		✓	
Li C., Laloui L., Impact of material properties on caprock stability in CO2 geological storage , in Geomechanics for Energy and the Environment , 2017, Abstract: yes, Status: accepted		✓	
Rotta Loria A. F., Laloui L., Displacement interaction among energy piles bearing on stiff soil strata , in Computers and Geotechnics , vol. 90, num. 144-154 , 2017, Abstract: yes, Status: published		✓	
Rotta Loria A., Laloui L., Thermally induced group effects among energy piles , in Geotechnique , vol. 67, num. 5, p.374-393 , 2017, Abstract: yes, Status: published		✓	
Vilarrasa V., Bustarreta G., Laloui L., Zeidouni M., A methodology to detect and locate low-permeability faults to reduce the risk of inducing seismicity of fluid injection operations in deep saline formations , in International Journal of Greenhouse Gas Control , vol. 59, p.110-122 , 2017, Abstract: yes, Status: published		✓	
Parisio F., Laloui L., Plastic-damage modeling of saturated quasi-brittle shales , in International Journal of Rock Mechanics and Mining Sciences , vol. 93, p.295–306 , 2017, Abstract: yes, Status: published		✓	
Rotta Loria A. F., Laloui L., The equivalent pier method for energy pile groups , in Geotechnique -London- , vol. 67, num. 5, p.374–393 , 2017, Abstract: yes, Status: published		✓	
Dieudonné A.-C., Della Vecchia G., Charlier R., A water retention model for compacted bentonites , in Canadian Geotechnical Journal , 2017, Abstract: yes, Status: published	✓	✓	
Madaschi A., Gajo A., A one-dimensional viscoelastic and viscoplastic constitutive approach to modeling the delayed behavior of clay and organic soils , in Acta Geotechnica -Springer Verlag- , 2017, Abstract: yes, Status: published		✓	
Rotta Loria A. F., Vadrot A., Laloui L., Effect of non-linear soil deformation on the interaction among energy piles , in Computers and Geotechnics , vol. 86, num. June, p.9-20 , 2017, Abstract: yes, Status: published		✓	
Vilarrasa V., Parisio F., Laloui L., Strength evolution of geomaterials in the octahedral plane under non-isothermal and unsaturated conditions , in International Journal of Geomechanics , vol. 17, num. 7 , 2017, Abstract: yes, Status: published		✓	
Qiao Y., Ding W., ACMEG-TVP: A thermoviscoplastic constitutive model for geomaterials , in Computers and Geotechnics , vol. 81, p.98-111 , 2017, Abstract: yes, Status: published		✓	

Conference papers (direct link to InfoScience)

Data	Peer reviewed	Key
Rotta Loria A. F., Laloui L., Serviceability assessment of energy pile groups through design charts , 7th Geotechnical Symposium with International Participation, Istanbul, Turkey, November 22-25, 2017,	✓	

Data	Peer reviewed	Key
Abstract: yes, Status: published		
Laloui L., Rotta Loria A. F., Recent development in the multiphysical analysis and design of energy piles , 7th Geotechnical Symposium with International Participation, Istanbul, Turkey, November 22-25, 2017, Abstract: yes, Status: published	✓	
Terzis D., Laloui L., <i>Editor(s):</i> Technical Committee 211 G. I., Quantitative analysis of the crystalline bond lattice of bio-improved soils using micro-computed tomography , 19th International Conference on Soil Mechanics and Geotechnical Engineering (Seoul), Seoul, South Korea, September 17-22, 2017, Abstract: yes, Status: published	✓	
Cassini E., Laloui L., Investigation of the Intrinsic Permeability of MX-80 Bentonite through a 4-Scale Analysis of Its Fabric , Sixth Biot Conference on Poromechanics, Paris, France, July 9-13, 2017, Abstract: yes, Status: published	✓	
Sutman M., Olgun G., Laloui L., Brettmann T., <i>Editor(s):</i> Brandon T. L., Valentine R. J., Effect of End-Restraint Conditions on Energy Pile Behavior , Geotechnical Frontiers 2017, Orlando, Florida, March 12–15, 2017, Abstract: yes, Status: published	✓	
Dieudonné A.-C., Charlier R., <i>Editor(s):</i> Ferrari A., Laloui L., Evaluation of the instantaneous profile method for the determination of the relative permeability function , International Workshop on Advances in Laboratory Testing and Modelling of Soils and Shales, Villars, Switzerland, 2017, Abstract: yes, Status: published	✓	
Li C., Laloui L., <i>Editor(s):</i> Ferrari A., Laloui L., Coupled Analysis of CO2 Injection Induced Stress Variation in the Caprock , International Workshop “Advances in Laboratory Testing and Modelling of Soils and Shales”, Swiss Alps, January 18-2, 2017, Abstract: no, Status: published	✓	
Rotta Loria A. F., Laloui L., Impact of thermally induced soil deformation on the serviceability of energy pile groups , Advances in Laboratory Testing and Modelling of Soils and Shales, Villar sur Ollon, Switzerland, 2017, Abstract: yes, Status: published	✓	
Cassini E., Mylnikov D., Makhnenko R., <i>Editor(s):</i> Ferrari A., Laloui L., Chemical Influence of Pore Pressure on Brine Flow in Clay-Rich Material , Advances in Laboratory Testing & Modelling of Soils and Shales, Villars-sur-Ollon, Switzerland, January 18-20, 2017, Abstract: yes, Status: published	✓	
Minardi A., Crisci E., Ferrari A., Laloui L., <i>Editor(s):</i> Ferrari A., Laloui L., The Role of Anisotropy on the Volumetric Behaviour of Opalinus Clay upon Suction Change , Advances in Laboratory Testing and Modelling of Soils and Shales, Villar sur Ollon, Switzerland, January 18-20, 2017, Abstract: yes, Status: published	✓	
Crisci E., Ferrari A., Giger S., Laloui L., <i>Editor(s):</i> Ferrari A., Laloui L., One Dimensional Consolidation of Opalinus Clay from Shallow Depth , Advances in Laboratory Testing and Modelling of Soils and Shales, ATMSS 2017, Villars-sur-Ollon, Switzerland, January 18-20, 2017, Abstract: yes, Status: published	✓	
Favero V., Ferrari A., Laloui L., 1D Compression Behaviour of Opalinus Clay , Advances in Laboratory Testing and Modelling of Soils and Shales (ATMSS), Villars-sur-Ollon, Switzerland, January 18-20, 2017, Abstract: no, Status: published	✓	

Conference proceedings (direct link to InfoScience)

Data	Key
Proc. 13th International Conference on Greenhouse Gas Control Technologies, GHGT-13, 14-18 November 2016, Lausanne, Switzerland. , 13th International Conference on Greenhouse Gas Control Technologies, GHGT-13, Lausanne, Switzerland, 14-18 November 2016, Abstract: no	

Theses (direct link to InfoScience)

Data	Key
Terzis D., <i>Advisor(s): Laloui L., Kinetics, Mechanics and Micro-structure of Bio-cemented Soils</i> , Thèse EPFL, n° 8147, 2017, Abstract: yes, Status: published	
Favero V., <i>Advisor(s): Laloui L., Ferrari A., Multiphysical behaviour of shales from Northern Switzerland</i> , Thèse EPFL, n° 7539, 2017, Abstract: yes, Status: published	

Outreach

Current ongoing collaborations

People involved at ENAC & EPFL wide	Collaborating institution(s) (if not EPFL)	Additional information on cooperation partner(s)	Project topic/Description, Financial support (CHF) if any	Collaboration includes...
Laloui, Lyesse (LMS)	Office fédéral de l'énergie (OFEN), CH (Swiss Government)	Swiss Federal Office of Energy SFOE	Geomechanical investigation of caprock for CO2 storage; Geotechnical Reliability of Thermo-piles-energy Investigation	
Laloui, Lyesse (LMS)	Swisselctric, CH (Private sector)	Swissnuclear	Constitutive modelling of bentonite	
Laloui, Lyesse (LMS)	Swiss Competence Center for Energy Research (SCCER-SoE), CH (Swiss Universities and Research Centers)	Swiss Competence Center for Energy Research – Supply of Electricity (SCCER-SoE)	Geothermal energy and CO2 storage	
Laloui, Lyesse (LMS)	Office fédéral de topographie (Swisstopo), CH (Swiss Government)	SWISSTOPO	Hydro-mechanical modelling of the Opalinus Clay in Mont Terri	
Laloui, Lyesse (LMS)	Office fédéral de l'énergie (OFEN), CH (Swiss Government)	Swiss Federal Office of Energy SFOE	Seismic resistance of embankment dams with asphalt facing	
Laloui, Lyesse (LMS); Ferrari, Alessio (LMS)	Chevron Corporation, US (Private sector)	CHEVRON	Geomechanical characterization of gas shales	
Laloui, Lyesse (LMS); Ferrari, Alessio (LMS)	National Cooperative for the Disposal of Radioactive Waste (NAGRA), CH (Private sector)	NAGRA	Experimental and constitutive analysis of the Opalinus Clay shale	

Innovation

Inventor(s)	Description of innovation	Additional information
Terzis, Dimitrios (LMS); Laloui, Lyesse (LMS)	A Geosynthetic Element for Bio-improvement	Application number PCT/EP2017/062995

Distinguished work

Author(s)	Article title	Journal & Pages	Publication date
Favero , Valentina (LMS)	Identification de sites pour stocker les déchets radioactifs	Homeland Security News Wire	24/02/2017
Laloui , Lyesse (LMS)	Sortie du nucléaire: quid des déchets?	L'extension, pp. 66-67	03/01/2017
Laloui , Lyesse (LMS)	Avec les déchets radioactifs, l'échelle du temps diffère	24 heures, p. 4	21/01/2017
Laloui , Lyesse (LMS)	Déchets nucléaires: L'éternelle question	Moustique, pp. 30-31	08/02/2017
Laloui , Lyesse (LMS)	L'EPFL envisage le stockage du CO2 comme une planche de salut	Terre & Nature, p. 11	09/02/2017
Laloui , Lyesse (LMS)	Augmentation des aléas climatiques: qui en est la cause?	L'extension, p. 50-51	09/2017

Appointments at other institutions

Name	Title	Institution	Additional information on institution
Ferrari , Alessio (LMS)	Associate professor	University of Palermo, IT (European Universities and Research Centers)	
Laloui , Lyesse (LMS)	Adjunct professor	Duke University, US (World Universities and Research Centers)	
Laloui , Lyesse (LMS)	Advisory Professor	Hohai University, CN (World Universities and Research Centers)	

Visiting scholars

Visitor	Home Institution	Additional information on home institution	Aim of visit, Duration
Cinicioglu , Feyza	Istanbul University, TR (World Universities and Research Centers)		Visit and seminar, November 11, 2017
Comodromos , Emiliios	University of Thessaly, GR (European Universities and Research Centers)		Visit and seminar, November 4, 2017
Ferronato , Massimiliano	University of Padova, IT (European Universities and Research Centers)	Department of Civil, Environmental and Architectural Engineering, ICEA	Visit and seminar
Gawin , Dariusz	Lodz University of Technology, PL (European Universities and Research Centers)		Visit and seminar, February 24, 2017

Alumni

Alumnus	Level	First position out of lab	Country	Sector of activity
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Alumnus	Level	First position out of lab	Country	Sector of activity
Arroyo Chávez, Hiram	Post doc	Assistant professor, Guanajuato University	Mexico	Academia
Dieudonné, Anne-Catherine (LMS)	Post doc	Assistant professor, TU Delft	Netherlands	Academia
Favero, Valentina (LMS)	Post doc	Geotechnical Engineer, Office Fédéral de l'Energie	Switzerland	Industry
Li, Chao (LMS)	Post doc	Staff Engineer, Intera	Switzerland	Industry

Distinguished alumni

Alumnus	Achievement / Distinction
Arroyo Chávez, Hiram	Assistant professor, Guanajuato University, Mexico
Dieudonné, Anne-Catherine (LMS)	Assistant professor, TU Delft, Netherlands

Organization of events

Date (month)	Location	Event title	Key people in lab involved	Description / URL
04/2017	EPFL, Lausanne, Switzerland	International Doctoral School on Unsaturated Soil Mechanics	Ferrari, Alessio (LMS); Laloui, Lyesse (LMS)	https://memento.epfl.ch/event/international-doctoral-school-on-unsaturated-soil/
11/2017	Davos, Switzerland	Convener of the 15th Swiss Geoscience Meeting, session "Shale-Gas, CO2 Storage and Deep Geothermal Energy"	Laloui, Lyesse (LMS)	
01/2017	Villars-sur-Ollon, Switzerland	Advances in Laboratory Testing & Modelling of Soils and Shales	Laloui, Lyesse (LMS); Ferrari, Alessio (LMS)	https://memento.epfl.ch/event/atmss-workshop-2017-2/

Invited talks and contributions to events

Date (month)	Location	Event title	Key people in lab involved	Role / Talk title	Description / URL	Organizing institution (if not EPFL)	Additional information on organizing institution
07/2017	Zhejiang, China	Conference on Geo-Energy and Geo-Environment 2017	Laloui, Lyesse (LMS)	Keynote lecture		Zhejiang University (ZJU), CN (World Universities)	

Date (month)	Location	Event title	Key people in lab involved	Role / Talk title	Description / URL	Organizing institution (if not EPFL)	Additional information on organizing institution
						and Research Centers)	
11/2017	Istanbul, Turkey	7th Geotechnical Symposium	Laloui, Lyesse (LMS)	Keynote lecture - Design of thermo-active foundations		Istanbul University, TR (World Universities and Research Centers)	
09/2017	Bochum, Germany	Bochum Underground Space Day	Laloui, Lyesse (LMS)	Keynote lecture - Geomechanical solutions for geo-energy issues	https://actu.epfl.ch/news/keynote-lecture-geomechanical-solutions-for-geo--2/	Ruhr-University Bochum, DE (European Universities and Research Centers)	
05/2017	Portugal	Workshop "Shallow geothermal energy systems. Applications and perspectives"	Laloui, Lyesse (LMS)	Keynote lecture - Design of thermos-active piles		University of Aveiro, PT (European Universities and Research Centers)	

Services

EPFL committees and services

Name	Service	Role	Role in funding allocation
Laloui, Lyesse (LMS)	Civil Engineering Section	Director	yes
Laloui, Lyesse (LMS)	Direction of the School of Architecture, Civil and Environmental Engineering (ENAC)	Member	yes
Laloui, Lyesse (LMS)	Committee of the Doctoral Program in Mechanics	Member	no
Laloui, Lyesse (LMS)	Faculty search committee for position of Professor in Structures & Materials	Member	no
Laloui, Lyesse (LMS)	Faculty search committee Professor position in "Renewable Energy in Buildings"	Member	no
Laloui, Lyesse (LMS)	ENAC Academic Promotion Committee CPA	Member	no
Laloui, Lyesse (LMS)	Faculty Search Committee for two positions of Professor in Transportation engineering and Transportation systems at EPFL	Member	no
Laloui, Lyesse (LMS)	Faculty Search Committee for a position of Professor in Hydraulics at EPFL	Member	no
Laloui, Lyesse (LMS)	Faculty Search Committee for a position of Professor in Indoor Environmental Quality and Building Controls at EPFL	Member	no

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

Name	Service	Role	Role in funding allocation
Ferrari, Alessio (LMS)	Journal Geomechanics for Energy and the Environment	Member of the Editorial Board	no
Ferrari, Alessio (LMS)	International Society of Soil Mechanics and Geotechnical Engineering ISSMGE	Member of the technical committee TC 308 "Energy Geotechnics"	no
Ferrari, Alessio (LMS)	International Society of Soil Mechanics and Geotechnical Engineering ISSMGE	Member of the technical committee TC 101 "Unsaturated Soils"	no
Ferrari, Alessio (LMS)	Sixth EAGE shale workshop, Bordeaux, France	Member of the Scientific Committee	no
Ferrari, Alessio	TC308/ISSMGE workshop in Rome, 8/4/2016	Organizer	no

Name	Service	Role	Role in funding allocation
(LMS)			
Ferrari, Alessio (LMS)	ISSMGE Technical Committee 101	Member of the Scientific Committee	no
Ferrari, Alessio (LMS)	ISSMGE Technical Committee 308	Member of the Scientific Committee	no
Laloui, Lyesse (LMS)	Geomechanics and Geomaterials – Hermes Science Publishing Limited (WILEY-ISTE, London)	Book Series Editor	no
Laloui, Lyesse (LMS)	Acta Geotechnica	Member of Editorial Board	no
Laloui, Lyesse (LMS)	Chinese Journal of Geotechnical Engineering	Member of Editorial Board	no
Laloui, Lyesse (LMS)	European Journal of Environmental and Civil Engineering	Member of Editorial Board	no
Laloui, Lyesse (LMS)	Journal of Coupled Systems and Multiscale Dynamics	Member of Editorial Board	no
Laloui, Lyesse (LMS)	Environmental Geotechnics	Advisory Board Member	no
Laloui, Lyesse (LMS)	International Journal for Numerical and Analytical Methods in Geomechanics	Member of Editorial Board	no
Laloui, Lyesse (LMS)	TC101 “Laboratory Stress Strain Strength - Testing of Geomaterials” of the International Society for Soil Mechanics and Geotechnical Engineering.	Vice-Chair	no
Laloui, Lyesse (LMS)	International journal Geomechanics for Energy and the Environment	Editor-in-Chief	no
Laloui, Lyesse (LMS)	Scientific Committee of the International Conference on Computational Methods for Coupled Problems in Science and Engineering (COUPLED PROBLEMS 2017), Island of Rhodes (Greece), 2017.	Member	no
Laloui, Lyesse (LMS)	International technical committee of the PanAm-UNSAT 2017: The 2nd Pan American Conference on Unsaturated Soils, Dallas/Fort Worth, Texas, USA, 2017.	Member	no

Name	Service	Role	Role in funding allocation
Laloui, Lyesse (LMS)	Scientific committee of the 7th Clay Conference (Clays in Natural and Engineered Barriers for Radioactive Waste Confinement) Davos, 2017.	Member	no
Laloui, Lyesse (LMS)	International Centre for Mechanical Sciences (CISM)	Member of the scientific council	no
Laloui, Lyesse (LMS)	Swiss Competence Center for Energy Research - Supply of Electricity	Member of the executive committee	no
Laloui, Lyesse (LMS)	International Energy Agency Greenhouse R&D Technology Collaboration Program	Executive Committee representative for the Government of Switzerland	no
Laloui, Lyesse (LMS)	International Technical Committee of AP-UNSAT2019 - 7th Asia-Pacific Conference on Unsaturated Soils, 2019, Nagoya, Japan	Member	no
Laloui, Lyesse (LMS)	Scientific Committee of the 6th GeoProc conference, Paris 2017	Member	no
Laloui, Lyesse (LMS)	Technical Advisory Committee of the 2nd International Symposium on Coupled Phenomena in Environmental Geotechnics (CPEG2) – Leeds (UK), 2017.	Member	no

Vision

Highlights

Highlights

Significant contributions to education (5 PhDs and 8 Master projects awarded)
 Medusoil: the research activities of the last 12 years have lead to a patent to start an industrial application
 Strong scientific production (22 journal articles, 13 conference articles)

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. The 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 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:

Geo-energy structure

Efforts are being devoted to better understand the physical mechanisms and phenomena characterising the operation of energy geostructures for ensuring an optimal geotechnical, structural and energy performance of such ground structures. The LMS has

Goals

nowadays more than 10 years of experience on this scope and is internationally recognised by Universities and Companies as the leader research group in this field. The analyses that are being performed are focused on various aspects that characterise energy geostructures, including the non-isothermal behaviour of soils when subjected to cyclic temperature variations, the interaction (soil-structure) with the concrete composing these ground structures, the structural behaviour of the concrete itself subjected to temperature changes, the hydraulic aspects related to the fluid flow inside of the pipes embedded in the concrete that allow for the heat exchange between the soil and the ground structure, and the optimal practices for equipping the considered elements. It is considered that the exploitation of shallow geothermal energy for satisfying the energy needs of building environments in an environmentally-friendly way will increase and spread worldwide more and more in the foreseeable future. The LMS, through its expertise in this subject matter, aims at being the representative of this revolutionary approach.

Deep Geo-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.

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 technology with expertise in the fundamentals of soil mechanics.

LMS has a large tradition in the domain of landslides analysis. In the past years, early warning system methods have been developed. Climate change and its effects on earth equilibria, water budget are studied all around the world by thousands of researchers. Following this trend, the current researches at LMS focus on the effects of climate variations on the stability of slopes. To do so, interactions between the soil and the atmosphere have to be studied to understand the exchanges between the two systems. Making use of the foreseen climate changes, the aims of these researches would be to take a step forward in the management of the natural hazards by predicting the situation in the next century. As dry Summers as the 2015 are more often anticipated in the 21st century, the focus will be set on the mechanism of desiccation cracking in soils. The room for research on this phenomenon is extremely important and its implications on landfill liners integrity, stability of foundations, agriculture and stability of slopes have to be assessed.

The project of bio-improved soils currently carried out at LMS has proven great potential in building a sustainable, environmental-friendly method for stabilizing soils and preventing failures in a vast range of engineering problems. The project has already offered the chance for interdisciplinary collaboration between LMS and EML and offers common ground for collaboration with other ENAC laboratories. As a foreseen step, a pilot, large-scale application of the technique is planned in order to better design and suggest an efficient method, adaptable to the needs of the geotechnical problem.

Goals

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.

Others

Empty category

Printed 19.07.2018 by **Madaschi, Aldo** (LMS)