LMS | ACTIVITY REPORT 2020

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 2020

Teacher(s)	Code	Course title	Section-Semester	Credits / Coeff.	Student number
Guenat, Claire ; **Viganò**, Paola (LAB-U); **Ferrari**, Alessio (LMS); **Barcelloni Corte**, Martina (SAR-ENS); **Gobat**, Jean-Michel (SAR-ENS)	PENS-214	Our common soil	ENAC-BA4	4	11
Laloui, Lyesse (LMS); **Bernier-Latmani**, Rizlan (EML); **Fernandez Andrino**, Juan (SAR-ENS); **Nguyen**, Richard (SAR-ENS)	PENS-211	Terra Epidermis	ENAC-BA4	4	15
Vulliet, Laurent (LMS)	CIVIL-203	Mécanique des sols et écoulements souterrains	GC-BA4	5	58
Laloui, Lyesse (LMS)	CIVIL-444	Energy geostructures	GC-MA2, GC-MA4	4	22
Ferrari, Alessio (LMS)	CIVIL-530	Slope stability	GC-MA2, GC-MA4	3	34

Fall semester 2020

Teacher(s)	Code	Course title	Section-Semester	Credits / Coeff.	Student number
Vulliet, Laurent (LMS); **Defert**, Raphaël (SGC-ENS)	CIVIL-438	Analyse et gestion de risques	GC-MA1, GC-MA3	3	62
Laloui, Lyesse (LMS); **Koliji**, Azad (SGC-ENS)	CIVIL-402	Geomechanics	GC-MA1, GC-MA3	3	41
Laloui, Lyesse (LMS); **Terzis**, Dimitrios (LMS)	CIVIL-424	Innovation for construction and the environment	GC-MA1, GC-MA3	3	41

Additional teaching

Teacher(s)	Course title	Section-Semester	Credits	Student number	Institution where taught (if not EPFL)	Additional information on external institution(s)
Ferrari, Alessio (LMS)	A Resilient Future: Science and Technology for Disaster Risk Reduction	EPFLx - edX Course				Silvia Hostettler, Cooperation & Development Center, EPFL

Teacher(s)	Course title	Section-Semester	Credits	Student number	Institution where taught (if not EPFL)	Additional information on external institution(s)
Laloui, Lyesse (LMS)	Energy Geostructures: Analysis and Design. 3rd ed. continuing education	November 2-4, 2020		20		Rotta Loria, Alessandro, Northwestern University

Advising

Postdoc works (completed in 2020 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
Clarà Saracho, Alexandra (LMS)	Biomimetic control of calcium carbonate phase through capsule-based MICP and its application for soil improvement	01/2020		**Laloui**, Lyesse (LMS)		
Crisci, Eleonora (LMS)	Time-dependent response and sample-size effect on the geomechanical response of Opalinus Clay shale for radioactive waste disposal	11/2019		**Laloui**, Lyesse (LMS)		
Kim, Daehyun (LMS)	Multiscale study of biocementation process	10/2019	10/2020	**Laloui**, Lyesse (LMS)		
Lee, Kwangwoo (LMS)	Evaluation of rainfall-induced slope failure based on material point method	09/2019	08/2020	**Laloui**, Lyesse (LMS)		
Madaschi, Aldo (LMS)	Modelling activities on buffer and host rock materials for High Level Waste geologic repositories	10/2016	06/2021	**Laloui**, Lyesse (LMS)		
Stavropoulou, Eleni (LMS)	Impact of CO2 on the sealing capacity of caprock representative shale	09/2019		**Laloui**, Lyesse (LMS)		
Terzis, Dimitrios (LMS)	Bio-cemented soils	11/2017	12/2020	**Laloui**, Lyesse (LMS)		

PhD thesis (completed in 2020 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
Bosch Llufriu, Jose Antonio (LMS)	Constitutive modelling of active soils under environmental actions	EDME	2021	**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
Elmaloglou, Ariadni (LMS)	Ground bio-stabilization: Bio-chemo-mechanical monitoring and optimized upscaling	EDME	2022	**Laloui**, Lyesse (LMS)	**Terzis**, Dimitrios (LMS)			
Fryer, Barnaby Padraig (LEMR)	Hazard and Risk Assessment of Large Seismic Events Owing to Fluid Injection	EDME	2020	**Laloui**, Lyesse (LMS)	**Siddiqi**, Gunter (EDME-ENS)			
Fuselier, Héloïse (LMS)	Constitutive and numerical modelling of the thermo-hydro-mechanical behavior of the Callovo-Oxfordian claystone in the context of nuclear waste storage	EDME	2024	**Laloui**, Lyesse (LMS)	**Ferrari**, Alessio (LMS)			
Garbellini, Cristiano (EDME)	Soil-structure interaction in the context of piled-raft foundations with groups of energy piles	EDME	2020	**Laloui**, Lyesse (LMS)				
Harran, Ray (LMS)	Geotechnical aspects of Bio-improved soils in the context of BIOGEOS	EDME	2022	**Laloui**, Lyesse (LMS)	**Terzis**, Dimitrios (LMS)			
Kim, Jinwoo (LMS)	Effective Stress Framework for Partially Saturated Gas Shales	EDME	2022	**Laloui**, Lyesse (LMS)	**Ferrari**, Alessio (LMS)			
Kim, Taeheon (LMS)	The chemical effect of CO2 on geomechanical properties of geological carbon sequestration	EDME	2022	**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
Llabjani, Qazim (LMS)	Gas-induced impacts on the barrier integrity of deep geological repository of radioactive wastes: A contribution to the EURAD-Gas project	EDME	2024	**Laloui**, Lyesse (LMS)	**Ferrari**, Alessio (LMS)			
Martin, Grégoire (LMS)	Multiphysical and Multiscale Modelling of Biogrout Transport for MICP	EDME	2023	**Laloui**, Lyesse (LMS)				
Moser, Benedikt (LMS)	Multiphysical modeling of the coupled Bio-Chemo-Hydro-Mechanical behavior of Bio-mediated Soils	EDME	2023	**Laloui**, Lyesse (LMS)				
Ravera, Elena (LMS)	Cyclic thermo-mechanical behaviour of energy piles	EDME	2021	**Laloui**, Lyesse (LMS)				
Speranza, Gianluca (LMS)	Methods for carbon footprint assessment of geostructures	EDME	2020	**Laloui**, Lyesse (LMS)	**Ferrari**, Alessio (LMS)			
Tuttolomondo, Angelica (LMS)	Constitutive and numerical modeling of the coupled thermo-hydro-chemo-mechanical behaviour of shales	EDME	2020	**Laloui**, Lyesse (LMS)	**Ferrari**, Alessio (LMS)			
Wojnarowicz, Matthias (LMS)	Validation of thermally induced THM effects in the rock around the FE-tunnel	EDME	2023	**Laloui**, Lyesse (LMS)	**Madaschi**, Aldo (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
Zannin, Jacopo (LMS)	Shallow geothermal energy for renovated civil engineering structures: a geomechanical and environmental approach	EDME	2020	**Laloui**, Lyesse (LMS)	**Ferrari**, Alessio (LMS)			

Master diploma projects in Civil Engineering, Environmental Engineering and other programs (started in spring or fall 2020)

Advisee(s)	Project title	Section-Semester	Advisor(s)	Co-advisor(s)	Institution(s) involved (if not EPFL)	Additional information on external institution(s) involved
Cassina, Lisa (GC-PMH)	Energy performance of a high BHEs density at district scale	GC-PMH	**Laloui**, Lyesse (LMS)			
Lebbar, Youssouf (GC-PMH)	Thermo-hydraulic behaviour of Energy Barrettes	GC-PMH	**Laloui**, Lyesse (LMS)			
Richard, Nicolas Paul (GC-PME)	Thermo-hydro-mechanical modeling of energy barrettes	GC-PME	**Laloui**, Lyesse (LMS)			
Schenk, Benjamin Simon (GC-PME)	Étude géotechnique et géothermique de la station et du tunnel de Beaulieu pour le m3	GC-PME	**Laloui**, Lyesse (LMS)			
Wüthrich, Thomas Matthias (GC-PME)	District scale prediction of subsurface waste heat flows	GC-PME	**Laloui**, Lyesse (LMS)			
Zaarour, Mohamad (EDME)	Enhanced Geothermal Systems - Hydraulic fracturing and Induced Seismicity / Experimentation and Modeling	GC-PME	**Laloui**, Lyesse (LMS)		Massachusetts Institute of Technology (MIT), US (World Universities and Research Centers)	Herbert Einstein

Master diploma projects in Architecture (completed in spring 2020, retrieved from Infoscience)

Empty category

Prestudies of master projects in Civil Engineering (completed in fall 2020)

Advisee(s)	Project title	Section-Semester	Tutors(s)	Supervisors(s)	Institution(s) involved (if not EPFL)	Additional information on external institution(s) involved
Berrada, Marouane (GC-MA3)	BIM (Building Information Modeling) 5D	GC-MA3	**Vulliet**, Laurent (LMS)			
Bonny, Loïc (GC-MA3)	Tunnel en terrain meuble : métro M3 de Lausanne	GC-MA3	**Laloui**, Lyesse (LMS)			
Jaber, Nizar (GC-MA3)	Projet Geomechanique	GC-MA3	**Vulliet**, Laurent (LMS)			
Metral, Mathilde (GC-MA3)	Slope stability analysis of natural slopes in quick clay zones	GC-MA3	**Ferrari**, Alessio (LMS)			

Theoretical statements of master projects in Architecture (completed in january 2020, retrieved from Infoscience)

Empty category

Semester projects (completed in 2020)

Advisee(s)	Project title	Section-Semester	Tutor(s)	Supervisor(s)	Institution(s) involved (if not EPFL)	Additional information on external institution(s) involved
Heiniger, Selina (GC-MA3)	Projet de construction: Projet de construction: Parking Les Cédres Z2 à Chavannes-près-Renens	GC-MA2	**Vulliet**, Laurent (LMS)			
Kälin, Benoît Pascal (GC-MA3); **Grangeret**, Philippe Maël (GC-MA3); **Schaufelberger**, Annik Julia (GC-MA1); **Jermann**, Florian Till (GC-MA1)	Projet de construction: Projet géotechnique	GC-MA3	**Vulliet**, Laurent (LMS)			
Lebbar, Youssouf (GC-PMH)	Crack analysis with micro-CT	GC-PMH	**Laloui**, Lyesse (LMS); **Turberg**, Pascal (SGC-GE)			
Liardon, Tristan (GC-MA3)	Projet de construction: Use of high stress path reservoirs for CO2 sequestration	GC-MA4	**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
Liardon, Tristan (GC-MA3)	Laboratoire GC: Characterization and water retention of shales and clays: implications for engineering applications	GC-MA4	**Laloui**, Lyesse (LMS)			
Metral, Mathilde (GC-MA3)	Projet de construction: ECA: prévention de risques naturels	GC-MA2	**Vulliet**, Laurent (LMS)			
Pillajo Rosero, Daniel Isaac (GC-MA3); **Balmer**, Damien (GC-MA1)	Projet de construction: Projet Géotechnique	GC-MA3	**Vulliet**, Laurent (LMS)			
Wiedmer, Alexandre Claude (GC-MA3)	Projet de construction: Parking souterrain	GC-MA3	**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
Bourhis, Paul Marie	Internship	Visiting student : academic project.	01/2020	07/2020	**Laloui**, Lyesse (LMS); **Cousin**, Benoît (LMS)	École Centrale de Lyon, FR (European Universities and Research Centers)	
Cousin, Benoît (LMS)	Others	Scientific assistant / Machine learning techniques for the optimisation of geothermal system (GeoBrain project)	11/2018	08/2020	**Laloui**, Lyesse (LMS)		
Djerad, Sarah	Internship	Visiting student: academic project Caractérisation des géomatériaux par des essais en condition THM.	03/2020	06/2020	**Laloui**, Lyesse (LMS)	Université Gustave Eiffel, FR (European Universities and Research Centers)	

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
Duchemin, Antoine Maxime Paul	Internship	Visiting student: academic project	02/2020	06/2020	**Laloui**, Lyesse (LMS); **Peltier**, Margaux Marie Valérie (LMS)	École Centrale de Lyon, FR (European Universities and Research Centers)	
Katterbach, Maren (LMS)	Others	Scientific assistant / In-situ applications of bio-cementation for ground reinforcement	07/2019	10/2020	**Laloui**, Lyesse (LMS); **Terzis**, Dimitrios (LMS)		
Lucherini, Lorenzo (LMS)	Others	Scientific assistant / Microencapsulation for targeted delivery of MICP treatment and optimization of carbonate mineralization	03/2020		**Laloui**, Lyesse (LMS); **Terzis**, Dimitrios (LMS)		
Massaro, Silvestro	Internship	Visiting student: academic project Geomechanics, civil engineering and risks.	02/2020	06/2020	**Laloui**, Lyesse (LMS); **Madaschi**, Aldo (LMS)	Université Grenoble Alpes, FR (European Universities and Research Centers)	
Peltier, Margaux Marie Valérie (LMS)	Others	Scientific assistant / Development of geothermal-inspired technologies for existing built environments	01/2019		**Laloui**, Lyesse (LMS)		
Romanens, Natacha (LMS)	Apprenticeship	1st year apprentice, laborant en physique	08/2019		**Laloui**, Lyesse (LMS); **Dubey**, Patrick (LMS)		
Romann, Erwan (LMS)	Apprenticeship	1st year apprentice, laborant en physique	08/2016	07/2020	**Laloui**, Lyesse (LMS); **Dubey**, Patrick (LMS)		

Research

COVID impacts on your activities

How Covid affected your research activities
Covid had an awful impact on the research activities and on the functioning of the unit. The group collaboration and the scientific exchanges, which represent a vital part of the research dynamics, were irretrievably compromised. The most affected people have been the young Ph.D. students starting their academic careers.

Funded research projects

Title	Principal Investigator (PI)	Co-PI(s)	Funding organisation; Program	Granted amount (CHF)	Starting date	Duration (Months)	Status	External institution(s) involved	Which sustainability challenges does the project tackle?
ELEGANCY - Efficient generation of renewables H2 from Biomass, while harvesting geothermal heat and enabling negative CO2 emissions	Giardini Domenico	LALOUI Lyesse	Off. Conf.; Divers Confédération	45,000 out of 2,500,000	01.09.2017	36	Completed		
GeoBrain : A Machine Learning approach to the optimisation of geothermal systems.	Cousin Benoît Claude Henri	Cousin Benoît Claude Henri	FNS; BRIDGE	97,149 out of 97,149	01.09.2019	12	Completed		
Experimental assessment of shale properties for safe geological CO2 storage	LALOUI Lyesse		Non lucr.; Mont Terri	10,000 out of 10,000	01.09.2019	10	Completed		
MeduSoil: Ground Bio-stabilization	Terzis Dimitrios	Terzis Dimitrios	FNS; BRIDGE	150,394 out of 150,394	01.07.2019	18	Completed		
Experimental assessment of shale properties for safe geological CO2 storage	LALOUI Lyesse		Non lucr.; Mont Terri	10,000 out of 10,000	01.09.2018	22	Completed		

Title	Principal Investigator (PI)	Co-PI(s)	Funding organisation; Program	Granted amount (CHF)	Starting date	Duration (Months)	Status	External institution(s) involved	Which sustainability challenges does the project tackle?
DOn (prix BCV)	LALOUI Lyesse	LALOUI Lyesse	Non lucr.; BCV	132,000 out of 132,000	01.11.2018	24	Completed		
SoE - Supply of Electricity	AVELLAN François	SCHLEISS ANTON; LALOUI Lyesse; Lehning Michael; Lecampion Brice; Violay Marie	Off. Conf.; CTI / KTI	310,000 out of 18,200,120	01.01.2017	48	Completed		
Construction & Environmental Biocementation in REal World Applications	LALOUI Lyesse		H2020; Excellent Science	162,150 out of 162,150	01.02.2021	18	Granted		
Study on effective stress definition for gas shales in partially water saturated conditions	Lyesse LALOUI		; Chevron USA Inc.	150,000 out of 150,000	06.12.2017	37	Industrial contract		
THM-model validation in the context of the FE modelling Task Force	Lyesse LALOUI		; NAGRA National Cooperative for the Disposal of Radioactive Waste	180,000 out of 180,000	01.01.2019	36	Industrial contract		
Triaxial tests for buffer bentonite on rock shear	Lyesse LALOUI		; AINS (A-Insinnöörit Civil Oy)	51,000 out of 51,000	01.07.2019	10	Industrial contract		
Support in geomechanical test analysis : conclusion of benchmark study and derivation of reference parameters	Lyesse LALOUI		; NAGRA National Cooperative for the Disposal of Radioactive Waste	64,000 out of 64,000	01.07.2019	8	Industrial contract		

Title	Principal Investigator (PI)	Co-PI(s)	Funding organisation; Program	Granted amount (CHF)	Starting date	Duration (Months)	Status	External institution(s) involved	Which sustainability challenges does the project tackle?
Study on effective stress definition for gas shales in partially water saturated conditions - Avenant 1	Lyesse LALOUI		; Chevron USA Inc.	30,000 out of 30,000	06.12.2017	37	Industrial contract		
Geomechanical behavior of Opalinus Clay: time-dependent, scale effects and constitutive model validation	Lyesse LALOUI		; NAGRA National Cooperative for the Disposal of Radioactive Waste	300,000 out of 300,000	01.11.2019	32	Industrial contract		
Avenant : Support in geomechanical test analysis : conclusion of benchmark study and derivation of reference parameters	Lyesse LALOUI		; NAGRA National Cooperative for the Disposal of Radioactive Waste	0 out of 0	01.08.2018	23	Industrial contract		
Support in geomechanical test analysis: planning, evaluation and synthesis of tests from cores of deep boreholes	Lyesse LALOUI		; NAGRA National Cooperative for the Disposal of Radioactive Waste	117,000 out of 117,000	01.05.2020	24	Industrial contract		
Triaxial tests for buffer bentonite on rock shear- Avenant 1	Lyesse LALOUI		; AINS (A-Insinnöörit Civil Oy)	0 out of 0	30.04.2020	12	Industrial contract		
Enerdrape : Transforming underground parking into heat exchangers	Peltier Margaux Marie Valérie	Peltier Margaux Marie Valérie	FNS; BRIDGE	129,612 out of 129,612	01.11.2020	12	Ongoing		

Title	Principal Investigator (PI)	Co-PI(s)	Funding organisation; Program	Granted amount (CHF)	Starting date	Duration (Months)	Status	External institution(s) involved	Which sustainability challenges does the project tackle?
Visualising the impact of CO2 on the microstructure of an argillaceous caprock	Stavropoulou Eleni	Stavropoulou Eleni	FNS; FNS-SPARK	100,000 out of 100,000	01.12.2020	12	Ongoing		
Experimental assessment of shale properties for safe geological CO2 storage	LALOUI Lyesse	Tinguely Barbara	Non lucr.; Mont Terri	10,000 out of 10,000	01.10.2020	15	Ongoing		
European Joint Programme on Radioactive Waste Management	GARCIA Marie	LALOUI Lyesse	H2020; Other	273,862 out of 35,142,221	01.06.2019	60	Ongoing		
Comportement Thermo-Hydro-Mechanique du Callovo-Oxfordien sous chargement thermique	LALOUI Lyesse		INT Governmental; ANDRA	307,500 out of 307,500	01.08.2019	48	Ongoing		
INNOBOOSTER MEDUSOIL	Terzis Dimitrios		Non lucr.; GR Stiftung	130,000 out of 130,000	01.06.2019	21	Ongoing		
BIOGEOS - Bio-mediated Geo-material Strengthening for engineering applications	LALOUI Lyesse		H2020; Excellent Science	2,991,544 out of 2,991,544	01.11.2018	66	Ongoing		
Cyclic Thermo-Mechanical Behaviour of Energy Piles	LALOUI Lyesse		FNS; FNS-Project Funding	450,000 out of 450,000	01.11.2017	42	Ongoing		
BEACON - Bentonite Mechanical Evolution	Ferrari Alessio	LALOUI Lyesse	Autres EU; Euratom	268,193 out of 4,131,368	01.06.2017	60	Ongoing		

Title	Principal Investigator (PI)	Co-PI(s)	Funding organisation; Program	Granted amount (CHF)	Starting date	Duration (Months)	Status	External institution(s) involved	Which sustainability challenges does the project tackle?
Hostlng 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		

Other funded research projects

Empty category

Funded equipment

Empty category

Research facilities

Empty category

Awards

Awardee(s)	Name of prize / Competition	Place / Organization	Award description / URL	Prize sum (CHF)
Laloui, Lyesse (LMS)	Kersten Lecture	Minneapolis / ASCE	Lecture title: "Energy Geotechnology: A New Era for Geotechnical Engineering Practice"	

Publications & Presentations

Resources retrieved from Infoscience

Journal articles

Data	Not produced at EPFL	Peer reviewed	Key	Which sustainability challenges does the publication tackle?
Venkatesh C., Laurenti M., Bandeira M., Lanzagorta E., Lucherini L., Cauda V., Devine D. M.., ***Biodegradation and Antimicrobial Properties of Zinc Oxide-Polymer Composite Materials for Urinary Stent Applications***, in Coatings, vol. 10, num. 10, p.1002 , 2020, Abstract: yes, Status: published		✓		
Ravera E., Sutman M., Laloui L., ***Cyclic thermomechanical response of fine-grained soil-concrete interface for energy piles applications***, in Canadian Geotechnical Journal, vol. 58, num. 8, p.1216-1230 , 2020-10-23, Abstract: yes, Status: published		✓		
Zannin J., Rotta Loria A. F.., Llabjani Q., Laloui L., ***Extension of Winkler's solution to non-isothermal conditions for capturing the behaviour of plane geostructures subjected to thermal and mechanical actions***, in Computers and Geotechnics, vol. 128, p.103618 , 2020-09-18, Abstract: yes, Status: published		✓		
Terzis D., Hicher P., Laloui L., ***Direct currents stimulate carbonate mineralization for soil improvement under various chemical conditions***, in Scientific Reports, vol. 10, p.17014 , 2020-10-12, Abstract: yes, Status: published		✓		
Hata T., Saracho A. C., Haigh S. K.., Yoneda J., Yamamoto K., ***Microbial-induced carbonate precipitation applicability with the methane hydrate-bearing layer microbe***, in Journal Of Natural Gas Science And Engineering, vol. 81, p.103490 , 2020, Abstract: yes, Status: published		✓		
Meligrana G.., Ferrari S.., Lucherini L.., Cele J.., Colo F.., Brugger J.., Ricciardi C.., Ruffo R.., Gerbaldi C.., ***Na3V2(PO4)(3)-Supported Electrospun Carbon Nanofiber Nonwoven Fabric as Self-Standing Na-Ion Cell Cathode***, in Chemelectrochem, vol. 7, num. 7, p.1652-1659 , 2020-04-01, Abstract: yes, Status: published		✓		
Ravera E., Sutman M., Laloui L., ***Load Transfer Method for Energy Piles in a Group with Pile–Soil–Slab–Pile Interaction***, in Journal of Geotechnical and Geoenvironmental Engineering, vol. 146, num. 6, p.1-17, 04020042 , 2020-04-06, Abstract: yes, Status: published		✓		
Kim D., Mahabadi N., Jang J., van Paassen L. A.., ***Assessing the Kinetics and Pore-Scale Characteristics of Biological Calcium Carbonate Precipitation in Porous Media using a Microfluidic Chip Experiment***, in Water Resources Research, vol. 56, num. 2, p.e2019WR025420 , 2020-02-06, Abstract: yes, Status: published	✓	✓		
Shahnazari H.., Laloui L., Kouzegaran S., Jafarian Y.., ***Prediction and experimental evaluation of soil-water retention behavior of skeletal calcareous soils***, in Bulletin of Engineering Geology and the Environment, vol. 79, num. 5, p. 2395-2410 , 2020-07-01, Abstract: yes, Status: published	✓	✓		
Rotta Loria A. F., Laloui L., Catala Oltra V.., ***Equivalent pier analysis of full-scale pile groups subjected to mechanical and thermal loads***, in Computers and Geotechnics, vol. 120, p.103410 , 2020, Abstract: yes, Status: published		✓		

Data	Not produced at EPFL	Peer reviewed	Key	Which sustainability challenges does the publication tackle?
Ferrari A., Rosone M.., Ziccarelli M.., Giger S..B.., ***The shear strength of Opalinus Clay shale in the remoulded state***, in Geomechanics for Energy and the Environment, vol. 21, p.100142 , 2020, Abstract: yes, Status: published		✓		
Schäfers A., Gens A., Rodriguez-Dono A., Baxter S., Tsitsopoulos V., Holton D., Malmberg D., Sawada M., Qiao Y., Ferrari A., Laloui L., Sjöland A., ***Increasing understanding and confidence in THM simulations of Engineered Barrier Systems***, in Environmental Geotechnics, vol. 7, num. 1, p.59-71 , 2020, Abstract: yes, Status: published	✓	✓		
Sütman M., Speranza G., Ferrari A., Larrey-Lassalle P., Laloui L., ***Long-term performance and life cycle assessment of energy piles in three different climatic conditions***, in Renewable Energy, vol. 146, p.1177-1191 , 2020, Abstract: yes, Status: published		✓		

Conference papers

Data	Peer reviewed	Key	Which sustainability challenges does the publication tackle?
Tarantino A., El Mountassir G., Wheeler S., Gallipoli D., Russo G., Augarde C., Urciuoli G., Pirone M., Stokes A., van de Kuilen J. W., Gard W., Fourcaud T., Romero E., Priegue A., Smith C. C.., Larrey-Lassalle P., Becker P., Ferrari A., Dainese R., Salifu E., Beber R., Scarfone R., Cuccurullo A., Coudert E., Dias S., Mmuguda-Viswanath S., Rossi L. M.. W.., Kamath A., Fraccica A., Karagianni P., Castejon J. G., Ouakka S., Zannin J., Speranza G., ***TERRE project: interplay between unsaturated soil mechanics and low-carbon geotechnical engineering***, 4th European Conference on Unsaturated Soils (E-UNSAT), Lisboa, PORTUGAL, Oct 19-21, 2020, Abstract: yes, Status: published	✓		
Incollingo S., Ferrari A., Musso G., ***Numerical investigation on water exchange of shale samples***, 4th European Conference on Unsaturated Soils (E-UNSAT), Lisboa, PORTUGAL, Oct 19-21, 2020, Abstract: yes, Status: published	✓		
Buttice V., Ferrari A., Gragnano C. G.., Gottardi G., ***Hydro-mechanical behaviour of a sandy silt from a river embankment***, 4th European Conference on Unsaturated Soils (E-UNSAT), Lisboa, PORTUGAL, Oct 19-21, 2020, Abstract: yes, Status: published	✓		
Rosone M., Ferrari A., ***Water retention behaviour of compacted and reconstituted scaly clays***, 4th European Conference on Unsaturated Soils (E-UNSAT), Lisboa, PORTUGAL, Oct 19-21, 2020, Abstract: yes, Status: published	✓		
Buttice V., Ferrari A., Rosone M., ***Yielding of a quartz sand from saturated to dry state***, 4th European Conference on Unsaturated Soils (E-UNSAT), Lisboa, PORTUGAL, Oct 19-21, 2020, Abstract: yes, Status: published	✓		
Terzis D., Hicher P., Laloui L., ***Benefits and drawbacks of applied direct currents for soil improvement via carbonate mineralization***, 4th European Conference on Unsaturated Soils (E-UNSAT 2020), Lisboa, Portugal, October 19-21, 2020, Abstract: yes	✓		
Rotta Loria A. F.., Zannin J., Llabjani Q., Laloui L., ***Analytical solution for describing the thermo-mechanical behavior of plane energy geostructures***, 2nd International Conference on Energy Geotechnics (ICEGT 2020), La Jolla, USA, September 20-23, 2020, Abstract: yes	✓		

Data	Peer reviewed	Key	Which sustainability challenges does the publication tackle?
Kim J., Ferrari A., Ewy R., Laloui L., ***Developing a high capacity axis translation apparatus for gas shale testing***, 4th European Conference on Unsaturated Soils, E-UNSAT 2020, Lisboa, Portugal, October 19-21th, 2020, Abstract: yes	✓		
Speranza G., Ferrari A., Laloui L., ***A physical model for the interaction between unsaturated soils and retaining structures***, 4th European Conference on Unsaturated Soils, E-UNSAT 2020, Lisboa, Portugal (Virtual event), October 19-21, 2020, Abstract: yes	✓		
Tuttolomondo A., Ferrari A., Laloui L., ***An extended generalized effective stress for active clays***, 4th European Conference on Unsaturated Soils, E-UNSAT 2020, Lisboa, Portugal (Virtual event), 19-21st October 2020, Abstract: yes	✓		
Laloui L., Ferrari A., Bosch Llufriu J. A., ***Bentonite clay barriers in nuclear waste repositories***, 2nd International Conference on Energy Geotechnics (ICEGT 2020) , California, USA, Septembre 20-23, 20202, Abstract: yes	✓		
Bosch Llufriu J. A., Ferrari A., Laloui L., ***A coupled hydro – mechanical approach for modelling the volume change behaviour of compacted bentonite***, 4th European Conference on Unsaturated Soils (E-UNSAT 2020), Lisboa, Portugal, Octobre 19-21, 2020, Abstract: yes	✓		
Bosch Llufriu J. A., Ferrari A., Laloui L., ***A numerical study on the coupled hydro-mechanical behaviour of compacted bentonite***, 2nd International Conference on Energy Geotechnics (ICEGT 2020) , California, USA, Septembre 20-23, 2020, Abstract: yes	✓		
Ravera E., Sütman M., Laloui L., ***Load transfer approach for the geotechnical analysis of energy piles in a group with slab***, 2nd International Conference on Energy Geotechnics (ICEGT 2020), California, USA, April 10-13, 2020, Abstract: yes	✓		
Garbellini C., Laloui L., ***Performance of Energy Piles Considering Reinforced Concrete Non-Linearity***, 1st Session on Foundations, Soil Improvement, And Erosion at Geo-Congress on Vision, Insight, Outlook, Minneapolis, MN, Feb 25-28, 2020, Abstract: yes, Status: published	✓		
Terzis D., Laloui L., Dornberger S., Harran R., ***A Full-Scale Application of Slope Stabilization via Calcite Bio-Mineralization Followed by Long-Term GIS Surveillance***, Geo-Congress 2020, Minneapolis, Minnesota, US, February 25-28, 2020, Abstract: yes	✓		
Elmaloglou A., Terzis D., De Anna P., Laloui L., Mahé S., Miele F., ***Microfluidic-Based Study on the Activation and Evolution of Calcite Bio-Mineralization for Geotechnical Applications***, Geo-Congress on Biogeotechnics, Minneapolis, MN, US, February 25-28, Abstract: yes	✓		

Presentations & talks

Data	Key	Which sustainability challenges does the publication tackle?
Fryer B. P., Siddiqi G., Laloui L., Passelègue F. X. T., Violay M., ***Temperature preconditioning for EGS***, Swiss Geoscience Meeting 2020, Zurich, Switzerland, November 6-7, 2020, Abstract: no, Status: published		

Patents

Data	Key	Which sustainability challenges does the publication tackle?
Terzis D., Laloui L., Hicher P., ***System and method for ground consolidation***, 2020, Abstract: yes		

Data	Key	Which sustainability challenges does the publication tackle?
Laloui L., Rotta Loria A., ***Heat exchanger module and methods of using thereof***, 2020, Abstract: yes		

Technical reports

Data	Peer reviewed	Key	Which sustainability challenges does the publication tackle?
Crisci E., Laloui L., Giger S., ***TBO Bülach-1-1, Dossier IX: Rock mechanical and geomechanical laboratory testing (No. NAB 20-08)***, 2020, Abstract: no, Status: accepted	✓		
Schenk B., ***Station de Beaulieu et tunnel entre Beaulieu et Casernes pour le M3***, 2020-07-14, Abstract: no, Status: published	✓		

Theses

Data	Key	Which sustainability challenges does the publication tackle?
Zannin J., *Advisor(s): Laloui L.*, *Ferrari A.*, ***Thermomechanical behavior of underground energy infrastructures***, Thèse EPFL, n° 8450, 2020, Abstract: yes, Status: published		
Speranza G., *Advisor(s): Laloui L.*, *Ferrari A.*, ***Geotechnical and environmental performance of retaining structures in unsaturated soils***, Thèse EPFL, n° 8514, 2020, Abstract: yes, Status: published		
Fryer B. P., *Advisor(s): Laloui L.*, *Siddiqi G.*, ***Stress management in the context of induced seismicity in subsurface reservoirs***, Thèse EPFL, n° 8512, 2020, Abstract: yes, Status: published		

Media

Data	Key	Which sustainability challenges does the publication tackle?
Richter A., ***Swiss researchers share strategies on reducing induced seismicity***, in ThinkGeoEnergy , 2020-01-06, Abstract: yes		
ATS , ***Séismes induits par l'homme contrés***, in Le Nouvelliste , 2020-01-07, Abstract: yes		
LMS , ***Des pistes pour limiter les risques de catastrophes non naturelles***, in La Côte , 2020-01-07, Abstract: yes		
LMS , ***Récupérer la chaleur du sol***, in Vive la vie - Le magazine SIG du développement durable, p.2 , 2020, Abstract: yes		
Morel P., Laloui L., ***Séquestration du CO2: remettre le carbone à sa place***, in TRACES - décembre , 2020-12-04, Abstract: yes		
Suarez A., ***Heizwärme aus dem Tunnel***, in Haustech magazine, p.60-61 , 2020, Abstract: yes		

Other Open Resources

Other Open Teaching Resources

Empty category

Other Open Research Datasets

Empty category

Open research scripts and software

Empty category

Open Research scripts and software - Important recent additions

Empty category

Any other open research highlights from your lab ?

Empty category

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...	Which sustainability challenges does the collaboration tackle?
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); **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	Which sustainability challenges does the innovation tackle?
Laloui, Lyesse (LMS); **Rotta Loria**, Alessandro Francesco ; **Peltier**, Margaux Marie Valérie (LMS)	Start-up	Enerdrape - Modular geo-thermal panels to efficiently harvest energy (https://enerdrape.com/)	Climate change
Terzis, Dimitrios (LMS); **Laloui**, Lyesse (LMS); **Hicher**, Patrick	Patent	System and method for ground consolidation	Climate change | Urbanization and territorial development

Distinguished work

Author(s)	Article title	Journal & Pages	Publication date	Which sustainability challenges does the work tackle?
Peltier, Margaux Marie Valérie (LMS); **Rotta Loria**, Alessandro Francesco ; **Laloui**, Lyesse (LMS)	101 Exciting Renewable Energy Companies that are a must follow. This article showcases Startup Pill's top picks for the best Renewbale Energy startups. These startups are taking a variety of approaches to innovating inside of Renewables Market and around the world. They are all exceptional startups well worth a follow. Enerdrape was selected and figured at 48th position. https://startupill.com/101-exciting-renewable-energy-companies-that-are-a-must-follow/	Startupill.com	23.11.20	Climate change

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)	

Visiting scholars

Visitor	Home Institution	Additional information on home institution	Aim of visit, Duration
Alonso, Eduardo	Polytechnic University of Catalonia (BarcelonaTech), ES (European Universities and Research Centers)		Lecturer at GETE Winter School, Villars-sur-Ollon.
Detournay, Emmanuel	University of Minnesota, US (World Universities and Research Centers)		Prof. Emmanuel Detournay has been awarded the 2020 EPFL Distinguished Lecture in Geomechanics for his significant contributions to the fields of hydraulic fracturing, drilling dynamics, and poroelasticity. The lecture will be held on January 20th, 2020 and is entitled, "The role of scaling in geomechanics". https://gete-school.epfl.ch/epfl-distinguished-lecture-in-geomechanics/
Ewy, Russell Thomas	Chevron Corporation, US (Private sector)		Lecturer at GETE Winter School, Villars-sur-Ollon.
Hueckel, Tomasz	Duke University, US (World Universities and Research Centers)		Lecturer at GETE Winter School, Villars-sur-Ollon
Sulem, Jean	Ecole des Ponts ParisTech, FR (European Universities and Research Centers)		Lecturer at GETE Winter School, Villars-sur-Ollon.

Alumni

Alumnus	Level	First position out of lab	Country	Sector of activity
Fryer, Barnaby Padraig (LEMR)	PhD	Post doc	Switzerland	Academia

Alumnus	Level	First position out of lab	Country	Sector of activity
Garbellini, Cristiano (EDME)	PhD	Engineer	Switzerland	Industry
Kim, Daehyun (LMS)	Post doc	Researcher	USA	Academia
Lee, Kwangwoo (LMS)	Post doc	Researcher	South Korea	Academia
Speranza, Gianluca (LMS)	PhD	Engineer	Switzerland	Industry
Zannin, Jacopo (LMS)	PhD	Engineer	Switzerland	Industry

Distinguished alumni

Alumnus	Achievement / Distinction
Terzis, Dimitrios (LMS)	Forbes European Class of 30 Under 30, in the category Industry and Manufacturing

Organization of events

Date (month)	Location (if held in person)	Event title	Key people in lab involved	Description / URL
01/2020	Villars-sur-Ollon	Winter School on Geomechanics for Energy and the Environment. 3rd Edition	**Laloui**, Lyesse (LMS); **Ferrari**, Alessio (LMS)	Geomechanics, Environment and Energy are increasingly related and contemporary themes. The goal of the school is to provide the participants with a deep understanding on selected topics in Geomechanics which are fundamental for applications related to Energy and the Environment.
09/2020	Online	BioGeotechnics Webinar / 5 Little Known Keys For Successful Biogeotechnical Practice	**Laloui**, Lyesse (LMS); **Terzis**, Dimitrios (LMS); **Clarà Saracho**, Alexandra (LMS); **Katterbach**, Maren (LMS)	https://memento.epfl.ch/event/biogeotechnics-webinar-5-little-known-keys-for-suc/

Invited talks and contributions to events

Date (month)	Location (if held in person)	Event title	Key people in lab involved	Role / Talk title	Description / URL	Organizing institution (if not EPFL)	Additional information on organizing institution
02/2020	Minneapolis, USA	Geo-congress 2020	**Laloui**, Lyesse (LMS)	Kersten Lecturer / Energy Geotechnology: A New Era for Geotechnical Engineering Practice	https://www.geocongress.org/	American Society of Civil Engineers (ASCE), US (World Universities and Research Centers)	

Date (month)	Location (if held in person)	Event title	Key people in lab involved	Role / Talk title	Description / URL	Organizing institution (if not EPFL)	Additional information on organizing institution
02/2020	Minneapolis, USA	ASCE Geo-Banquet	**Laloui**, Lyesse (LMS)	Keynote lecture / Tailor-made soil properties with novel bio-geo-chemical means	https://ascemn.org/	American Society of Civil Engineers (ASCE), US (World Universities and Research Centers)	
10/2020	Online	E-UNSAT 2020 – Unsaturated Horizons	**Laloui**, Lyesse (LMS)	Keynote lecture / Clay barriers in nuclear waste repositories	https://eunsat2020.tecnico.ulisboa.pt/	University of Lisbon, PT (European Universities and Research Centers)	
10/2020	Online	Advancements in Geotechnical Engineering from Research to Practice	**Terzis**, Dimitrios (LMS)	Keynote lecture / The essentials for successful biogeotechnical practice	https://www.age-rp.com/past-lectures		

News / Actus

News channel	Title, Date	Heading	Authors	Links	Which sustainability challenges does the news tackle?
LMS	***Keynote lecture by Prof. Laloui at the Energy Geotechnics Conference*** 15.01.2020	Prof. Lyesse Laloui will deliver a Keynote lecture at the 2nd International Conference on Energy Geotechnics which will be held in La Jolla, California, in September 2020.		Conference website ; Prof. Lyesse Laloui	
LMS	***Enerdrape mentionné dans le nouveau numéro de PME Magazine*** 30.01.2020	Dans le nouveau numéro de Février 2020, PME Magazine met à l'honneur l'innovation et le futur des PME suisses dans un dossier spécial Foward 2020.		Climate KIC ; ClimateLaunchpad ; Enable ; Enerdrape ; Innoseed ENAC ; Laboratoire de mécanique des sols ; Margaux Peltier ; Prof. Lyesse Laloui	

News channel	Title, Date	Heading	Authors	Links	Which sustainability challenges does the news tackle?
LMS	***Le LMS fait les grands titres : réduire la sismicité induite*** 04.02.2020	Un récent article signé par des chercheurs du LMS a présenté une stratégie pour préconditionner le champ de contraintes avant la stimulation d'un potentiel système géothermique. En modifiant l'état de contrainte, l'éventuelle stimulation du réservoir par cisaillement, nécessaire pour rendre le réservoir économiquement viable, est moins susceptible d'entraîner de grands événements sismiques.		Article Geophysical Journal International ; Article La Côte ; Article La Liberté ; Article Le Nouvelliste ; Article Think Geo-Energy ; Laboratoire de mécanique des sols	
LMS	***Tunnels énergétiques: nouveautés en énergie et techniques du bâtiment*** 05.02.2020	Un article sur les avancées récentes des tunnels énergétiques est paru dans le magazine Haustech, qui référence les derniers développements et actualités dans le secteur de l'énergie et des techniques du bâtiment en Suisse.			
LMS	***Dr. Terzis sur la prestigieuse liste Forbes 2020 30Under30 Europeans*** 18.03.2020	Félicitations ! Au nom du Laboratoire de mécanique des sols (LMS) de l'EPFL, nous sommes ravis d'annoncer que notre chercheur post-doc, Dimitrios Terzis, est dans la classe européenne Forbes 30Under30 de cette année 2020, dans la catégorie Industrie et Manufacturing.		Dr. Dimitrios Terzis ; ForbesUnder30 ; Laboratoire de mécanique des sols ; MeduSoil	
LMS	***Les géo-structures énergétiques marquent le rapport annuel EPFL 2019*** 19.04.2020	Dans le rapport annuel 2019 de l'EPFL, tout un article est consacré à une étude menée par des chercheurs du LMS, qui propose de convertir un tunnel de métro en source d'énergie géothermique.		EPFL annual report 2019 ; Laboratoire de mécanique des sols ; Link to article ; Link to paper	
LMS	***Vers une Géotechnique Durable*** 06.05.2020	Le Laboratoire de mécanique des sols (LMS) a participé au projet européen TERRE, un réseau de formation innovant qui a permis la collaboration entre 14 institutions universitaires et industrielles de toute l'Europe (Horizon 2020 Marie-Sklodowska Curie Action), avec l'objectif de développer des technologies nouvelles pour concevoir des infrastructures géotechniques à faibles émissions carbone.		Laboratoire de mécanique des sols ; TERRE	
LMS	***Performances thermomécaniques des groupes de pieux énergétiques*** 12.05.2020	Un projet de recherche au Laboratoire de mécanique des sols (LMS) a approfondi les performances thermomécaniques des géo-structures énergétiques, en particulier ceux des pieux thermo-actifs.		Laboratoire de mécanique des sols	

News channel	Title, Date	Heading	Authors	Links	Which sustainability challenges does the news tackle?
LMS	***Le Leman Express Alimente des Géostructures Energétiques*** 12.06.2020	Laloui's Research Group (Laboratoire de Mécanique des Sols LMS) développe un projet pionnier in-situ, lié à l'évaluation du potentiel thermique des géostructures énergétiques installées à la gare souterraine de Lancy-Bachet à Genève. Ce projet est développé en collaboration avec SIG (Services Industriels de Genève), BG Ingénieurs Conseils et l'Office cantonale de l'énergie.		Laboratoire de mécanique des sols ; Link to Article	
LMS	***La Kersten Lecture 2020 par Prof. Lyesse Laloui*** 23.06.2020	Présentation du Prof. Lyesse Laloui durant la prestigieuse Kersten Lecture lors d'une session plénière de l'Association Américaine de Génie Civil (ASCE) au Geo-congrès 2020 à Minneapolis en février dernier. La conférence est intitulée : « Energy Geotechnology : A New Era for Geotechnical Engineering Practice ».		Laboratoire de Mécanique des Sols ; Lecture Video ; Prof. Lyesse Laloui	
LMS	***Enerdrape reçoit le support de Venture Kick*** 15.07.2020	Après avoir convaincu le jury d'expert du programme Venture Kick, Enerdrape, la jeune pousse du LMS, continue son transfert technologique et reçoit 10'000 CHF de support de la part de Venture Kick.		Dr. Alessandro Rotta Loria ; Enerdrape ; Margaux Peltier ; Prof. Lyesse Laloui ; Venture Kick	
LMS	***Lyesse Laloui awarded a prestigious ERC Proof of Concept Grant*** 29.07.2020	Lyesse Laloui, professor at EPF Lausanne and director of the Soil Mechanics Laboratory (LMS) is awarded the prestigious Proof of Concept Grant (PoC) by the European Research Council (ERC). The grant adds up to the breakthrough developments achieved within the first 18 months of his previous advanced ERC-funded BIOGEOS project.		About Prof. Laloui Research Group ; BIOGEOS Project ; ERC press release July 2020 ; ERC Proof of Concept Grants ; Prof. Lyesse Laloui	
LMS	***Dr. Eleni Stavropoulou reçoit le financement Spark du Fonds National*** 24.08.2020	Dr. Eleni Stavropoulou, membre du groupe de recherche du Prof. Laloui à l'EPFL, reçoit le financement Spark du Fonds National Suisse de la Recherche Scientifique (FNS).		About Prof. Laloui Research Group ; Chaire Gaz Naturel ENAC ; Dr. Eleni Stavropoulou ; Spark SNF	
LMS	***Margaux Peltier et son projet Enerdrape gagnent un financement BRIDGE*** 07.09.2020	Margaux Peltier fait partie des 12 jeunes chercheurs ayant obtenu un financement de la part du programme BRIDGE Proof-of-concept lors du 15ème appel à projets. Ce financement permettra l'implémentation du projet de startup Enerdrape.		About Prof. Laloui Research Group (LMS) ; Enerdrape ; Margaux Peltier	

News channel	Title, Date	Heading	Authors	Links	Which sustainability challenges does the news tackle?
LMS	***Visualiser l'impact du CO2 sur la micro-structure d'un caprock*** 11.09.2020	Eleni Stavropoulou, du Laboratoire de Mécanique des Sols du Professeur Laloui, à l'EPFL, a obtenu une bourse du Fonds National Suisse pour étudier les modifications structurelles des roches de couverture (caprocks) en présence de dioxyde de carbone. Le projet s'inscrit dans le contexte du stockage souterrain du CO2 pour réduire les émissions de gaz à effet de serre.	Carlier Rémi	Un tunnel de métro converti en source d'énergie géothermique	
LMS	***Visualizing the effect of CO2 on caprock microstructures*** 11.09.2020	Eleni Stavropoulou, scientist in EPFL's Laboratory of Soil Mechanics (LMS) lead by Prof. Laloui, has been awarded a Swiss National Science Foundation grant to study how the presence of carbon dioxide alters the structure of caprocks. Her research dovetails with efforts to reduce greenhouse gas emissions by storing CO2 deep underground.	Carlier Rémi	Engineering heat out of metro tunnels	
LMS	***Session plénière du Prof Laloui à la prochaine 4ème conférence EUNSAT*** 22.09.2020	Le professeur Lyesse Laloui présentera la session plénière intitulée « Clay barriers in nuclear waste repositories » lors de la 4ème conférence européenne sur les sols non saturés « E-UNSAT 2020 - Horizons insaturés » qui se tiendra en ligne du 19 au 21 octobre 2020.		About Prof. Laloui Research Group (LMS) ; Conference Website ; Prof. Lyesse Laloui	
LMS	***Session plénière du Dr. Terzis à la série de conférences AGERP*** 25.09.2020	Dr. Dimitrios Terzis est invité à tenir une session plénière durant le prochain épisode de la série AGE-RP (Advancements in Geotechnical Engineering from Research to Practice) qui aura lieu le 3 octobre 2020.		AGERP Lecture Series ; AGERP Registration ; Dr. Dimitrios Terzis	
LMS	***Du courant électrique pour stabiliser les sols peu perméables*** 13.10.2020	Afin d'améliorer la stabilisation des sols argileux, une équipe de chercheurs de l'EPFL favorise l'agglomération des sédiments grâce à des ions carbonates et calcium et un courant électrique appliqué à la manière d'une pile. Un article est paru hier dans Scientific Reports.	Carron Cécilia	Laboratoire de mécanique des sols	
LMS	***Enerdrape reçoit un financement de Switzerland Innovation Tech4Impact*** 24.10.2020	Parmi les six projets gagnant, Margaux Peltier et le Laloui Research Group (LMS) recevront un financement de CHF 85 000 pour booster le développement technologique de la spin-off Enerdrape.		About Prof. Laloui Research Group (LMS) ; Enerdrape ; Margaux Peltier ; SI TECH4IMPACT	

News channel	Title, Date	Heading	Authors	Links	Which sustainability challenges does the news tackle?
LMS	***Enerdrape choisie parmi 101 startups d'énergie renouvelable à suivre!*** 23.11.2020	Enerdrape, une spin-off du Laloui Research Group (LMS), co-fondée par Margaux Peltier, Prof. Lyesse Laloui et Dr. Alessandro Rotta Loria, se positionne dans le classement du média The Startup Pill parmi les 101 startups à suivre dans le domaine des Energies renouvelables. Dans le monde entier, des startups à suivre de près ont été sélectionnées pour leurs approches innovantes ou leur croissance exceptionnelle.		About Prof. Laloui Research Group (LMS) ; Link to article ; Margaux Peltier ; Prof. Lyesse Laloui	
LMS	***Interview par Prof Laloui sur la séquestration du CO2 dans TRACÉS*** 08.12.2020	Le Prof. Lyesse Laloui, directeur du Laboratoire de mécanique des sols (LMS) de l'EPFL, parle de la séquestration du CO2 lors de son entretien avec le magazine TRACÉS dans le numéro de décembre.		About Prof. Laloui Research Group (LMS) ; Link to article ; Prof. Lyesse Laloui	

Services

EPFL committees and services

Name	Service	Role	Role in funding allocation
Ferrari, Alessio (LMS)	Doctoral School in Mechanics (EDME)	Commission member	no
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)	Faculty Search Committee for a position of Professor in Digital Infrastructure	Member	no
Laloui, Lyesse (LMS)	Faculty Search Committee for a position of Professor in Human-Centric Emerging Mobility	Member	no
Laloui, Lyesse (LMS)	Faculty Search Committee for a position of Professor in Sustainable Civil Engineering	Member	no

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

Name	Service	Role	Role in funding allocation
Ferrari, Alessio (LMS)	International School on "LAndslide Risk Assessment and Mitigation" (LARAM)	Member of the Scientific Committee	no
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) TC 308 “Energy Geotechnics”	Vicechair of the technical committee	no
Ferrari, Alessio (LMS)	International Society of Soil Mechanics and Geotechnical Engineering (ISSMGE) TC 101 “Unsaturated Soils”	Member of the technical committee	no
Ferrari, Alessio (LMS)	Sixth EAGE shale workshop 2019, Bordeaux, France	Member of the Scientific Committee	no
Ferrari, Alessio (LMS)	International Society of Soil Mechanics and Geotechnical Engineering (ISSMGE) TC 106 “Laboratory Testing”	Member of the technical 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)	Swiss Competence Center for Energy Research - Supply of Electricity	Member of the executive committee	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

Name	Service	Role	Role in funding allocation
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)	International journal Geomechanics for Energy and the Environment	Editor-in-Chief	no
Laloui, Lyesse (LMS)	Faculty Search Committee for a position of Professor in Engineering Geology at ETHZ	Member	no

Vision

Highlights / 8 key achievements

Highlights / Key achievements
1. Lyesse Laloui is awarded the prestigious Proof of Concept Grant (PoC) by the European Research Council (ERC) (https://actu.epfl.ch /news/lyesse-laloui-awarded-a-prestigious-erc-proof-of-2/) 2. Five doctoral theses have been defended at the LMS during 2020. 3. LMS has introduced a strategy to precondition the stress field of a potential Enhanced Geothermal System prior to stimulation (https://actu.epfl.ch/news/lms-makes-the-headlines-limiting-induced-seismicit/)

Goals

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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 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

Goals
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. 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.

Contribution to ENAC Strategy

*Contribution to ENAC Strategy in 2020 (please refer to the presentation of **ENAC strategy**)*

Contribution to ENAC Strategy
The LMS is actively contributing to the developments in sustainability and energy applications. The work conducted in the framework of the ERC project Biogeos has a great impact on the development of environmentally friendly soil improvement techniques. In the field of green energy and climate-change mitigation impacts, LMS is contributing with projects on energy geostructures, CO2 storage, and geological nuclear waste management.

Planned contribution to ENAC Strategy for the upcoming year(s)

Planned contribution to ENAC Strategy for the upcoming year(s)
Continuing developing cutting-edge research in the field of green energy, construction sustainability, and climate-change mitigation techniques.

Suggestions

Empty category

Others

Empty category

The activity report has not been validated by the head of the unit and can still be modified.

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