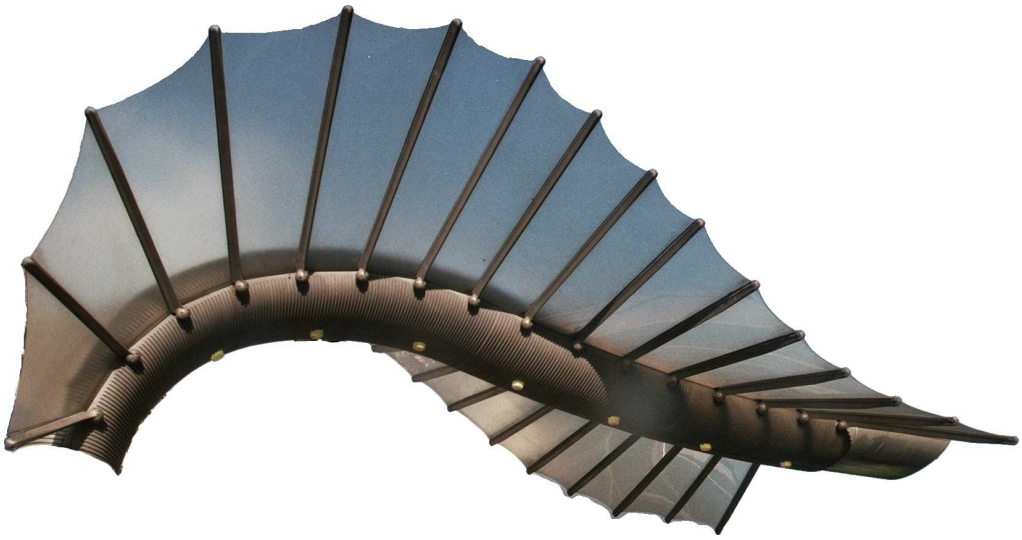
EUROPEAN MECHANICS SOCIETY

LMFA

EUROMECH colloquium 525

Instabilities and transition in three-dimensional flows with rotation



21–23 June 2011 — École centrale de Lyon — France

Laboratoire de mécanique des fluides et d'acoustique

http://lmfa.ec-lyon.fr/EC525/

Final programme

Scientific scope and topics

Shear flows are known to display a variety of spatio-temporal instabilities and very complex transition scenarios. The route from laminar flow to the fully turbulent régime cannot be understood without taking into account three-dimensional effects. Particularly interesting phenomena are observed in the presence of rotation — either external, through rotating boundaries, or internal, through large-scale vorticity. Recently, our understanding of such flows has been improved by technical advances in analysis and experiments as well as a vast increase in computational capabilities. This allows consideration of increasingly complex mean flow distortions. The hydrodynamic stability community and the turbulence community tackle the additional complexity arising from three-dimensional coupling with different techniques. These techniques can however be compared and, whenever possible, linked.

By bringing together experts in experimental, analytical and numerical approaches, this colloquium attempts to clarify the global picture prevailing near transition and to narrow the gap between stability and turbulence analyses. It is expected that the development of modern analytical tools will suggest new experiments, and that novel experimental observations will in turn inspire more theoretical work.

Contributions have been received from the following topics:
- Three-dimensional boundary layers
- Flows around or inside rotating bodies
- Vortex breakdown
- Spatio-temporal development of perturbations
- Transition scenarios
- Flow control
- Transient phenomena
- Inhomogenous and anisotropic turbulence

Organizing committee

Chairman:
Benoît PIER, LMFA, CNRS—Université de Lyon

Co-chairmen:
Fabien GODEFERD, LMFA, CNRS—Université de Lyon
Nigel PEAKE, DAMTP, Cambridge University, UK

Scientific committee:
François GALLAIRE, École polytechnique fédérale de Lausanne, Switzerland
Matthew P. JUNIPER, Engineering, Cambridge University, UK
Robert RUBINSTEIN, NASA Langley, US

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ÉCOLE CENTRALE LYON École centrale de Lyon

LMFA Laboratoire de mécanique des fluides et d'acoustique

EUROPEAN MECHANICS SOCIETY EUROMECH

ERCOFTAC Ercoftac

AFM Association française de mécanique

Scientific programme

Tuesday, June 21, 2011

8:30–9:30	Registration

9:30–10:00	Welcome and Opening

	Session 1	*chair: B. Pier*
10:00–10:40	**Towards a direct route to turbulence in an open rotating cavity**	É. Serre, B. Viaud & J.-M. Chomaz
10:40–11:10	Coffee break	
11:10–11:30	Local and global stability of rotating disk boundary layers	C. Davies & C. Thomas
11:30–11:50	An experimental study of laminar–turbulent transition of a rotating-disk flow	S. Imayama, P. H. Alfredsson & R. J. Lingwood
11:50–12:10	Response to localized forcing of the boundary layer on a rotating disk	M. Vasudevan, M. E. Siddiqui, B. Pier, J. Scott, A. Azouzi, R. Michelet & C. Nicot
12:10–12:30	Instability of stationary streamwise vortices embedded in a swept-wing boundary layer	V. Kozlov, V. Chernoray, A. Dovgal & L. Löfdal

12:30–14:30	Lunch

	Session 2	*chair: F. Gallaire*
14:30–15:10	**Resonances of a rotor/stator cavity in the vicinity of the critical point of SF6**	P. Le Gal & G. Verhille
15:10–15:30	Local linear stability analysis of a turbulent, swirling jet undergoing vortex breakdown	L. Rukes, K. Oberleithner & C. O. Paschereit
15:30–15:50	Sensitivity analysis of spiral vortex breakdown	U. Qadri, D. Mistry & M. P. Juniper
15:50–16:10	Structural transitions and stability in swirling compressible flows	A. Ni
16:10–16:40	Coffee break	
16:40–17:00	Control of vortex breakdown by density effects	P. Meunier, M.-Z. P. Ismadi, A. Fouras & K. Hourigan
17:00–17:20	Large eddy simulation of swirling jet flow undergoing vortex breakdown including nozzle modeling	T. Luginsland & L. Kleiser
17:20–17:40	Fan tone generation in an isolated rotor due to unstable secondary flow structures	D. Wolfram, T. Carolus & M. Sturm
17:40–18:00	Segregation-band dynamics in particle-laden rimming flow	P. J. Thomas & E. Guyez
18:00–18:20	Cluster formation for incompressible viscous fluid/rigid solid particle mixtures in rotating cylinders	R. Glowinski & T.-W. Pan

Wednesday, June 22, 2011

	Session 3	*chair: N. Peake*
9:00–9:40	**Global instability of flows across a junction**	J. J. Healey
9:40–10:00	Stability of unsteady flow in a rotating torus	J. P. Denier, R. E. Hewitt, A. L. Hazel & R. J. Clarke
10:00–10:20	Instabilities in Taylor–Couette–Poiseuille flow with porous cylinders	D. Martinand, N. Tilton, É. Serre & R. M. Lueptow
10:20–10:40	Secondary instability of stratified Ekman layer roll vortices	N. Mkhinini, T. Dubos & P. Drobinski
10:40–11:10	Coffee break	
11:10–11:30	A study on the 3D inertial instability mechanism in the sub-mesoscale ocean	A. Lazar, A. Stegner & E. Heifetz
11:30–11:50	Sloshing modes and singular inertial modes in a cylindrical tank rotating around its axis	D. Fabre, J. Mougel & L. Lacaze
11:50–12:10	Flow instabilities in a vertical differentially rotating cylindrical annulus with a radial temperature gradient	I. Mutabazi, R. Guillerm, A. Prigent, V. Lepiller & S. Malik
12:10–12:30	Multivariate data analysis methods for detecting baroclinic wave interactions in the thermally driven rotating annulus	T. von Larcher, U. Harlander & C. Egbers

12:30–14:30	Lunch

	Session 4	*chair: M. P. Juniper*
14:30–15:10	**Dynamo action in finite cylinders**	C. Nore, J.-L. Guermond, J. Léorat & F. Luddens
15:10–15:30	Dynamics of flows with helical symmetry	M. Rossi, I. Delbende & B. Piton
15:30–15:50	Spatio-temporal development of instabilities in helical vortices	H. Bolnot, S. Le Dizès & T. Leweke
15:50–16:10	Development of helical vortex theory	V. Okulov
16:10–16:40	Coffee break	
16:40–17:00	A unified criterion for the centrifugal instability of vortices and swirling jets	P. Billant & F. Gallaire
17:00–17:20	Transition characteristics of a swirling annular flow	A. H. González Araya
17:20–17:40	Axisymmetric vortex breakdown in constricted pipes	F. Gallaire & P. Meliga
17:40–18:00	Influence of piston position on the scavenging and swirling flow in two-stroke Diesel engines	A. Obeidat, S. Haider, K. E. Meyer, T. Schnipper, S. Mayer & J. H. Walther

20:00	Banquet at Brasserie Georges

Thursday, June 23, 2011

	Session 5	*chair: F. S. Godeferd*
9:00–9:40	**Anisotropic energy transfers in decaying rotating turbulence**	F. Moisy, C. Lamriben & P.-P. Cortet
9:40–10:00	On the relation between the equations for large-eddy simulations of turbulent flow and for weakly nonlinear evolution of disturbances for flows in transition	V. I. Vasanta Ram
10:00–10:20	Inertia–gravity waves during the transition towards geostrophic turbulence within a baroclinic cavity	A. Randriamampianina
10:20–10:40	Experimental investigation of transition to turbulence in a magnetic obstacle	F. Samsami, A. Thess & Y. Kolesnikov
10:40–11:10	Coffee break	
11:10–11:30	Experimental investigation on torque scaling in turbulent Taylor–Couette flow	S. Merbold & C. Egbers
11:30–11:50	Experimental evidence of a phase transition in a turbulent swirling flow	P.-P. Cortet, A. Chiffaudel, F. Daviaud, B. Dubrulle & E. Herbert
11:50–12:10	Excitation of inertial modes in a closed grid turbulence experiment under rotation	C. Lamriben, P.-P. Cortet, F. Moisy & L. R. M. Maas
12:10–12:30	Grid turbulence in solid body rotation	P. Orlandi

12:30–14:30	Lunch

	Session 6	*chair: B. Rubinstein*
14:30–15:10	**Spanwise rotation effects on shear flow**	P. H. Alfredsson, N. Tillmark & T. Tsukahara
15:10–15:30	Turbulent flow in rotating ribbed channel with Coriolis forces and centripetal buoyancy	R. Van den Braembussche, P. Coletti, I. Cresci & T. Arts
15:30–15:50	Turbulence and instabilities in rotating channel flow simulations	G. Brethouwer, P. Schlatter & A. V. Johansson
15:50–16:10	Laminar–turbulent patterns in rotating plane Couette flow	Y. Duguet, G. Brethouwer & P. Schlatter
16:10–16:30	Streamwise rotating Poiseuille flow: modal and non-modal stability analyses	G. Khujadze, J.-P. Hickey & M. Oberlack
16:30–16:50	Transition from quasi-2D to 3D in a rotating electromagnetically forced dipolar flow structure	M. Duran-Matute, G. Di Nitto, R. Trieling & G. van Heijst

16:50–17:30	Closing and coffee

General information

Venue

The EUROMECH Colloquium 525 on "Instabilities and transition in three-dimensional flows with rotation" will be held on the campus of École centrale de Lyon, located in Écully, on the western outskirts of Lyon. All presentations will take place in the newly refurbished conference room 3, ground floor of building W1. Room 105, on first floor of building W1, is also reserved for the colloquium and may be used by those wishing to work.

École centrale de Lyon is easily accessible from Lyon town center (30 min by Bus 55 from Perrache train station or 20 min by Bus 3 from Gorge-de-Loup metro station).

Enquiries

During the colloquium, all enquiries should be addressed to:

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Fax: +33 (0)4 78 64 71 45
email: ec525@lmfa.fr
web site: http://lmfa.ec-lyon.fr/EC525/

Badges

Each participant will receive a name badge upon registration. All participants are requested to wear their badge during all the conference activities.

Meals and refreshments

In the morning and afternoon breaks, coffee and refreshments will be served in front of the conference room. Lunches will be served daily at 12:30 in the on-campus restaurant.

The banquet will take place on Wednesday 22 June at Brasserie Georges. The banquet will begin with a drinks reception from 20:00, followed by the banquet itself at 20:30.

Lunch and banquet tickets are included in the colloquium package and must be shown for admittance.

Internet

Internet access will be available wirelessly on the campus of École centrale de Lyon. Username and passwords are provided in the colloquium package.

Posters

All posters will be on display throughout the colloquium in the hall in front of conference room 3.

Abstracts

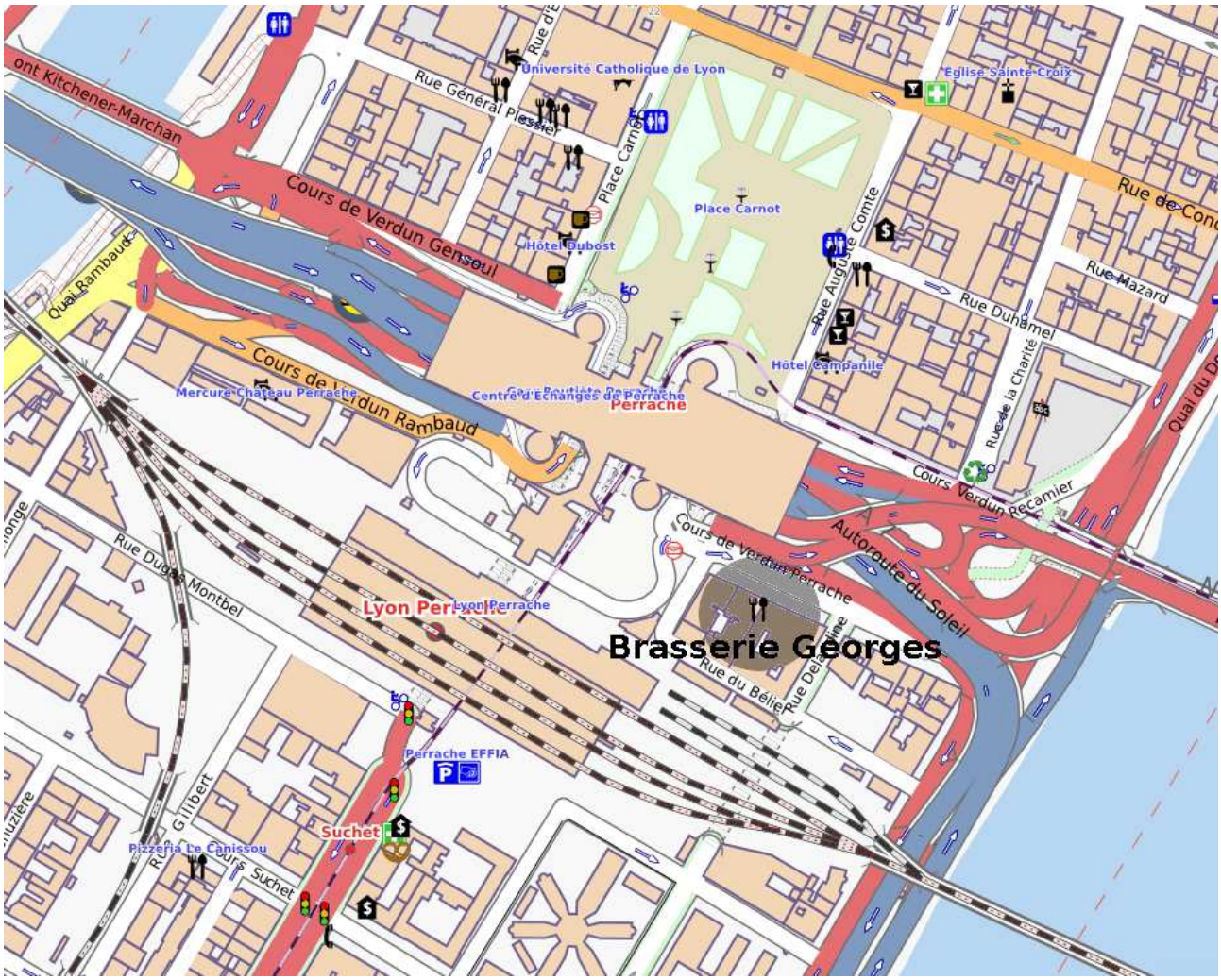
All the abstracts printed in the *Book of Abstracts* are freely available in electronic form on the open-access archive "HAL—Hyper articles en ligne" under `http://hal.archives-ouvertes.fr/EC525/`.

Conference banquet

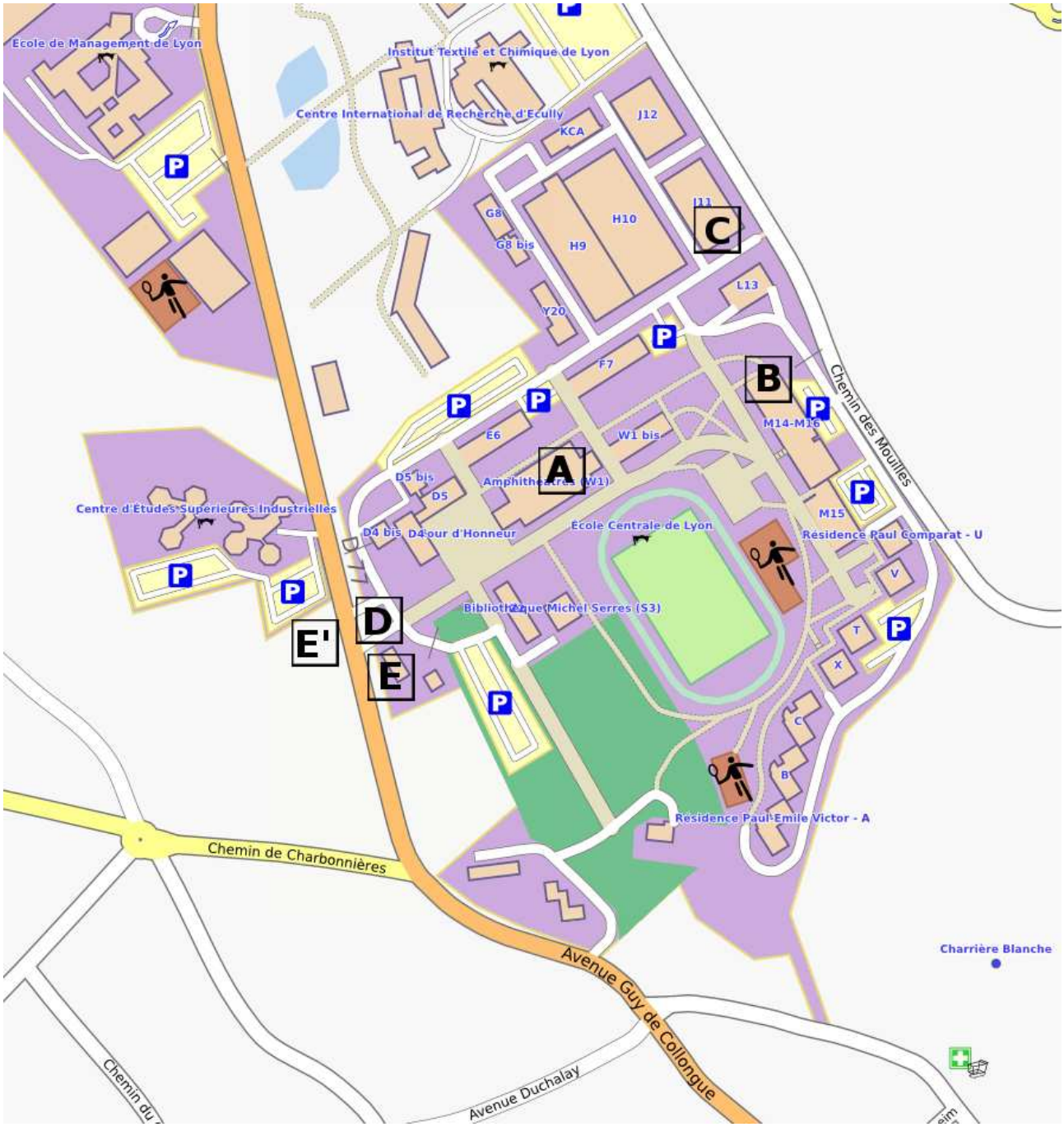
The banquet will take place on Wednesday 22 June at Brasserie Georges. Drinks will be served from 20:00, followed by the banquet itself at 20:30. Banquet tickets included in the colloquium package will be requested for admittance, and participants are expected to arrive no later than 20:00.

Founded in 1836, the Brasserie Georges (http://www.brasseriegeorges.com) is closely linked to Lyon's history and features an amazing dining room decorated in Art Déco style.

The Brasserie Georges is located 30 Cours de Verdun, 2 minutes walking distance from Perrache station.

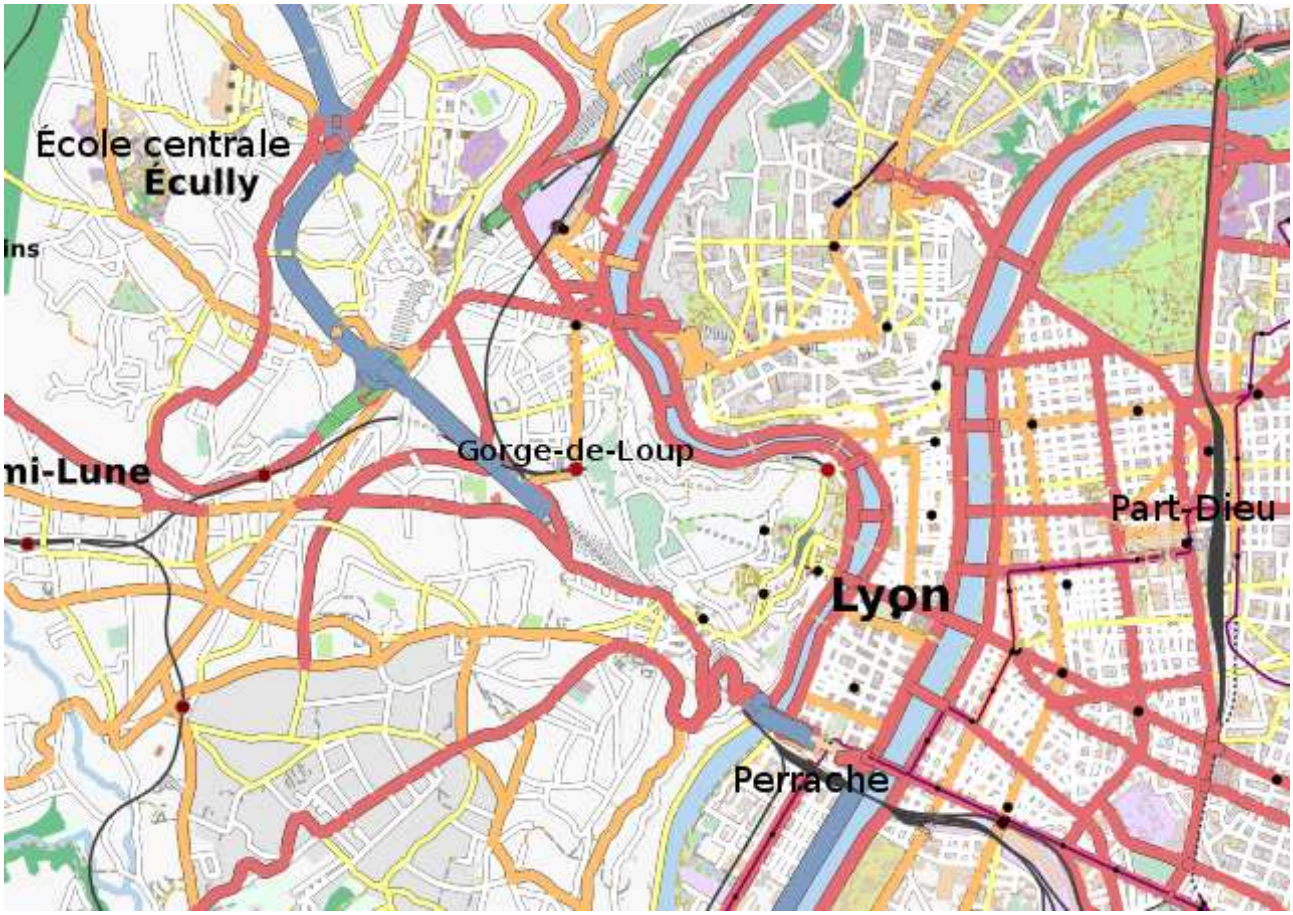


ÉCL campus



A: Location of conference room 3, ground floor of building W1; room 105 is on first floor.
B: On-campus restaurant for lunch
C: Main entrance to Laboratoire de mécanique des fluides et d'acoustique
D: Final stop of bus 55 (direct to Perrache)
E and E': stops of bus 3 (from and to Gorge-de-Loup)

General map of Lyon and Écully



All maps in this booklet are based on the OpenStreetMap free geographical data (the free wiki world map available at http://www.openstreetmap.org).