

Pier Giuseppe Ledda

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Education	08.2018-05.2022	PhD in Mechanical Engineering, EPFL, Lausanne, Switzerland Thesis title: <i>From coating flow patterns to porous body wake dynamics via multiscale models</i> , under the supervision of Prof. François Gallaire, Laboratory of Fluid Mechanics and Instabilities
	09.2015-05.2018	Master's Degree in Aerospace Engineering - Aerodynamics, University of Pisa, Italy Thesis title: <i>Behavior of wake flows past porous bluff bodies</i> , under the supervision of Prof. François Gallaire (EPFL) and Prof. S. Camarri (University of Pisa)
	09.2012-09.2015	Bachelor's Degree in Aerospace Engineering, University of Pisa, Italy
	09.2007-06.2012	Diploma di Liceo Scientifico, I.I.S. G.A. Pischedda, Bosa, Italy
Working experience	07.2022-01.2023	Collaborator at Università degli Studi di Cagliari, Cagliari, Italy
	03.2023-present	Researcher at Università degli Studi di Cagliari, Cagliari, Italy
Teaching experience	Teaching Assistant	1) EPFL (Switzerland), 2018/2019, Semester 1, Master, Two-phase flows and heat transfer (ME-446, Pr. F. Gallaire) 9 hours 2) EPFL (Switzerland), 2018/2019, Semester 2, Bachelor, ICC-Information, Calcul, Communication (CS-119(a) Pr. M. Rajman) 9 hours 3) EPFL (Switzerland), 2018/2019, Semester 2, Master, Hydrodynamics (ME-444, Pr. F. Gallaire) 16 hours 4) EPFL (Switzerland), 2019/2020, Semester 1, Master, Two-phase flows and heat transfer (ME-446 Pr. F. Gallaire) 27 hours 5) EPFL (Switzerland), 2019/2020, Semester 2, Master, Hydrodynamics (ME-444 Pr. F. Gallaire) 20 hours 6) EPFL (Switzerland), 2020/2021, Semester 1, Master, Two-phase flows and heat transfer (ME-446 Pr. F. Gallaire) 25 hours 7) EPFL (Switzerland), 2020/2021, Semester 2, Master, Hydrodynamics (ME-444 Pr. F. Gallaire) 26 hours 8) EPFL (Switzerland), 2021/2022, Semester 1, Master, Two-phase flows and heat transfer (ME-446 Pr. François Gallaire) 10 hours 9) University of Cagliari, 2022/2023, Semester 1, Master, Environmental Hydraulics (Pr. G. Querzoli) (10 hours) 10) University of Cagliari, 2022/2023, Semester 2, Bachelor, Fluid mechanics (Pr. G. Querzoli) (27 hours)

Thesis supervisor *Wake flow past a permeable sphere: characterization, stability and design*
(EPFL and University of Pisa Master 2021)

Three-dimensional instability of the von Karman vortex street past a porous cylinder (EPFL and University of Pisa Master 2022)

Wakes and paths of buoyancy-driven permeable disks: a linear stability approach (EPFL and University of Pisa Master 2022)

- List of publications**
- 1) **P.G. Ledda, L. Siconolfi, F. Viola, F. Gallaire, S. Camarri**
Suppression of von Karman vortex streets past porous rectangular cylinders.
Physical Review Fluids, 3, 103901 (2018) (doi:10.1103/PhysRevFluids.3.103901).
 - 2) **P.G. Ledda, L. Siconolfi, F. Viola, S. Camarri, F. Gallaire**
Flow dynamics of a dandelion pappus: a linear stability approach.
Physical Review Fluids, 4, 071901(R) (2019) (doi:10.1103/PhysRevFluids.4.071901).
 - 3) **G. Lerisson, P.G. Ledda, G. Balestra, F. Gallaire**
Instability of a thin viscous film flowing under an inclined substrate: steady patterns.
Journal of Fluid Mechanics, 898, A6 (2020) (doi:10.1017/jfm.2020.396)
 - 4) **P.G. Ledda, G. Lerisson, G. Balestra, F. Gallaire**
Instability of a thin viscous film flowing under an inclined substrate: the emergence and stability of rivulets.
Journal of Fluid Mechanics, 904, A23 (2020) (doi:10.1017/jfm.2020.673)
 - 5) **P.G. Ledda, G. Balestra, G. Lerisson, B. Scheid, M. Wyart, F. Gallaire**
Hydrodynamic-driven morphogenesis of karst draperies: Spatio-temporal analysis of the two-dimensional impulse response.
Journal of Fluid Mechanics, 910, A53 (2021) (doi:10.1017/jfm.2020.1010)
 - 6) **P.G. Ledda, F. Gallaire**
Secondary instability in thin film flows under an inclined plane: growth of lenses on spatially developing rivulets.
Proceedings of the Royal Society A 477:20210291 (2021) (doi:10.1098/rspa.2021.0291)
 - 7) **E. Jambon-Puillet, P.G. Ledda, F. Gallaire, P-T Brun**
Drops on the Underside of a Slightly Inclined Wet Substrate Move Too Fast to Grow.
Physical Review Letters 127, 044503 (2021) (doi:10.1103/PhysRevLett.127.044503)
 - 8) **P.G. Ledda, E. Boujo, S. Camarri, F. Gallaire, G.A. Zampogna**
Homogenization based design of microstructured membranes: wake flows past permeable shells.
Journal of Fluid Mechanics 927, A31 (2021) (doi:10.1017/jfm.2021.756)
 - 9) **G.A. Zampogna, P.G. Ledda, F. Gallaire**
Transport across thin membranes: effective solute flux jump.
Physics of Fluids 34, 083113 (2022) (doi:10.1063/5.0101621)
 - 10) **M. Ciuti, G.A. Zampogna, F. Gallaire, S. Camarri, P.G. Ledda**
On the effect of a penetrating recirculation region on the bifurcations of the flow past a permeable sphere.
Physics of Fluids 33, 124103 (2021) (doi:10.1063/5.0075244)
 - 11) **P.G. Ledda, M. Pezzulla, E. Jambon-Puillet, P-T Brun, F. Gallaire**
Gravity-driven coatings on curved substrates: a differential geometry approach.
Journal of Fluid Mechanics , 949, A38 (2022) (doi:10.1017/jfm.2022.758)
 - 12) **P.G. Ledda**
From coating flow patterns to porous body wake dynamics via multiscale models
PhD Thesis EPFL (2022) (doi:10.5075/epfl-thesis-9970)
 - 13) **L. Martin-Monier, P.G. Ledda, P.L. Piveteau, F. Gallaire, F. Sorin**
Prediction of Self-Assembled Dewetted Nanostructures for Photonics Applications via a Continuum-Mechanics Framework.

Physical Review Applied 16, 034025 (2021) (doi:10.1103/PhysRevApplied.16.034025)

14) **G. Lerisson, P.G. Ledda, G. Balestra, F. Gallaire**

Dripping down the rivulet. Paper associated with a video winner of the 2018 APS/DFD Milton van Dyke Award,

Physical Review Fluids 4, 100504 (2019) (doi:10.1103/PhysRevFluids.4.100504)

15) **G. Vagnoli, G.A. Zampogna, S. Camarri, F. Gallaire, P.G. Ledda**

Permeability sets the linear path instability of buoyancy-driven disks.

Journal of Fluid Mechanics, 955, A29 (2023) (doi:10.1017/jfm.2020.396)

16) **P.G. Ledda, M.G. Badas, G. Matta, G. Querzoli**

Flow dynamics in a model of dilated thoracic aorta prior to and following prosthetic replacement.

Theoretical and Computational Fluid Dynamics 37, 375–396 (2023) (doi:10.1007/s00162-023-00651-4)

17) **F. Caruso Lombardi, A. Bongarzone, G.A. Zampogna, S. Camarri, F. Gallaire, P.G. Ledda**

Von Karman vortex street past a permeable circular cylinder: two-dimensional flow and dynamic mode decomposition-based secondary stability analysis.

Physical Review Fluids 8, 083901 (2023) (doi:10.1103/PhysRevFluids.8.083901)

Manuscripts in preparation or submitted

G.A. Zampogna, K. Wittkowski, P.G. Ledda, F. Gallaire

Homogenization theory captures macroscopic flow discontinuities across Janus membranes.

Accepted in the Journal of Fluid Mechanics

P.G. Ledda, G. Vagnoli, G. Corsi, F. Gallaire, A. De Simone

Instability and trajectories of buoyancy-driven perforated disks.

Submitted to Physical Review Fluids

P.G. Ledda, T. Rossi, M.G. Badas, G. Querzoli

Silicone oil tamponade flow dynamics following everyday movements

In preparation

P.G. Ledda, M.G. Badas, G. Querzoli

Stratified flow and ventilation in a model of a classroom

In preparation

Presenting author at national conferences

1) 09.2022

P.G. Ledda, F. Angius, M.G. Badas, T. Rossi, G. Querzoli

Silicone oil tamponade flow dynamics following everyday movements
Convegno congiunto dei Gruppi AIMETA GIMC, GMA e GBMA, July 2023, Reggio Calabria, Italy

Presenting author at international conferences

1) 09.2022

P.G. Ledda, G. Vagnoli, G.A. Zampogna, S. Camarri, F. Gallaire

Linear path instability of buoyancy-driven permeable disks

15th ERCOFTAC SIG 33 Workshop - Progress in Flow Instability, Transition and Control, June 2023, Alghero, Italy

2) 09.2022

P.G. Ledda, M. Pezzulla, E. Jambon-Puillet, P-T Brun, F. Gallaire

Gravity-driven coatings on three-dimensional substrates

14th European Fluid Mechanics Conference (EFMC14), September 2022, Athens, Greece

- 3) 11.2021 **P.G. Ledda, E. Boujo, S. Camarri, F. Gallaire, G.A. Zampogna**
Homogenization-based optimization and design of microstructured membranes: flow past a circular cylindrical shell
 74th Annual Meeting of the APS Division of Fluid Dynamics , November 2021, Phoenix, USA
- 4) 09.2021 **P.G. Ledda, G. Lerisson, G.Balestra, F. Gallaire**
To drip or not to drip: pattern formation of a thin film flowing under an inclined plane
 European Coating Symposium, September 2021, Bruxelles, Belgium
- 5) 08.2021 **P.G. Ledda, G. Lerisson, G.Balestra, F. Gallaire**
Instability of a thin film flowing under an inclined plane
 25th International Congress of Theoretical and Applied Mechanics (ICTAM 2020+1), August 2021, Milan, Italy
- 6) 11.2020 **P.G. Ledda, G.Balestra, G. Lerisson, B. Scheid, M. Wyart, F. Gallaire**
On the origin of draperies structures in limestone caves: two-dimensional analysis of the impulse response
 73rd Annual Meeting of the APS Division of Fluid Dynamics , November 2020, Virtual, Chicago Time
- 7) 11.2019 **P.G. Ledda, G. Lerisson, G.Balestra, F. Gallaire**
Pattern formation of a thin film flowing under an inclined plane
 72nd Annual Meeting of the APS Division of Fluid Dynamics , November 2019, Seattle, USA
- Coauthor at international conferences**
- 1) 09.2022 **G. A. Zampogna , P.G. Ledda, F. Gallaire**
Effective jumps across Janus membranes
 14th European Fluid Mechanics Conference (EFMC14), September 2022, Athens, Greece
- 2) 11.2021 **F Gallaire, PG Ledda, G Balestra, G Lerisson, B Scheid, M Wyart**
Two-dimensional absolute/convective instability analysis through the Riesz transform and application to draperies structures in limestone caves
 74th Annual Meeting of the APS Division of Fluid Dynamics, November 2021, Phoenix, USA
- 3) 11.2021 **PT Brun, E Jambon-Puillet, F Gallaire, PG Ledda**
Too fast to grow: Dynamics of pendant drops sliding on a thin film
 74th Annual Meeting of the APS Division of Fluid Dynamics, November 2021, Phoenix, USA
- 4) 11.2021 **G A Zampogna, PG Ledda, F Gallaire**
Effective solvent-solute transport across micro-structured thin membranes
 74th Annual Meeting of the APS Division of Fluid Dynamics, November 2021, Phoenix, USA
- 5) 11.2020 **E Jambon-Puillet, PG Ledda, F Gallaire, PT Brun**
Grow or perish: Dynamics of a pendant drop sliding on a thin film
 73rd Annual Meeting of the APS Division of Fluid Dynamics , November 2020, Virtual, Chicago Time
- 6) 11.2018 **L Siconolfi, PG Ledda, F Viola, S Camarri, F Gallaire**
On the stability of wake flows past porous bluff bodies
 71st Annual Meeting of the APS Division of Fluid Dynamics, November 2018, Atlanta, USA

Summer schools	07.2019	Fluid Dynamics for Sustainability and the Environment Summer School, Ecole Polytechnique, Palaiseau, France
	04.2018	ERCOTAC Montestigliano Spring School, "Lattice-Boltzmann methods for fluid dynamics", Brenna, Italy
Awards		SWICCOMAS PRIZE 2023 for the thesis dissertation. Awarded by the Swiss Community for Computational Methods in Applied Sciences.
		2022 EDME Award. Best PhD thesis of EPFL Department "Mécanique" (https://www.epfl.ch/education/phd/edme-mechanics/edme-awards-laureates/).
		2018 APS/DFD Milton van Dyke Award at the DFD Gallery of Fluid Motion. Original video available online at the Gallery of Fluid Motion https://doi.org/10.1103/APS.DFD.2018.GFM.V0070
Media Coverage	07.2019	The physics of the dandelion, Cosmos Magazine.
	07.2019	Dandelion Fluff Perfected for Flight, Physics Magazine.
	07.2019	The uplifting science of how dandelion seeds stay aloft, PBS Magazine.
Other experiences		Organization of the "MEchanics GAthering MEGA Seminar" series at EPFL (Switzerland) (09.2020-06.2022).

Cagliari, August 9, 2023

P.G. Ledda