CURRICULUM Pier Giuseppe Ledda

Contact Information DICAAR Università degli Studi di Cagliari
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Education

08.2018-05.2022 PhD in Mechanical Engineering, EPFL, Lausanne, Switzerland. Thesis title: *From coating flow patterns to porous body wake dynamics via multiscale models*, supervisor: Prof. François Gallaire

09.2015-05.2018 Master's degree in Aerospace Engineering - curriculum Aeronautics, Università di Pisa, Italia
Thesis title: *Behavior of wake flows past porous bluff bodies*
Final score: 110/110 cum Laude

09.2012-09.2015 Bachelor degree in Aerospace Engineering, Università di Pisa, Italia
Final score: 110/110 cum Laude

09.2007-06.2012 High-school Diploma "Liceo Scientifico", I.I.S. G.A. Pischedda, Bosa (OR), Italia
Final score: 100/100 cum Laude

Highlights

P.G. Ledda works as a research assistant at the University of Cagliari, Sardinia, Italy. After obtaining my PhD degree at the Swiss Federal Institute of Technology (EPFL, 26th and 33rd place in the QS World University Rankings and Times Higher Education World University Rankings, respectively), in 2022, I joined the Hydraulics section at the University of Cagliari. My research involves different aspects of fluid mechanics. During my PhD, I extensively worked within the framework of flows past permeable bluff bodies (aerodynamic flows and falling objects) and pattern formation of thin liquid films and free-surface flows. I exploit theoretical developments with numerical simulations as well as experimental campaigns to assess practical consequences on flows of interests. I am actively working on low-Reynolds hydraulics and fluid mechanics, bio-fluid mechanics (cardiovascular and eye-tamponade flows), heat transfer and dispersion in indoor environments as well as turbulent atmospheric flows around and through canopies and their effect on the surrounding environment. To date, I published 22 documents in international journals; I received 144 citations by 90 documents and my *h-index* is 7 (source: Scopus, ORCID 0000-0003-4435-8613).

After my PhD

03.2023-present Assistant Professor ("Ricercatore a tempo determinato tipo A").
Università degli Studi di Cagliari, SSD ICAR/01
Hydraulics, civil and environmental engineering and bio-fluid mechanics.

09.2022-01.2023 Collaborator, Università degli Studi di Cagliari
Urban (indoor and outdoor) Fluid Mechanics.

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**
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)

4) **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)

5) **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)

6) **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)

7) **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)

8) **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)

9) **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)

10) **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)

11) **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)

12) **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)

13) **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)

14) **G.A. Zampogna, P.G. Ledda, K. Wittkowski, F. Gallaire.**
Homogenization theory captures macroscopic flow discontinuities across Janus membranes.
Journal of Fluid Mechanics 970, A39 (2023) (doi:10.1017/jfm.2023.659)

15) **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)

16) **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.2022.989)

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)

18) **P.G. Ledda, T. Rossi, M.G. Badas, G. Querzoli.**
Can wall shear-stress topology predict proliferative vitreoretinopathy localization following pars plana vitrectomy?
Journal of Biomechanics 162, 111914 (2024) (doi:10.1016/j.jbiomech.2023.111914)

19) **G. Corsi, P. G. Ledda, G. Vagnoli, F. Gallaire, A. De Simone**
Instability and trajectories of buoyancy-driven annular disks: A numerical study
Physical Review Fluids 9, 043907 (2024) (doi:10.1103/PhysRevFluids.9.043907)

Preprints

1) **H. Garg, P.G. Ledda, J.K. Pedersen, M. Pezzulla**
Passive viscous flow selection via fluid-induced buckling.
Accepted in *Physical Review Letters* (arXiv:2402.11966).

2) **A. Marcotte, P.G. Ledda, V. Buriasco, P. Dene, F. Gallaire, L. Keiser**
Releasing long bubbles trapped in thin capillaries via tube centrifugation and inclination.
Accepted in *Journal of Fluid Mechanics* (arXiv.2404.17934).

3) **K. Wittkowski, A. Ponte, P.G. Ledda, G.A. Zampogna**
Quasi-linear homogenization for large-inertia laminar transport across permeable membranes.
Under revision in *Journal of Fluid Mechanics* (arXiv.2401.14842).

4) **P.G. Ledda,M.G. Badas, P. Monti, A. Pelliccioni, G. Querzoli**
Thermal Stratification Affects Comfort and Air Quality in Naturally Ventilated Amphitheatre Classrooms.
Submitted to *Urban Climate* (doi:10.2139/ssrn.4877066.

Presenter at conferences

1) **07.2024.** **P.G. Ledda, A. Seoni, M.G. Badas, G. Querzoli**
Toward A Micrometeorological Assessment Of Agrivoltaic Farms: A Feature Tracking Velocimetry-Based Analysis
21st International Symposium on the Application of Laser and Imaging Techniques to Fluid Mechanics, 8-11 July 2024, Lisbon, Portugal

2) **06.2024.** **P.G. Ledda, F. Angius, M.G. Badas, G. Querzoli**
Impact of renewable energy integration: a numerical study of atmospheric flow around models of agrivoltaic farms
22nd International Conference on Harmonisation within Atmospheric Dispersion Modelling for Regulatory Purposes 10-13 June 2024, Parnu, Estonia

3) **08.2023.** **P.G. Ledda, F. Angius, M.G. Badas, T. Rossi, G. Querzoli**
Flow dynamics of silicone oil tamponade in steady and unsteady conditions
Engineering Mechanics Institute 2023 International Conference, August 2023, Palermo, Italy

4) **07.2023.** **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

5) **06.2023** **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

6) **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), 13-16 Settembre 2022, Atene, Grecia

7) **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 , 21-23 Novembre 2021, Phoenix, USA

8) **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, 6-9 Settembre 2021, Bruxelles, Belgio

9) **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), 22-27 Agosto 2021, Milano, Italia

10) **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 , 22-24 Novembre 2020, Virtual, Chicago Time

11) **09.2020** **P.G. Ledda, G. Lerisson, G.Balestra, F. Gallaire**
Rivulet formation in a thin film flowing under an inclined plane
Virtual Technical Meeting of the Society of Engineering Science

12) **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 , 23-26 Novembre 2019, Seattle, USA

Awards

1) **2024 Junior Marchi Lecture** - Honorary lecture organized by the italian Community of Hydraulics (GII, https://gii-idraulica.it/).

2) **SWICCOMAS Prize 2023 for the thesis dissertatio** - Awarded by the Swiss Community for Computational Methods in Applied Sciences.(https://swiccomas.ch/).

3) **2022 EDME Award** - Best PhD thesis of EPFL Department "M´ecanique" (https://www.epfl.ch/education/phd/edme-mechanics/edme-awards-laureates/).

4) **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

Teaching activity

Teaching assistant

1) EPFL (Svizzera), 2018/2019, Semester 1, Master, Two-phase flows and heat transfer (ME-446, Pr. F. Gallaire) 9 hours

2) EPFL (Svizzera), 2018/2019, Semestre 2, Bachelor, ICC-Information, Calcul, Communication (CS-119(a) Pr. M. Rajman) 9 hours

3) EPFL (Svizzera), 2018/2019, Semestre 2, Master, Hydrodynamics (ME-444, Pr. F. Gallaire) 16 hours

4) EPFL (Svizzera), 2019/2020, Semestre 1, Master, Two-phase flows and heat transfer (ME-446 Pr. F. Gallaire) 27 hours

5) EPFL (Svizzera), 2019/2020, Semestre 2, Master, Hydrodynamics (ME-444 Pr. F. Gallaire) 20 hours

6) EPFL (Svizzera), 2020/2021, Semestre 1, Master, Two-phase flows and heat transfer (ME-446 Pr. F. Gallaire) 25 hours

7) EPFL (Svizzera), 2020/2021, Semestre 2, Master, Hydrodynamics (ME-444 Pr. F. Gallaire)26 hours

8) EPFL (Svizzera), anno accademico 2021/2022, Semestre 1, Master, Two-phase flows and heat transfer (ME-446 Pr. Francois Gallaire) 10 hours

Master Thesis supervision

1) *Three-dimensional instability of the von Karman vortex street past a porous cylinder* (EPFL and Università di Pisa 2022)
2) *Wakes and paths of buoyancy-driven permeable disks: a linear stability approach* (EPFL and Università di Pisa 2022)

3) *Wake flow past a permeable sphere: characterization, stability and design* (EPFL and Università di Pisa 2021)

Coauthor at international conferences

1) **03.2024** **M. Pezzulla, H. Garg, P.G. Ledda, J.K. Pedersen**
Passive flow selection via elastic buckling in narrow channels
APS March Meeting 2024, Monday–Friday, March 4–8, 2024; Minneapolis, USA

2) **11.2023** **K. Wittkowski, A. Ponte, P.G. Ledda, F. Gallaire, G.A. Zampogna**
A macroscopic model for inertial flows through thin permeable membranes
76th Annual Meeting of the Division of Fluid Dynamics Sunday–Tuesday, November 19–21, 2023; Washington, DC, USA

3) **09.2022** **G. A. Zampogna , P.G. Ledda, F. Gallaire**
Effective jumps across Janus membranes
14th European Fluid Mechanics Conference (EFMC14), 13-16 Settembre 2022, Atene, Grecia

4) **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, 21-23 Novembre 2021, Phoenix, USA

5) **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, 21-23 Novembre 2021, Phoenix, USA

6) **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, 21-23 Novembre 2021, Phoenix, USA

7) **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 , 22-24 Novembre 2020, Virtual, Chicago Time

8) **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, Atlanta, USA

Summer Schools

07.2019 1) Fluid Dynamics for Sustainability and the Environment Summer School, Ecole Polytechnique, Palaiseau, Francia (2 settimane)

04.2018 2) ERCOFTAC Montestigliano Spring School, "Lattice-Boltzmann methods for fluid dynamics", Brenna, Italia (1 settimana)

Other experience

Member of the Organizing Committee of Seminar Series: "MEchanics GAthering MEGA Seminar", EPFL, Switzerland (09.2020-06.2022).

Media coverage

07.2019 The physics of the dandelion, Cosmos Magazine (https://cosmosmagazine.com/science/physics/the-physics-of-the-dandelion/).

07.2019 Dandelion Fluff Perfected for Flight, Physics Magazine (https://physics.aps.org/articles/v12/s76).

07.2019 The uplifting science of how dandelion seeds stay aloft, PBS Magazine (https://www.pbs.org/wgbh/nova/article/dandelion-seed-flight/).

July 28, 2024