Yves-Marie Ducimetière

Personal information

Born August 13, 1996, in Meyrin, Switzerland
French citizenship
yves-marie.ducimetiere@epfl.ch

Research interests

Linear stability approaches, modal and non-modal theories,
Effect of stochastic and deterministic excitations, receptivity,
Nonlinear effects, weakly nonlinear theory, asymptotic methods, semi-linear methods,
Optimal control, adjoint theory,
Statistical mechanics, large deviations theory, active matter, etc...

Education

2019–2023 **PhD in Mechanical Engineering at EPFL, Switzerland.**
Research activity in the Laboratory of Fluid Mechanics and Instabilities (LFMI) under the supervision of Prof. F. Gallaire. The thesis proposes a theoretical approach to derive amplitude equations governing the weakly nonlinear evolution of non-normal dynamical systems when they experience transient growth or respond to harmonic or stochastic forcing.

2016–2019 **MSc. in Mechanical Engineering at EPFL, Switzerland.**
Thesis title: "Absolute instabilities and the role of confinement in stratified shear flows",
advisors: Prof. C.-c. Caulfield, Prof. F. Gallaire and Dr. A. Lefauve,
Thesis mark: $6/6$.

Sept 2018 – Mar 2019 **Research Internship at Cambridge University, UK.**
Six months project at DAMTP (Department of Applied Mathematics and Theoretical Physics) on the absolute/convective discrimination of stratified shear instabilities occurring in an inclined duct.
Tutored by Prof. C.-c. Caulfield, Prof. F. Gallaire, and Dr. A. Lefauve.

Feb 2018 – Aug 2018 **R&D Engineering Internship at Almatech, Switzerland.**
Six months project in an EPFL start-up for the development of a simplified simulator for the trajectory of a hydrofoil-craft under specified waves and wind conditions.
Tutored by Dr. L. Blecha.

Sept 2017 – Jan 2018 **Research Internship at EPFL, Switzerland.**
Four months project at LFMI on the modal and non-modal stability of a thin Newtonian fluid spreading on a horizontal cylinder under the action of gravity.
Tutored by Prof. F. Gallaire, and Dr. G. Balestra.

July 2017 – Sept 2017 **Research Internship at University of Geneva, Switzerland.**
Two months summer project at the Nonlinearity and Climate Group on statistical properties after a sudden episode of wind for water waves propagating in one direction and described by the nonlinear Schrödinger equation.
Tutored by Prof. J. Kasparian, and Dr. M. Brunetti.

2013–2016 **BSc. in Mechanical Engineering at EPFL, Switzerland.**

2013 **French Scientific Baccalaureate (Specialty : Mathematics) from Lycée International de Ferney-Voltaire.**

Additional schools and training

July 2022 **Boulder School 2022: "Hydrodynamics Across Scales", University of Colorado Boulder, USA.**

Languages

French (Native)

English (Fluent)

German (B1)

Teaching and students supervision

Teaching assistant

Analysis I Bachelor course in Mechanical Engineering at EPFL (2021), 28 hours in total.

Finite Elements Method Bachelor course in Mechanical Engineering at EPFL (2019-2023), 4×14 hours in total.

Hydrodynamics Master course in Mechanical Engineering at EPFL (2022), 28 hours in total.

Numerical Flow Simulation Master course in Mechanical Engineering at EPFL (2021), 28 hours in total.

Instability Master course in Mechanical Engineering at EPFL (2019-2023), 4×14 hours in total.

Master thesis supervisor

Tutored a student for her Master's project "Study of the Holmboe instability in an inclined duct and application of the semi-linear model".

Publications

Peer-reviewed journal articles

Eeltink, D., Armaroli, A., Ducimetière, Y.-M., Kasparian, J., and Brunetti, M. (2019). Single-spectrum prediction of kurtosis of water waves in a nonconservative model. *Physical Review*

E, 100, 013102.

Balestra, G., Badaoui, M., Ducimetière, Y.-M., and Gallaire, F. (2019). Fingering instability on curved substrates: Optimal initial film and substrate perturbations. *Journal of Fluid Mechanics*, 868, 726-761.

Ducimetière Y.-M., Gallaire F., Lefauve A., and C. Caulfield (2021). Effects of spanwise confinement on stratified shear instabilities. *Physical Review Fluids*, 6, 103901.

Ducimetière, Y.-M., Boujo, E., and Gallaire, F. (2022). Weak nonlinearity for strong non-normality. *Journal of Fluid Mechanics*, 947, A43.

Ducimetière, Y.-M., Boujo, E., and Gallaire, F. (2022). Weakly nonlinear evolution of stochastically driven non-normal systems. *Journal of Fluid Mechanics*, 951, R3.

Eghbali S., Ducimetière. Y.-M., Boujo, E., and Gallaire. F. (2023). Liquid film instability of an internally coated horizontal tube. *Physical Review Fluids*, 8, 053901.

Zhou, J., Ducimetière, Y.-M., Migliozzi, D., Keiser, L., Bertsch, A., Gallaire, F., and Renaud, Philippe (2023). Breaking one into three: Surface-tension-driven droplet breakup in T-junctions. *Physical Review Fluids*, 8, 054201.

Ducimetière, Y.-M., and Gallaire, F. (2023). A weakly nonlinear amplitude equation approach to the bypass transition in the two-dimensional Lamb–Oseen vortex. *Journal of Fluid Mechanics*, 976, A10.

Papers submitted

Ducimetière, Y.-M., Boujo, E., and Gallaire, F. (2023). Noise-induced transitions past the onset of a steady symmetry-breaking bifurcation: the case of the sudden expansion. *submitted to Physical Review Fluids*.

Conferences contributed

Weak nonlinearity for strong non-normality, 74th Annual Meeting of the Division of Fluid Dynamics (APS DFD), Phoenix (AZ), USA, November 21-23, 2021.

Weakly nonlinear evolution of stochastically driven non-normal systems, 14th SIG 33-ERCOFTAC Workshop, Cadix, Spain, June 15-17, 2022.

Weakly nonlinear evolution of stochastically driven non-normal systems, 14th European Fluid Mechanics Conference (EFMC), Athens, Greece, June 13-16, 2022.

Noise-induced transitions after a steady symmetry-breaking bifurcation: the case of the sudden expansion, 15th SIG 33-ERCOFTAC Workshop, Alghero, Italy, June 28-30, 2023.

Non-modal amplitude equations, Invited speaker at Laboratoire J. A. Dieudonné (Séminaire de l'équipe EDP Analyse Numérique), Nice, France, December 7, 2023.