

Mohammadreza (Perseus) Sepahi

CURRICULUM VITAE · FLUID DYNAMICS

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Education

M.Math, Applied Mathematics (Fluid Mechanics Group)

Sep 2023 – 2026

University of Waterloo, Waterloo, ON, Canada

CGPA 81.5/100 (A)

Thesis [*Stratification and Vertical Turbulence Structure in the Atmospheric Boundary Layer: A Large-Eddy Simulation Study*](#) (2026)

M.Sc, Mechanical Engineering (Energy Conversion)

Sep 2022

Amirkabir University of Technology (Tehran Polytechnic), Tehran, Iran

CGPA 17.65/20 (A); 3.9/4.0 by [WES](#) evaluation · top 10% of graduating class

Thesis *Experimental and Numerical Study of Deformation of Fibers in a Viscous Fluid*

B.Sc, Mechanical Engineering

Sep 2018

Kermanshah University of Technology, Kermanshah, Iran

CGPA 14.04/20

Thesis *Calculating Stress Intensity Factor in Symmetric Crack of Perforated Plate with Inside Pressure*

Research Experience

Graduate Research Assistant

Sep 2023 – 2026

Fluid Mechanics Group, Department of Applied Mathematics, University of Waterloo

- Large-eddy simulation of the stably stratified atmospheric boundary layer with WRF (ARW), replicating and extending Udina et al. (2016): eight idealised cases crossing two geostrophic winds (16.5 and 8.25 m s^{-1}) with four surface cooling rates (0 – 1 K h^{-1}).
- Strongly forced cases follow the classical quasi-steady regime: the boundary layer contracts from ≈ 486 to $\approx 278 \text{ m}$ as the low-level jet strengthens and descends, with the gradient Richardson number near critical.
- Weakly forced cases reach a maximum sustainable heat flux: the surface flux saturates near 10 W m^{-2} despite fourfold stronger cooling, friction velocity collapses, and the flow aloft decouples from the surface.
- Built MATLAB/Python post-processing for fluxes, Richardson numbers, boundary-layer height and vertical-velocity spectra.

Research Assistant (Erasmus+ KA107 Fellow)

Jul 2021 – Oct 2021

Hydrodynamics Laboratory (LadHyX), École Polytechnique, Institut Polytechnique de Paris, France

- Experiments and simulations of flexible fibers sedimenting through obstacle arrays in a viscous fluid, with Camille Duprat and Blaise Delmotte; this work led to a *Physical Review Fluids* paper and talks at APS DFD 2022 and SIAM CSE 2023.

M.Sc. Researcher

2019 – 2022

Amirkabir University of Technology

- Experimental and numerical study of fiber deformation in viscous flow (M.Sc. thesis).

Publications & Presentations

Thesis

P. Sepahi. **Stratification and Vertical Turbulence Structure in the Atmospheric Boundary Layer: A Large-Eddy Simulation Study**. M.Math thesis, University of Waterloo, 2026. hdl.handle.net/10012/24382

Journal article

U. Makanga, M. Sepahi, C. Duprat, B. Delmotte. **Obstacle-induced lateral dispersion and nontrivial trapping of flexible fibers settling in a viscous fluid**. *Physical Review Fluids* 8(4), 044303, 2023. [doi:10.1103/PhysRevFluids.8.044303](https://doi.org/10.1103/PhysRevFluids.8.044303)

Conference presentations

U. Makanga, M. Sepahi, C. Duprat, B. Delmotte. **Sedimentation of flexible fibers in structured environments**. SIAM Conference on Computational Science and Engineering (CSE23), February 2023. hal-04438332

U. Makanga, M. Sepahi, C. Duprat, B. Delmotte. **Sedimenting flexible fibers against obstacles in a viscous fluid**. 75th Annual Meeting of the APS Division of Fluid Dynamics, November 2022; *Bulletin of the American Physical Society*. [APS abstract](#) · hal-04574057

Teaching Experience

University of Waterloo, Faculty of Mathematics

TA, Differential Equations for Engineers

Spring 2026

Head TA, Calculus 2

Winter 2024

TA, calculus tutorials

Spring 2024, Fall 2024, Spring 2025, Spring 2026

TA, Theoretical Mechanics

Fall 2023

TA, Introduction to Differential Equations

Fall 2023

Industry Experience

Westport Fuel Systems, Cambridge, ON

Sep 2025 – Present

Quality Engineering Contractor (May 2026 – present); Quality Engineering Co-op (Sep 2025 – Apr 2026)

- Quality engineering for clean fuel-injection systems: hands-on testing and root-cause investigation.
- Built the quality team's Line Reject Tracking System and NCMR (non-conforming material report) platform, covering workflow tracking, statistics, Excel migration and multi-user data handling.

Awards & Honours

President's Graduate Scholarship, University of Waterloo

International Doctoral Student Award (IDSA), \$15,420, University of Waterloo

Graduate Research Studentship (GRS), University of Waterloo

Erasmus+ KA107 Fellowship, LadHyX, École Polytechnique

2021

Top 10% by CGPA, M.Sc. graduating class (35 students), Amirkabir University of Technology

2022

Completed both B.Sc. and M.Sc. degrees tuition-free

1st place, 7th Iranian Students' Debate Competition

2018

Research Interests

- Atmospheric boundary layers and large-eddy simulation
- Stratified turbulence and geophysical fluid dynamics
- Wind energy and offshore wind turbines
- Physical oceanography and climate dynamics
- Fluid–structure interaction and biological fluid dynamics
- Scientific machine learning for fluid problems

Technical Skills

Simulation	WRF (ARW / LES), OpenFOAM, COMSOL Multiphysics, Gmsh
Programming	Python, MATLAB, JavaScript, Swift, SQL, Linux shell
Other	LaTeX, ImageJ (experimental image analysis), AutoCAD

Selected Graduate Coursework

Scientific Machine Learning	Waterloo · 92/100 (A+)
Mathematics for Climate Change	Waterloo · 91/100 (A+)
Turbulence	Amirkabir · 19/20 (A+)
Hydrodynamic Instability	Amirkabir · 19/20 (A+)
Advanced Mathematics	Amirkabir · 18/20 (A+)
Advanced Fluid Mechanics	Amirkabir · 17/20 (A)

Schools & Certificates

Summer School: Linux Shell, Compute Ontario (online)	Jun 2024
Winter School: Energy Systems, Resilience, and Climate Change, Sharif University of Technology	Feb 2021

Languages

English: TOEFL iBT 106 (Reading 28, Listening 30, Speaking 26, Writing 22)	Apr 2023
Persian: native	

Interests

Gym, soccer, cycling, swimming, camping.