Andrew P. Grace

Assistant Professor of Applied Mathematics

Department of Applied Mathematics · University of Colorado Boulder, Boulder, CO, 80309, U.S.A.

andrew.grace@colorado.edu

Professional Appointments

Assistant Professor of Applied Mathematics — *Boulder, Colorado, U.S.A.*
University of Colorado, Boulder — *August 2025 - Present*

NSERC Postdoctoral Research Fellow — *Notre Dame, Indiana, U.S.A.*
Held at the University of Notre Dame — *January 2025 - August 2025*

ND-ECI Postdoctoral Research Fellow — *Notre Dame, Indiana, U.S.A.*
Held at the University of Notre Dame — *September 2023 - August 2025*

Education

University of Waterloo — *Waterloo, Ontario, Canada*
PhD in Applied Mathematics (Water) — *September 2018 - August 2022*

- Advisors: Marek Stastna, Kevin Lamb, and Andrea Scott
- **2022 Winner of the Tertia M.C. Hughes Prize** (Canadian Meteorological and Oceanographic Society)

University of Waterloo — *Waterloo, Ontario, Canada*
M.Math in Applied Mathematics — *September 2016 - August 2018*

- Advisors: Marek Stastna, Francis Poulin

Trent University — *Peterborough, Ontario, Canada*
B.Sc Mathematical Physics (Hons) — *September 2012 - May 2016*

Publications

1. **Grace, A. P.**, Berk, T., Bragg, A. D., & Richter, D. H. (2025). Effects of settling on inertial particle slip velocity statistics in wall-bounded flows. Journal of Fluid Mechanics, 1015, A21.
2. **Grace, A. P.**, & Richter, D. (2025). Multi-scale interactions in turbulent mixed convection drive efficient transport of Lagrangian particles. Journal of Fluid Mechanics, 1008, A30.
3. **Grace, A. P.**, Richter, D. H., & Bragg, A. D. (2024). A Reinterpretation of Phenomenological Modeling Approaches for Lagrangian Particles Settling in a Turbulent Boundary Layer. Boundary-Layer Meteorology, 190(4), 1-31.
4. Castro-Folker, N., **Grace, A. P.**, and Stastna, M. (2023). Three-dimensional structure of cold-water gravity currents. Physical Review Fluids, 8(11), 113901.
5. **Grace, A. P.**, Fogal, A., and Stastna, M. Restratification in late winter lakes induced by cabbeling. Geophysical Research Letters, 50(14), e2023GL103402. (2023) (**Featured on the Water Institute homepage**)
6. **Grace, A.P.**, Stastna, M., Lamb, K.G. and Scott, K.A. Gravity currents in the cabbeling regime. Physical Review Fluids 8(1) (2023):014502 (**Featured in Physics Magazine** and **Editor's Highlight**)
7. Legare, S., **Grace, A.P.**, and Stastna, M. Double Diffusive Instability with a Constriction. Physics of Fluids 35(2) 024109 (2023) (**Scilight**)
8. Stastna, M., **Grace, A.P.**, and Robinson, T. Exact solutions for flow through porous media with the Klinkenberg Effect. AIP Advances 13, (2023):015309

9. Allum, D.J.M., **Grace, A.P.**, and Stastna, M. Two dimensional simulations of flow in ice-covered lakes with horizontal variations in surface albedo. Physical Review Fluids 7, (2022):103501
10. Stastna, M., Deepwell, D. and **Grace, A.** Shear instability in mode-2 internal Kelvin waves. Environmental Fluid Mechanics, 23(2), 407-428 (2022).
11. **Grace, A.P.**, Stastna, M., Lamb, K.G. and Scott, K.A. Numerical simulations of the three-dimensionalization of a shear flow in radiatively forced cold water below the density maximum. Physical Review Fluids 7(2) (2022): 023501 (**Editor's Highlight**)
12. Legare, S., **Grace, A.**, and Stastna, M. Double-Diffusive Instability in a Thin Vertical Channel. Physics of Fluids, 33, 114106 (2021)
13. **Grace, A.P.**, Stastna, M., Lamb, K. G., and Scott, K. A. Asymmetries in gravity currents attributed to the nonlinear equation of state. Journal of Fluid Mechanics, 915. (2021)
14. **Grace, A.P.**, Stastna, M., and Poulin, F.J., Numerical simulations of the shear instability and subsequent degeneration of basin scale internal standing waves. Physical Review Fluids 4.1 (2019): 014802. (**Editor's Highlight**)

Accepted

1. Swartz-Schult K., et. al. Observed deviation from Stokes' Law in the dry deposition of heavy particles in Rayleigh–Bénard turbulence. *Accepted 01/27/2026 for publication in Aerosol Science and Technology*

Under Review

1. **Grace, A.P.**, and Richter, D.H. Incorporating particle settling enhancement in a coarse-mode deposition model. *Submitted to Geophysical Research Letters*
2. Stastna M.,**Grace, A.P.**, On the arrested development of the Rayleigh Taylor instability in the cabbeling regime. *Submitted to Physical Review Fluids*
3. Menicali, L, Castruccio, S., **Grace, A.P.**, and Richter, D.H. Turbulence Modeling of Rayleigh-Benard Flow using Physics-Informed Convolutional Recurrent Neural Network. *Submitted to the Journal of the American Statistical Association*

In Preparation

1. **Grace, A.P.**, and Richter, D.H. On Eulerian anisotropy of settling Lagrangian particles in a turbulent boundary layer.

Awards, Fellowships, & Grants

Postdoctoral Fellowship *January 2025 - Present*
Natural Sciences and Engineering Research Council

Partial Postdoctoral Fellowship *September 2023-Present*
Notre Dame Environmental Change Initiative

Tertia M.C. Hughes Graduate Student Prize *June 2023*
Canadian Meteorological and Oceanographic Society

Teaching

Instructor of Record

- Differential Equations with Linear Algebra (CU Boulder)
- Hydraulics Lab (University of Notre Dame)

January 2025-April 2026

Lecturer

Calculus II — *January 2021 - April 2021*

Teaching Assistant

- Introduction to Fluid Dynamics
- Asymptotics and Perturbation Theory
- Continuum Mechanics
- Calculus
- Introduction to Computational Mathematics
- Introduction to Theoretical Mechanics

2016-2022

Mentoring

Mentor: Kristin Swartz-Schult (PhD), Nico Castro-Folker (PhD), Donovan Allum (PhD), Sierra Legare (M.MATH), Alexander Fogal (UG) and Travis Robinson (UG). — *2019-Present*

- Helped guide math and science students at various stages of their academic careers (undergraduate, Masters, and PhD) through the life cycle of academic research: problem formulation, literature review, simulation setup, data analysis and writing of multiple peer reviewed publications.
- Help junior graduate students and senior undergraduate students prepare for academic conferences by helping to construct presentations and posters, and providing written and oral feedback.

APS Division of Fluid Dynamics (DFD) Mentoring Program — *2023-2025*

- Served as a mentor for four first-time attendees at the 2023 and 2024 APS-DFD meetings. The program provided an opportunity for new attendees to meet with more experienced attendees (attendance at least previous 3 meetings) to help guide them through the meeting.
- Through this opportunity, I was able to use my experience from attending meetings at different times in my own academic career to help first-time attendees identify what parts of the meeting they valued and to make the most of their meeting experience.
- I facilitated networking opportunities between first-time attendees and members of my own network, allowing new attendees to expand their network.

Academic Service

Panelist

Oral Communication in Academia and Mathematics: Research Presentations and Teaching — *2025*

Peer Reviewer

Peer Reviewer of 17 papers. — *2023-Present*

Graduate Committee Member

Department of Applied Mathematics
University of Colorado Boulder — *2025-Present*

Session Chair

- APS-DFD: Particle Laden Convection
- Physical Processes In Natural Waters

2022-2024

Award Judging

Outstanding Student Presentation Awards Judge — *2023-2024*

Volunteering

- Canadian Meteorological and Oceanographic Society Technical Volunteer
- New Graduate Student Orientation *2021-Present*
- Conference Organizer: Canadian Undergraduate Physics Conference

Professional Development

Notre Dame Future Faculty Workshop

University of Notre Dame *May 2023*

- Workshop comprised of several panels of current Notre Dame faculty answering questions and providing their experience and expertise in the faculty hiring process.
- Panels included information on writing effective research and teaching statements, how to construct an effective job talk, as well as presentations from faculty members outside of the Notre Dame community.

Compute Canada Deep Learning Seminars

Digital Research Alliance of Canada *June 2021*

- Two-day seminar series lead by specialists at the Digital Research Alliance of Canada (formerly Compute Canada) focused on fundamentals and practical applications of machine learning using the PyTorch software package.
- Components included several assignments and labs which included training simple models on linear and nonlinear regression, as well as image classification.

Fluid Dynamics of Sustainability and the Environment

École Polytechnique and University of Cambridge *July 2019*

- International summer school consisting of lectures led by world-renowned experts in atmospheric sciences, oceanography, renewable energies, and climate science.
- Summer school featured two poster presentations, and dedicated physical and numerical laboratory work.

Compute Canada High Performance Computing Summer School

Compute Canada *June 2017*

- Two-day summer school consisted of a series of short courses focused on the understanding and efficient use of Digital Research Alliance of Canada (formerly Compute Canada) infrastructure.
- Content inlcuded introduction to parallel programming using C++ and FORTRAN, profiling and optimizing code for use on multiple machines, as well as data visualization using Paraview and VisIt.

Professional Memberships

Member: APS Division of Fluid Dynamics *2017-Present*

- Branch of the American Physical Society dedicated to advancement of fluid physics.

Member: American Geophysical Union *2023-Present*

- Organization dedicated to advancing Earth and Space science.

Member: The Water Institute *2018-2022*

- Canadian leader in interdiciplinary water related research.

Member: Global Water Futures *2018-2022*

- Multi-institute organization with the aim of positioning Canada as a world leader in water and cold regions research.

Special Seminars

Modeling the influence of buoyancy: implications for mixing and transport in natural waters and the atmosphere. *Boulder, Colorado*

Invited Talk: Boulder Fluids and Thermal Sciences Seminar *November, 2025*

Eulerian and Lagrangian transport in wall-bounded turbulent flows *Boulder, Colorado*

Invited Talk: University of Colorado Boulder, Department of Applied Mathematics Colloquium *August, 2025*

Environmental Fluid Flows: Stratification, Particles, and Turbulence — *Boulder, Colorado*
Invited Talk: University of Colorado Boulder, Department of Applied Mathematics — *February, 2025*

Mathematical modelling to gain insights into the environment around us — *Charlottetown, P.E.I.*
Invited Talk: University of Prince Edward Island, Department of Mathematics and Computational Sciences — *October, 2024*

Simulations and scaling of density driven flows in the cabbeling regime — *Peterborough, Ontario*
Invited talk: Trent University Physics and Astronomy seminar series — *September 2022*

A Tour of the Incompressible Navier-Stokes Equations — *Online*
Graduate Student Department Seminar: University of Waterloo Department of Applied Mathematics — *September 2020*

A brief introduction to geophysical fluid dynamics — *Peterborough, Ontario*
Invited talk: Trent Mathematics and Statistics Conference — *March 2019*

Conference Presentations

Exploring Removal Mechanisms in the Pi Convection-Cloud Chamber — *Houston, Texas*
Swartz-Schult et. al. — *January 2026*
Contributed Talk: 106th American Meteorological Society Annual Meeting

Multi-scale interactions in turbulent mixed convection drive efficient transport of Lagrangian particles. — *Houston, Texas*
Grace, A.P., and Richter, D.H. — *November 2025*
Contributed Talk: American Physical Society Division of Fluid Dynamics

Multi-scale interactions in turbulent mixed convection drive efficient transport of Lagrangian particles. — *Salt Lake City, Utah*
Grace, A.P., and Richter, D.H. — *November 2024*
Interact Session: American Physical Society Division of Fluid Dynamics

On the arrested development of the Rayleigh Taylor instability with and without cabbeling. — *Salt Lake City, Utah*
Stastna, M., and **Grace, A.P.** — *November 2024*
Contributed Talk: American Physical Society Division of Fluid Dynamics

The Settling Rates of Particles in Rayleigh–Bénard Turbulence. — *Salt Lake City, Utah*
Swarz-Schult, K., Anderson, J.C., Sadi, H.F., Sulaiman, S.V., Cantrell, W., Shaw R.A., Richter, D.H., and **Grace, A.P.** — *November 2024*
Contributed Talk: American Physical Society Division of Fluid Dynamics

Slip velocity statistics of settling inertial particles in wall bounded turbulence. — *Salt Lake City, Utah*
Grace, A.P., Berk, T., Bragg, A.D., and Richter, D.H. — *November 2024*
Contributed Talk: American Physical Society Division of Fluid Dynamics

Restratification in late winter lakes induced by cabbeling — *San Francisco, California*
Grace, A.P., Fogal, A., and Stastna, M. — *December 2023*
Contributed Talk: American Geophysical Union Annual Meeting

Phase space modeling for settling enhancement of inertial particles — *San Francisco, California*
Grace, A.P., Richter, D.H., and Bragg, A. — *December 2023*
Contributed Talk: American Geophysical Union Annual Meeting

Phase space modeling for settling enhancement of inertial particles — *Washington, District of Columbia*
Grace, A.P., Richter, D.H., and Bragg, A. — *November 2023*
Contributed Talk: American Physical Society Division of Fluid Dynamics

PDF-based model for inertial particles settling in a turbulent boundary layer using an asymptotic closure approximation — *Washington, District of Columbia*
Zhang, Y., **Grace, A.P.**, Richter, D.H., and Bragg, A. — *November 2023*
Contributed Talk: American Physical Society Division of Fluid Dynamics

Three-dimensional simulations of gravity currents in cold, fresh water — *Washington, District of Columbia*
Castro-Folker, N., **Grace, A.P.**, and Stastna, M. — *November 2023*
Contributed Talk: American Physical Society Division of Fluid Dynamics

Gravity Currents in the Cabbeling Regime — *Toronto, Ontario*
Grace, A.P., Stastna, M., Lamb, K.G., and Scott, K.A. — *December 2022*
Contributed Talk: Canadian Mathematical Society Winter Meeting

Gravity Currents in the Cabbeling Regime — *Indianapolis, Indiana*
Grace, A.P., Stastna, M., Lamb, K.G., and Scott, K.A. — *November 2022*
Contributed Talk: American Physical Society Division of Fluid Dynamics

3D Simulations of the Interior of an Ice-Covered Lake subjected to Spatially Heterogeneous Solar Radiation Intensity — *Indianapolis, Indiana*
Allum, D.J.M., **Grace, A.P.**, and Stastna, M. — *November 2022*
Contributed Talk: American Physical Society Division of Fluid Dynamics

Double Diffusive Instability with a Constriction — *Indianapolis, Indiana*
Legare, S., **Grace, A.P.**, and Stastna, M. — *November 2022*
Contributed Talk: American Physical Society Division of Fluid Dynamics

Gravity Currents in the Cabbeling Regime — *Vancouver, British Columbia*
Grace, A.P., Stastna, M., Lamb, K.G., and Scott, K.A. — *July 2022*
Contributed Talk: Physical Processes in Natural Waters

Shear mediates downward heat fluxes in unstably stratified environments. — *Online*
Grace, A.P., Stastna M., Lamb, K.G., and Scott, K.A. — *June 2021*
Contributed Talk: The Canadian Meteorological and Oceanographic Society Congress

Gravity current evolution in the cold water regime — *Online*
Grace, A.P., Stastna M., Lamb, K.G., and Scott, K.A. — *June 2020*
Contributed Talk: The Canadian Meteorological and Oceanographic Society Congress.

Numerical modeling of hydrodynamic-ice dynamic coupling in a small lake — *Brockport, New York*
Grace, A.P., Stastna M., Lamb, K.G., and Scott, K.A. — *May 2019*
Contributed Talk: International Association for Great Lakes Research

Simulations of motion in the bottom boundary layer induced by an internal standing wave — *Atlanta, Georgia*
Grace, A.P., Stastna M. — *November 2018*
Contributed Talk: American Physical Society Division of Fluid Dynamics

Reconciling simulations of theoretical and experimental laboratory scale seiche motion — *Vienna, Austria*

Grace, A.P., Stastna, M., and Poulin, F.J. — *April 2018*

Contributed Talk: European Geophysics Union General Assembly, Vienna, Austria.

The response of a basin scale seiche due to variation of the aspect ratio of the density surface — *Denver, Colorado*

Grace, A.P., Stastna, M., and Poulin, F.J. — *November 2017*

Contributed Talk: American Physical Society Division of Fluid Dynamics

Poster Presentations

Multi-scale interactions in turbulent mixed convection drive efficient transport of Lagrangian particles. — *New Orleans, Louisiana*

Grace, A.P., and Richter, D.H. — *December 2025*

Contributed Poster: American Geophysical Union Annual Meeting

Using Upscaling Techniques to Incorporate Particle Settling Speed Enhancement in a Coarse-Mode Deposition Model. — *New Orleans, Louisiana*

Grace, A.P., and Richter, D.H. — *December 2025*

Contributed Poster: American Geophysical Union Annual Meeting

Volumetric heating models and their impact on small scale, non-hydrostatic dynamics — *Online*

Grace, A.P., Stastna, M., Lamb, K.G., and Scott, K.A. — *May 2020*

Contributed Poster: Global Water Futures Annual Science Meeting

Numerical process studies of the circulation and ice formation on a small lake. — *Palaiseau, France.*

Grace, A.P., Stastna, M., Lamb, K.G., and Scott, K.A. — *July 2019*

Contributed Poster: The Fluid Dynamics of Sustainability and the Environment, École Polytechnique

Modeling ice growth in Marginal Ice Zones using a coupled hydrodynamic-ice model — *Saskatoon, Saskatchewan*

Grace, A.P., Stastna, M., Lamb, K.G., and Scott, K.A. — *May 2019*

Contributed Poster: Global Water Futures Annual Science Meeting

From DNS of shear instability to cross-layer transport — *Toronto, Ontario*

Grace, A.P., Stastna, M., and Poulin, F.J. — *June 2017*

Contributed Poster: The Canadian Meteorological and Oceanographic Society Congress.