ALEXIS K. KAMINSKI

Department of Mechanical Engineering – University of California, Berkeley, Berkeley, CA, USA 94720 *https://akkaminski.github.io*
kaminski@berkeley.edu *https://ucbstratflows.github.io*

Current Position

University of California, Berkeley (Berkeley, CA, USA)
Assistant Professor, Department of Mechanical Engineering *2021–present*

Education

University of Cambridge (Cambridge, UK)
Ph.D. in Applied Mathematics & Theoretical Physics *2012–2016*
Thesis title: Linear optimal perturbations and transition to turbulence in strongly-stratified shear flows [Supervisor: J. R. Taylor]

University of Alberta (Edmonton, AB, Canada)
M.Sc. in Mechanical Engineering *2010–2012*
Thesis title: Modal decomposition of tidally-forced internal waves (reconstructed from timeseries data) [Supervisor: M. R. Flynn]

University of Alberta (Edmonton, AB, Canada)
B.Sc. in Mechanical Engineering (with Distinction) *2006–2010*

Professional Experience

Applied Physics Laboratory, University of Washington (Seattle, WA, USA)
Postdoctoral Scholar *2018–2020*
Analyzed ocean observations of wave and instabilities, performed numerical simulations of associated stratified mixing processes. [Supervisor: E. A. D'Asaro]

Oregon State University, College of Earth, Ocean, & Atmospheric Sciences (Corvallis, OR, USA)
Research Associate (Postdoc) *2016–2018*
Modelled shear-driving mixing of stratified oceanic flows using large-scale parallel direct numerical simulations. [Supervisor: W. D. Smyth]

Woods Hole Oceanographic Institution (Woods Hole, MA, USA)
Geophysical Fluid Dynamics Fellowship *2014*
Performed laboratory experiments investigating the interaction of Rossby waves with barriers. [Supervisors: K. Helfrich and J. Pedlosky]

University of Lethbridge, Dept. of Geography (Lethbridge, AB, Canada)
Research Assistant *2010*
Modelled spray and deposition of mycoinsecticides, worked with climate data for degree-day models of insect growth. [Supervisor: D. L. Johnson]

University of Alberta, Dept. of Mechanical Engineering (Edmonton, AB, Canada)
Research Assistant *2009–2010*
Designed a heat transfer demonstration unit for temperature data acquisition, wrote accompanying control program and calibration code. [Supervisor: D. S. Nobes]

Transports Québec, Secteur Granulats (Québec, QC, Canada)
Stagiaire (Intern) *2008*
Developed an algorithm using the wavelet transform for image denoising of road surface microtexture measurements. [Supervisors: D. Fleury, C. Robert]

Teaching Experience

University of California, Berkeley, Dept. of Mechanical Engineering (Berkeley, CA, USA)

Assistant Professor *2021–present*

Graduate courses: ME 260A/B – Advanced Fluid Mechanics I/II (∼20 students), ME 266 – Geophysical Fluid Dynamics (∼15 students).

Undergraduate courses: ME 106 – Fluid Mechanics (∼150 students).

University of Washington, Dept. of Civil and Environmental Engineering (Seattle, WA, USA)

Guest Lecturer *2019–2020*

Guest lectures in courses: Case Studies in Environmental Engineering (third-year undergraduate), Hydrodynamics, Numerical Modelling (graduate).

Oregon State University, Centre for Teaching and Learning (Corvallis, OR, USA)

Certificate in Teaching & Learning *2017–2018*

Churchill College, University of Cambridge (Cambridge, UK)

Undergraduate Supervisor *2014–2015*

Courses: Electromagnetism, Methods, Fluid Dynamics (all second-year undergraduate).

University of Alberta, Dept. of Mechanical Engineering (Edmonton, AB, Canada)

Teaching Assistant *2010–2012*

Courses: Numerical Methods, Mechanical Measurements, Heat Transfer (all third-year undergraduate).

Scientific Contributions

Journal articles

- Liu, C.-L., Kaminski, A. K., and Smyth, W. D., 2024. Turbulence and mixing from neighbouring stratified shear layers. *Journal of Fluid Mechanics*, 987, A8. [Cover image for JFM volume 987.]
- Sutherland, B. R., DiBenedetto, M., Kaminski, A., and van den Bremer, T., 2023. Fluid dynamics challenges in predicting plastic pollution transport in the ocean: A perspective. *Physical Review Fluids*, 8, 070701. [Featured in Physical Review Journal Club, Sept. 2023.]
- Liu, C.-L., Kaminski, A. K., and Smyth, W. D., 2023. The effects of boundary proximity on Kelvin-Helmholtz instability and turbulence. *Journal of Fluid Mechanics*, 966, A2.
- Olsthoorn, J., Kaminski, A. K., and Robb, D. M., 2023. The dynamics of asymmetric stratified shear instabilities. *Physical Review Fluids*, 8, 024501.
- Liu, C.-L., Kaminski, A. K., and Smyth, W. D., 2022. The butterfly effect and the transition to turbulence in a stratified shear layer. *Journal of Fluid Mechanics*, 953, A43.
- Tu, J., Fan, D., Sun, F., Kaminski, A., and Smyth, W., 2022. Shear instabilities and stratified turbulence in an estuarine fluid mud. *Journal of Physical Oceanography*, 52, 2257-2271.
- Prend, C. J., Flierl, G. R., Smith, K. M., and Kaminski, A. K., 2021. Parameterizing eddy transport of biogeochemical tracers. *Geophysical Research Letters*, 48, e2021GL094405.
- Kaminski, A. K., D'Asaro, E. A., Shcherbina, A. Y., and Harcourt, R. R., 2021. High-resolution observations of the North Pacific transition layer from a Lagrangian float. *Journal of Physical Oceanography*, 51, 3163-3181.
- Kaminski, A. K., Helfrich, K. R., and Pedlosky, J. 2020. An experimental investigation of the Rossby two-slit problem. *Journal of Fluid Mechanics*, 893, A4.
- Kaminski, A. K. and Flynn, M. R. 2020. Modal decomposition of polychromatic internal wave fields in arbitrary stratifications. *Wave Motion*, 95, 102549.

- Tu, J., Fan, D., Lian, Q., Liu, Z., Liu, W., Kaminski, A., and Smyth, W. 2020. Acoustic observations of Kelvin-Helmholtz billows on an estuarine lutocline. *Journal of Geophysical Research: Oceans*, 125, e2019JC015383.
- Kaminski, A. K. and Smyth, W. D. 2019. Stratified shear instability in a field of pre-existing turbulence. *Journal of Fluid Mechanics*, 862, 639-658.
- Kaminski, A. K., Caulfield, C. P., and Taylor, J.R., 2017. Nonlinear evolution of linear optimal perturbations to stably-stratified shear layers. *Journal of Fluid Mechanics*, 825, 213-244.
- Sahuri, R. M., Kaminski, A. K., Flynn, M. R. and Ungarish, M., 2015. Axisymmetric gravity currents in two-layer density-stratified media. *Environmental Fluid Mechanics*, 15(5), 1035-1051.
- Kaminski, A. K., Caulfield, C. P., and Taylor, J.R., 2014. Transient growth in strongly-stratified shear layers. *Journal of Fluid Mechanics*, 758, R4.

Conference and workshop talks (* indicates invited/plenary speaker)

- * Kaminski, A. Estimating efficiency and lengthscales of stratified mixing events from limited measurements. *Isaac Newton Institute Programme on Anti-Diffusive Dynamics, Workshop 3: Climate applications of layering*, Cambridge, UK, May 2024.
- * Kaminski, A. Layering in stratified flows. *Isaac Newton Institute Programme on Anti-Diffusive Dynamics, Workshop 1: Layering – A structure formation mechanism in oceans, atmospheres, active fluids and plasmas*, Cambridge, UK, Jan. 2024.
- Kaminski, A. K. and Olsthoorn, J. Estimating turbulent lengthscales in stratified mixing events from limited measurements. *APS 76th Annual DFD Meeting*, Washington, DC, Nov. 2023.
- Kaminski, A. K., Tu, J., and Smyth, W. Stratified shear instabilities in estuarine fluid muds. *APS 75th Annual DFD Meeting*, Indianapolis, IN, Nov. 2022.
- * Kaminski, A. Turbulent lengthscales in overturning and scouring stratified shear instabilities. *9th Intl. Symposium on Stratified Flows*, Cambridge, UK, Aug.-Sept. 2022.
- * Kaminski, A. Stratified shear instability in a field of pre-existing turbulence. *Gordon Research Conference on Ocean Mixing*, South Hadley, MA, June 2022.
- Kaminski, A. K., Prend, C. J., Flierl, G. R., and Smith, K. M. Parameterizing eddy fluxes of reactive biogeochemical tracers, *APS 74th Annual DFD Meeting*, Phoenix, AZ, Nov. 2021.
- * Kaminski, A., and Caulfield, C. Can we ever know our LIMITS? Some open questions concerning Layering, Instability, Mixing, Internal (waves), Turbulence & Stratification. *Kavli Institute for Theoretical Physics Program: Layering in Atmospheres, Oceans and Plasmas*, online, Jan. 2021. [delivered jointly with C. Caulfield]
- Kaminski, A., D'Asaro, E. A., Shcherbina, A. Y., and Harcourt, R. R. Detailed observations of centimetre-scale structures and entrainment in the transition layer. *2020 Ocean Sciences Meeting*, San Diego, CA, Feb. 2020.
- Kaminski, A., Olsthoorn, J., Robb, D., and D'Asaro, E. Overturning structures in symmetric and asymmetric shear instabilities. *APS 72nd Annual DFD Meeting*, Seattle, WA, Nov. 2019.
- Kaminski, A., Cherian, D., and Smyth, W. Can limited observations recover irreversible turbulent fluxes? A test case using DNS. *APS 71st Annual DFD Meeting*, Atlanta, GA, Nov. 2018.
- Kaminski, A. and Smyth, W. Stratified shear instability in a field of pre-existing turbulence. *2018 Ocean Sciences Meeting*, Portland, OR, Feb. 2018.
- Kaminski, A. and Smyth, W. The effect of pre-existing turbulence on stratified shear instability. *APS 70th Annual DFD Meeting*, Denver, CO, Nov. 2017.
- Kaminski, A., Pedlosky, J. and Helfrich, K. An experimental investigation of the Rossby two-slit problem. *APS 69th Annual DFD Meeting*, Portland, OR, Nov. 2016.
- Kaminski, A. and Taylor, J. Stability and mixing of shear layers forced by standing internal waves. *8th Intl. Symposium on Stratified Flows*, San Diego, CA, Aug.-Sept. 2016.
- Kaminski, A., Caulfield, C., and Taylor, J. Nonlinear evolution of optimal perturbations to strongly stratified shear layers. *24th Intl. Congress of Theoretical and Applied Mechanics*, Montreal, QC, Aug. 2016.

- Kaminski, A. and Taylor, J. Instability and mixing of stratified shear layers forced by internal wave strain. *APS 68th Annual DFD Meeting*, Boston, MA, Nov. 2015.
- Kaminski, A. K., Caulfield, C. P., and Taylor, J. R. Evolution of linear optimal perturbations in stratified shear layers. *It All Adds Up: LMS Women in Maths Day 2015*, Oxford, UK, April 2015.
- Kaminski, A. K., Caulfield, C. P., and Taylor, J. R. Transient stability of stratified shear layers. *Euromech Colloquium 567 on Turbulent Mixing in Stratified Fluids*, Cambridge, UK, March 2015.
- Kaminski, A., Caulfield, C. P., and Taylor, J. Turbulence and mixing from optimal perturbations to a stratified shear layer. *APS 67th Annual DFD Meeting*, San Francisco, CA, Nov. 2014.
- Kaminski, A. and Taylor, J. Linear optimal perturbations of a stratified shear flow. *APS 66th Annual DFD Meeting*, Pittsburgh, PA, Nov. 2013.
- Kaminski, A. K. and Flynn, M. R. Modal decomposition of tidally-forced internal waves. *EGU General Assembly 2012*, Vienna, Austria, April 2012.

Posters

- Kaminski, A., Olsthoorn, J., and Lewin, S. Estimating the efficiency of stratified mixing events from limited measurements. *Gordon Research Conference on Ocean Mixing*, South Hadley, MA, June 2024.
- Kaminski, A., D'Asaro, E. A., Shcherbina, A. Y., and Harcourt, R. R. The effects of surface forcing and mixed layer turbulence on transition layer dynamics. *American Geophysical Union Fall Meeting*, online, Dec. 2020.
- Kaminski, A. and D'Asaro, E. Float-based observations of the North Pacific transition layer, *University of Washington Postdoctoral Association Annual Research Symposium*, Seattle, WA, Oct. 2019
- Kaminski, A. and Taylor, J. R. Instability and mixing of stratified shear layers forced by internal wave strain. *2016 Ocean Sciences Meeting*, New Orleans, LA, Feb. 2016.
- Kaminski, A. K. and Taylor, J. R. Linear optimal perturbations of a stratified shear flow. *London Mathematical Society Women in Mathematics Day 2014*, London, UK, April 2014.
- Kaminski, A. K. and Taylor, J. R. Linear optimal perturbations of a stratified shear flow. *Summer school on Fluid Dynamics of Sustainability and the Environment*, École Polytechnique, Palaiseau, France, Sept. 2013.

Seminars

- Physics & Astronomy Colloquium, Dept. of Physics & Astronomy, San Francisco State University, San Francisco, CA, Feb. 2024.
- Earth & Planetary Sciences Colloquium, Dept. of Earth & Planetary Sciences, University of California, Berkeley, CA, Sept. 2023.
- Geophysical Fluid Dynamics Program, Woods Hole Oceanographic Institution, Woods Hole, MA, July 2023.
- Applied Mathematics Seminar, University of California, Santa Cruz, CA, June 2023.
- Fluid Mechanics, Combustion, & Engineering Physics Seminar, Dept. of Mechanical and Aerospace Engineering, University of California, San Diego, CA, May 2023.
- Australasian Fluid Mechanics Society, Nov. 2022 [delivered remotely].
- Environmental and Water Resources Engineering, University of Texas, Austin, TX, Oct. 2022.
- Berkeley Atmospheric Science Center, University of California, Berkeley, CA, April 2022.
- Center for Atmosphere and Ocean Science, Courant Institute for Mathematical Sciences, Dec. 2021 [delivered remotely].
- Applied Ocean Physics & Engineering, Woods Hole Oceanographic Institution, Oct. 2021 [delivered remotely].
- Fluid Mechanics Seminar, Stanford University, Stanford, CA, Sept. 2021.
- Dept. of Mechanical Engineering, University of California, Berkeley, April 2020 [delivered remotely].
- Dept. of Engineering Science and Applied Mathematics, Northwestern University, April 2021 [delivered remotely].
- Dept. of Applied Mathematics, University of Leeds, Nov. 2020 [delivered remotely].
- Graduate School of Oceanography, University of Rhode Island, Aug. 2020 [delivered remotely].
- Geophysical Fluid Dynamics Program, Woods Hole Oceanographic Institution, Aug. 2020 [delivered remotely].
- Physical Oceanography group, University of British Columbia, May 2020 [delivered remotely].

- School of Oceanography, University of Washington, Seattle, WA, Oct. 2019.
- Geophysical Fluid Dynamics Program, Woods Hole Oceanographic Institution, Woods Hole, MA, July 2019.
- Dept. of Physical Oceanography, Woods Hole Oceanographic Institution, Woods Hole, MA, March 2018.
- Geophysical Fluid Dynamics Program, Woods Hole Oceanographic Institution, Woods Hole, MA, July 2018.
- NOAA Geophysical Fluid Dynamics Laboratory, Princeton, NJ, May 2018.
- Environment Fluid Mechanics group, University of Washington, Seattle, WA, April 2018.
- College of Earth, Ocean, & Atmospheric Sciences, Oregon State University, Corvallis, OR, March 2018.
- National Center for Atmospheric Research, Boulder, CO, Nov. 2017.
- Geophysical Fluid Dynamics Program, Woods Hole Oceanographic Institution, Woods Hole, MA, July 2017.
- College of Earth, Ocean, & Atmospheric Sciences, Oregon State University, Corvallis, OR, Feb. 2017.
- Institute for Geophysical Research, University of Alberta, Edmonton, AB, Canada, Sept. 2016.
- Geophysical Fluid Dynamics Program, Woods Hole Oceanographic Institution, Woods Hole, MA, July 2016.
- BP Institute, University of Cambridge, Cambridge, UK, Feb. 2016.
- Dept. of Applied Mathematics & Theoretical Physics, University of Cambridge, Cambridge, UK, Feb. 2014.
- Dept. of Earth & Atmospheric Sciences, University of Alberta, Edmonton, AB, Canada, March 2012.

Research Funding

- Co-Principal Investigator, NSF grant CBET-2231781: Collaborative Research: Correlating Large-Scale Visual Structures to Entrainment Mechanisms in Buoyant and Momentum-Driven Plumes, UCB funds $250 001, 2022-2025.
- Principal Investigator, NSF grant OCE-2123204: Collaborative Proposal: Harnessing simulation data to characterize transition layer mixing rates and mechanisms UCB funds $366 086, 2021-2024.

Mentorship

Postdoctoral researchers

- Dr. Samuel Lewin, 2023-present.

Graduate students

- Leo (Zichuan) Li, 2023-present.
- Shuai Meng, 2022-present.
- Vincent Laroche, 2021-present.

Undergraduate researchers

- Anant Ayyar, spring 2024-present, co-advised with Dr. Samuel Lewin
- Tristan Villeneuva, summer 2021-fall 2022.
- Matthew Thomas, fall 2022.
- Martin Beshara, spring 2022.

Other

- Arefe Ghazi Nezami (UT Austin), student fellow in WHOI Geophysical Fluid Dynamics program, summer 2023.
- Channing Prend (Scripps Institution of Oceanography), student fellow in WHOI Geophysical Fluid Dynamics program, summer 2019.

Service

University service

- Department of Mechanical Engineering Preliminary Exams Committee member, 2022-present.
- Faculty Search Committee (Manufacturing) member, 2023-2024.
- Guest speaker, UC Berkeley Society for Women Engineers High School Engineering Program, and faculty volunteer, SWE Overnight Host Program, 2024.
- Presenter on PrairieLearn software for ME department faculty, 2023.
- Application reviewer, panel host, and panel member, UC Berkeley ME Rising Stars program, 2023.
- Application reviewer, NextProf Nexus, 2022, 2023.
- Department of Mechanical Engineering MEng Committee member, 2022-2023.
- Moderator, UC Berkeley Mechanical Engineering EDI UG & Grad Committee Women in MechE Career Panel, 2022.
- Department of Mechanical Engineering Awards Committee member, 2021-2022.
- Department of Mechanical Engineering Powley Fund Committee member, 2021-2022.
- Guest speaker, UC Berkeley Mechanical Engineering Scholars Program, 2021, 2022.
- Guest speaker, UC Berkeley SWE High School Engineering Program, 2021, and SWE Mini-University, 2021.

Service external to UC Berkeley

- Reviewer, Phys. Rev. Fluids (9), J. Fluid Mech. (13), J. Geophys. Res. – Oceans (5), Phys. Rev. Lett. (3), J. Phys. Oceanogr. (5), Proc. Roy. Soc. A (1), Fluid Dyn. Res. (1), J. Oceanol. Limnol. (1), Geophys. Res. Lett. (1), J. Adv Modell. Earth Sys. (1), Oceanography (1), Wiley Publishing (1)
- Faculty organizing committee member, Geophysical Fluid Dynamics program, 2021–present.
- Co-organizer and diversity lead, Isaac Newton Institute Programme on "Anti-Diffusive Dynamics", 2022-2024.
- Session chair, APS Division of Fluid Dynamics Meeting, 2021-2023.
- Panel member, UC Davis Society for Women Engineers Women in STEM panel, 2023.
- Panel reviewer, National Science Foundation, 2022.
- Organizing committee member, Banff International Research Station workshop on "Predicting Microplastic Transport in the Ocean", 2020–2022.

Service prior to UC Berkeley

- Secretary, University of Washington Postdoctoral Association, 2020.
- Webmaster, University of Washington Postdoctoral Association, 2019–2020.
- Session chair, APS 72nd Annual Division of Fluid Dynamics Meeting, 2019.
- Staff member, Geophysical Fluid Dynamics program, Woods Hole Oceanographic Institution, 2016–2019.
- Volunteer, University of Washington Engineering Discovery Days, 2019.
- Volunteer, Pacific Science Center Climate Change Weekend, 2019.
- Coordinator, Physics of Oceans and Atmospheres seminar series, Oregon State University, 2017–2018.
- Interviewer for prospective mathematics undergraduates, Churchill College, 2015.
- General Secretary, Churchill College Middle Common Room, 2014–2015.
- Bar Treasurer, Churchill College Middle Common Room, 2013–2014.
- Co-organizer, George K. Batchelor laboratory lunches, 2013.
- Women in Scholarship, Engineering, Science & Technology (WISEST) volunteer, 2010–2011.
- U. Alberta Graduate Residence Student Conference planning committee, 2010–2011.

Computing Resources

- NCAR University Large Allocation – 800 000 core-hours on the NCAR Cheyenne supercomputer. Proposal co-written with Prof. William Smyth, Fall 2017.

Cruise Experience

- R/V Sikuliaq, Nov.-Dec. 2018: CTD rosette casts, float and glider recovery.
- R/V Sally Ride, Sept. 2017: mooring deployment, microstructure and CTD profiling (part of ONR Inner Shelf project).

Academic Awards

- GFD Distinguished Scholar: WHOI Geophysical Fluid Dynamics Program, 2023.
- Best poster, University of Washington Postdoctoral Association Annual Research Symposium, 2019.
- Ocean Sciences Meeting Travel Grant: American Geophysical Union, 2016.
- NSERC Post-Graduate Scholarship – Doctoral level: Government of Canada, 2012–2015.
- Edmonton Churchill Scholarship: Edmonton Churchill Society, 2012–2015.
- Queen Elizabeth II Master's Scholarship: University of Alberta, 2011–2012.
- Margaret Brine Graduate Scholarship: CFUW-Edmonton, 2011.
- NSERC Canada Graduate Scholarship – Master's level: Government of Canada, 2010–2011.

Additional Information

- Experienced in programming in MATLAB and Fortran.
- Proficient in spoken and written French.
- Professional affiliations: member of American Physical Society and American Geophysical Union.