LOU BAKER, PhD

SUMMARY

Fluid mechanics researcher with expertise in image processing, statistical analysis, and experimental methods, as well as teaching, mentorship, and improving equity and accessibility in academia.

EDUCATION

University of Minnesota, Minneapolis, MN

Ph.D., Aerospace Engineering and Mechanics | 4.00 — Jun 2021
Focus: Experimental Fluid Mechanics

M.S., Aerospace Engineering and Mechanics | 4.00 — Dec 2018

B.Eng., Aerospace Engineering and Mechanics | 3.75 — May 2016

EXPERIENCE

Part-time Lecturer, Northeastern University, Seattle, WA — May 2025 – present
ME 3465: Introduction to Flight

Financial Secretary, UAW Local Union 4121, WA — Aug 2023 – present
Organizing for equity and accessibility in academia through the academic workers' union at the University of Washington and managing staff, finances, and accounting.

NSF Postdoctoral Fellow, University of Washington — Jun 2021 – Jul 2023
Dept of Mechanical Engineering / Environmental Fluid Mechanics Group
Investigated the statistical behavior of microplastic particles in wind-driven ocean surface turbulence and wind waves through laboratory experiments using image processing techniques

Guest Lecturer, University of Washington — May 2022
ME 543: Fluid Turbulence

Space Weather Simulation Summer School, University of Colorado — Jul 2022
Learned and implemented numerical techniques for modeling atmospheric dynamics and chemistry using GitHub, Python, and Julia

Graduate Research Assistant, University of Minnesota — May 2016 – Jun 2021
Dept of Aerospace Engineering / St. Anthony Falls Laboratory
Explored the interactions between inertial particles and fluid turbulence in open channel flows through image-based experiments in a laboratory water channel and an outdoor stream

Laboratory Instructor/Teaching Assistant, University of Minnesota — Jan 2014 – May 2017
AEM 2012: Dynamics
AEM 4601: Instrumentation Laboratory
AEM 4602: Aeromechanics Laboratory

Summer Institute on Earth-Surface Dynamics, St. Anthony Falls Laboratory, MN Aug 2017
Explored geophysical fluid dynamics through theory, experiments, fieldwork, and numerical modeling in Python

Undergraduate Research Assistant, University of Minnesota Jan 2014 – May 2016
Dept of Aerospace Engineering / Laboratories for Turbulent and Complex Flows
Studied particle clustering in homogeneous turbulence by analyzing large datasets generated by numerical simulations

Intern, Virgin Orbit, CA Jun – Aug 2015
Designed engine gimbals and heat exchangers for LauncherOne rocket engines

Intern, NASA Jet Propulsion Laboratory, CA Jun – Aug 2013 & 2014
Designed and tested magnetic shielding for the ISS Cold Atom Lab research facility

PUBLICATIONS

9. **Baker, L.**, Aggarwal, A., Chávez-Dorado, J., Garrey, I., & DiBenedetto, M. "Irradiation of nonspherical particles in wind-driven turbulence." In preparation.
8. Sanness Salmon, H., **Baker, L.**, Kozarek, J., & Coletti, F. (2023) "Effect of Shape and Size on the Transport of Floating Particles on the Free-surface of a Meandering Stream." *Water Resources Research, 59*, e2023WR035716.
7. **Baker, L.** & DiBenedetto, M. (2023) "Large-scale particle shadow tracking and orientation measurement with collimated light." *Experiments in Fluids, 64*, 52.
6. **Baker, L.** & Coletti, F. (2022) "Experimental investigation of inertial fibres and disks in a turbulent boundary layer." *Journal of Fluid Mechanics, 943*, A27.
5. **Baker, L.**, Qiao, Y., Ghaemi, S., & Coletti, F. (2021) "Method to minimize polymer degradation in drag-reduced non-Newtonian turbulent boundary layers." *Measurement Science and Technology, 32*, 085303.
4. **Baker, L.** & Coletti, F. (2021) "Particle–fluid–wall interaction of inertial spherical particles in a turbulent boundary layer." *Journal of Fluid Mechanics, 908*, A39.
3. **Baker, L.** & Coletti, F. (2019) "Experimental study of negatively-buoyant finite-size particles in a turbulent boundary layer up to dense regimes." *Journal of Fluid Mechanics*, *866*, 598-629.
2. Petersen, A., **Baker, L.**, & Coletti, F. (2019) "Experimental study of inertial particles clustering and settling in homogeneous turbulence." *Journal of Fluid Mechanics, 864*, 925-970.
1. **Baker, L.**, Frankel, A., Mani, A., & Coletti, F. (2017) "Coherent clusters of inertial particles in homogeneous turbulence." *Journal of Fluid Mechanics, 833*, 364-398.

INVITED TALKS

Mechanical Engineering Graduate Seminar, University of Iowa (Feb 2023)

Workshop on Microplastic Transport in the Ocean, Banff International Research Station (Feb 2022)

Center for Coastal and Ocean Mapping / Ocean Engineering Seminar, University of New Hampshire (Feb 2022)

Hydro-Geo Seminar, University of Minnesota / University of Illinois Urbana-Champaign (Feb 2022)

Environmental Fluid Mechanics Seminar, University of Washington (Oct 2021)

ACADEMIC SERVICE

Peer Review Mar 2019 – present

Journal referee: *Journal of Fluid Mechanics, Experiments in Fluids, International Communications on Heat and Mass Transfer, European Journal of Mechanics / B Fluids, Physical Review Fluids, Water Research, Microplastics & Nanoplastics*

Proposal reviewer: NSF

MENTORSHIP, OUTREACH, & DEJI

Research Mentor, University of Washington Jun 2021 – Jan 2023
Primary mentor for three undergrad research assistants performing fluid mechanics experiments

Leadership Academy and Network for Diversity in the Geosciences Academy: Postdoctoral Research Fellows Program, American Geophysical Union Jan 2022 – Jan 2023
Learn to implement evidence-based DEI practices to create equity and inclusion in STEM

Postdoc Union Steward, University of Washington May 2022 – Jul 2023
Organize for equitable and safe working conditions and foster community among postdocs

Climate Justice Working Group, University of Washington Jun 2021 – Jul 2023
Advocate for climate/social justice initiatives related to housing, transportation, and energy

Volunteer Income Tax Preparer, United Way of King County, WA Jan 2023 – present
Prepare income tax returns at no cost for low-income taxpayers

Seattle Astronomical Society, Seattle, WA Feb 2022 – Jan 2023
Outreach volunteer for Girl Scout astronomy programs and public stargazing events

A Friend in STEM, University of Minnesota Mar – Jun 2021
Mentor to a woman undergraduate student in Aerospace Engineering

Women of Aeronautics and Astronautics, University of Minnesota Sep 2017 – Jun 2021
Mentor to women undergraduate students in Aerospace Engineering

AWARDS

NSF Ocean Sciences Postdoctoral Research Fellowship Aug 2021 – Aug 2023

National Defense Science and Engineering Graduate Fellowship Sep 2017 – Jun 2021

Edward Silberman Fellowship Jan 2019 – May 2020

John A. & Jane Dunning Copper Fellowship May 2017

Albert George Oswald Prize for Outstanding Research Sep 2015 – May 2016

CONFERENCE PRESENTATIONS

DiBenedetto, M., **Baker, L.**, & Chávez-Dorado, J. E. (2024) “Vertical dispersion of buoyant particles in a free surface flow.” APS Division of Fluid Dynamics, Salt Lake City, UT.

DiBenedetto, M., Chávez-Dorado, J. E., & **Baker, L.** (2024) “Dynamics of buoyant, non-spherical particles in a wind-driven surface boundary layer.” Ocean Sciences Meeting, New Orleans, LA.

Baker, L., Aggarwal, A., Chávez-Dorado, J. E., Garrey, I., & DiBenedetto, M. (2023) “Non-spherical particle orientation dynamics under a wind-driven free surface boundary layer.” APS Division of Fluid Dynamics, Washington D.C.

Baker, L., Aggarwal, A., Chávez-Dorado, J. E., Garrey, I., & DiBenedetto, M. (2023) “Buoyant, Non-Spherical Particles in Wind-Driven Waves.” Waves in Sea Environment Meeting, Princeton, NJ.

Baker, L., Aggarwal, A., Chávez-Dorado, J. E., Garrey, I., & DiBenedetto, M. (2022) “Buoyant, Non-Spherical Plastic Particles in Turbulent Wind-Driven Waves.” AGU Fall Meeting, Chicago, IL.

Baker, L., Aggarwal, A., Chávez-Dorado, J. E., Garrey, I., & DiBenedetto, M. (2022) “Buoyant, non-spherical particles in turbulent wind-driven waves.” APS Division of Fluid Dynamics, Indianapolis, IN.

Baker, L., Aggarwal, A., Chávez-Dorado, J. E., Garrey, I., & DiBenedetto, M. (2022) “Buoyant, non-spherical particles in turbulent wind-driven waves.” Atmospheres, Oceans, Earths—Unifying perspectives on geophysical and environmental multiphase flows, KITP, Santa Barbara, CA.

Axworthy, J., Wang, S., DiBenedetto, M., **Baker, L.**, & Padilla-Gamiño, J. (2022) “Microplastics ingestion and adhesion by reef-building corals under different flow rates.” International Coral Reef Society, Bremen, Germany.

Baker, L. & DiBenedetto, M. (2022) “Vertical transport and orientation of buoyant, non-spherical particles in the wind-mixed ocean surface boundary layer.” Ocean Sciences Meeting, virtual.

Baker, L. & Coletti, F. (2021) “Orientation and tumbling of inertial rod and disk particles in a turbulent boundary layer.” APS Division of Fluid Dynamics, Phoenix, AZ.

Baker, L. & Coletti, F. (2020) “Effects of shape on microplastic particle–fluid–wall interaction and transport in a turbulent boundary layer.” AGU Fall Meeting, virtual.

Baker, L. & Coletti, F. (2020) “Particle-fluid-wall interaction of anisotropic inertial particles in a turbulent boundary layer.” APS Division of Fluid Dynamics, virtual.

Sanness Salmon, H., **Baker, L.**, Kozarek, J., & Coletti, F. (2020) “Effect of size and shape on the transport of particles over the free surface of a natural stream.” APS Division of Fluid Dynamics, virtual.

Baker, L. & Coletti, F. (2019) “Experimental Investigation of the Dynamics of Resuspending Spherical Sediment Particles in a Turbulent Boundary Layer.” AGU Fall Meeting, San Francisco, CA.

Coletti, F. & **Baker, L.** (2019) “Simultaneous tracking of suspended particles and time-resolved PIV in a turbulent boundary layer.” APS Division of Fluid Dynamics, Seattle, WA.

Petersen, A., **Baker, L.**, & Coletti, F. (2017) “Laboratory Study of Air Turbulence-Particle Coupling.” AGU Fall Meeting, New Orleans, LA.

Baker, L. & Coletti, F. (2017) “Experimental study of dense suspension of large particles in a turbulent boundary layer.” APS Division of Fluid Dynamics, Denver, CO.

Petersen, A., **Baker, L.**, & Coletti, F. (2017) “Particle Plumes Falling Through Quiescent and Turbulent Environments.” APS Division of Fluid Dynamics, Denver, CO.

Petersen A., Carter D., **Baker L.**, & Coletti F. (2017) “Experimental Study of Particle-turbulence Interaction in Homogeneous Turbulence.” 10th International Symposium on Turbulence and Shear Flow Phenomena, Chicago, IL, USA.

Coletti F., Toloui M., Fong, K.O., Nemes A., & **Baker L.** (2016) “Volumetric distribution and velocity of inertial particles in a turbulent channel flow.” 18th International Symposium on Application of Laser and Imaging Techniques to Fluid Mechanics, Lisbon, Portugal.

Coletti F., Petersen A., Carter D., & **Baker L.** (2016) “Measurements of particle settling velocity in homogeneous turbulence with no mean flow.” International Conference on Multiphase Flows, Florence, Italy.

Baker L., Frankel A., Mani A., & Coletti F. (2016) “Coherent clusters of inertial particles in homogeneous turbulence.” APS Division of Fluid Dynamics, Portland, OR.

Petersen A., Carter D., **Baker L.**, & Coletti F. (2015) “Settling of inertial particles through quiescent, weakly turbulent and strongly turbulent air.” APS Division of Fluid Dynamics, Boston, MA.