

LUCIA BAKER

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RESEARCH INTERESTS

Environmental fluid mechanics, particles in turbulence, microplastics, wind-driven ocean surface boundary layer flows, wind waves, open channel flows, experimental fluid mechanics, wind energy

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

RESEARCH EXPERIENCE

NSF Postdoctoral Fellow, University of Washington

Jun 2021 – present

Mentor: Prof. Michelle DiBenedetto

Investigating the vertical mixing of microplastic particles in wind-driven ocean surface turbulence and wind waves through laboratory experiments

Space Weather Simulation Summer School, University of Colorado-Boulder Jul 2022

Learned and implemented techniques for modeling atmospheric dynamics and chemistry using Python and Julia

Graduate Research Assistant, University of Minnesota

May 2016 – Jun 2021

St. Anthony Falls Laboratory & Laboratories for Turbulent and Complex Flows

Thesis: *Experimental investigation of inertial sphere, rod, and disk particles in a turbulent boundary layer* | Advisor: Prof. Filippo Coletti

Explored the interactions between inertial particles and fluid turbulence in open channel flows through experiments in a laboratory water channel and an outdoor stream

Summer Institute on Earth-Surface Dynamics, St. Anthony Falls Laboratory, MN

Aug 2017

Explored geophysical fluid dynamics through theory, experiments, numerical modeling, and fieldwork

Undergraduate Research Assistant, University of Minnesota

Jan 2014 – May 2016

Studied particle clustering in homogeneous turbulence through 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

Mentor: Dr. Anita Sengupta

Designed and tested magnetic shielding for the ISS Cold Atom Lab research facility

PUBLICATIONS

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.

Under review / In preparation:

Sanness Salmon, H., **Baker, L.**, Kozarek, J., & Coletti, F. "Effect of Shape and Size on the Transport of Floating Particles on the Free-surface of a Meandering Stream." Under review for *Water Resources Research*.

Baker, L., Aggarwal, A., Chávez-Dorado, J., Garrey, I., & DiBenedetto, M. "Buoyant, Non-Spherical Plastic Particles in Turbulent Wind-Driven Waves." In preparation.

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)

TEACHING & SERVICE

Guest Lecturer, University of Washington
ME 543: Fluid Turbulence

May 2022

Laboratory Instructor/Teaching Assistant, University of Minnesota
AEM 2012: Dynamics
AEM 4601: Instrumentation Laboratory
AEM 4602: Aeromechanics Laboratory

Jan 2014 – May 2017

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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

Mentees:

Anusha Aggarwal, undergraduate research assistant

Sep 2021 – Jan 2023

Alexander Erling, undergraduate research assistant

Sep – Dec 2021

Cali McFarland, undergraduate research assistant

Jun – Aug 2021

Leadership Academy and Network for Diversity in the Geosciences Academy: Postdoctoral

Research Fellows Program, American Geophysical Union

Jan 2022 – present

Learning to implement evidence-based DEI practices to create equity and inclusion in STEM

Union Steward, University of Washington

May 2022 – present

Organizing for equitable and safe working conditions and fostering connection among postdocs

Climate Justice Working Group, University of Washington

Jun 2021 – present

Advocating for climate/social justice initiatives related to housing, transportation, and energy

Seattle Astronomical Society, Seattle, WA

Feb 2022 – present

Outreach volunteer for Girl Scout astronomy programs and public stargazing events

Volunteer Income Tax Preparer, United Way of King County, WA

Jan 2023 – present

Preparing income tax returns at no cost for low-income or disabled taxpayers

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

Panelist in panel discussions on graduate school and career paths

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

- Baker, L.**, Aggarwal, A., Chávez-Dorado, J., 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., 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., 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.
- 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.