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

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PUBLICATIONS

1. **Baker, L.** & Coletti, F. (2022) “Experimental investigation of inertial fibres and disks in a turbulent boundary layer.” *Journal of Fluid Mechanics, 943*, A27.
2. **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.
3. **Baker, L.** & Coletti, F. (2021) “Particle–fluid–wall interaction of inertial spherical particles in a turbulent boundary layer.” *Journal of Fluid Mechanics, 908*, A39.
4. **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.
5. 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.
6. **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:

7. **Baker, L.** & DiBenedetto, M. “Large-scale particle shadow tracking and orientation measurement with collimated light.” Under review for *Experiments in Fluids*.
8. 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.*
9. **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

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 — May 2022
ME 543: Fluid Turbulence

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

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*

Proposal reviewer: NSF

MENTORSHIP, OUTREACH, & DEJI

Research Mentor, University of Washington

Mentees:

Anusha Aggarwal, undergraduate research assistant — Sep 2021 – present

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

Astronomy outreach volunteer for Girl Scout 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

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.