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

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

Graduate Researcher, University of Minnesota — May 2016 – Jun 2021
St. Anthony Falls Laboratory & Laboratories for Turbulent and Complex Flows
Advisor: Prof. Filippo Coletti
Thesis: *Experimental investigation of inertial sphere, rod, and disk particles in a turbulent boundary layer*
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 Participant, St. Anthony Falls Laboratory, MN — Aug 2017
Summer Institute on Earth-Surface Dynamics: explored Earth-surface systems 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 Galactic, 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

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

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John A. & Jane Dunning Copper Fellowship	May 2017
Albert George Oswald Prize for Outstanding Research	Sep 2015 – May 2016
Undergraduate Research Opportunities Grant	Jan – May 2015

PUBLICATIONS

Baker, L. & Coletti, F. (2022) “Experimental investigation of inertial fibres and disks in a turbulent boundary layer.” *Journal of Fluid Mechanics, 943*, A27.

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 turbulent natural stream.” In preparation for *Water Resources Research.*

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.

Baker, L. & Coletti, F. (2021) “Particle–fluid–wall interaction of inertial spherical particles in a turbulent boundary layer.” *Journal of Fluid Mechanics, 908*, A39.

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.

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.

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

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

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

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

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

CONFERENCE PRESENTATIONS

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.

TEACHING & SERVICE

Peer Reviewer Mar 2019 – present

Journal of Fluid Mechanics, Experiments in Fluids, International Communications on Heat and Mass Transfer, European Journal of Mechanics / B Fluids, Physical Review Fluids, NSF proposal reviewer

Laboratory Instructor/Teaching Assistant, University of Minnesota Jan 2014 – May 2017

AEM 2012: Dynamics
AEM 4601: Instrumentation Laboratory
AEM 4602: Aeromechanics Laboratory

MENTORSHIP & OUTREACH

Research Mentor, University of Washington

Students mentored:

Anusha Aggarwal, undergraduate research assistant	Sep 2021 – present
Alexander Erling, undergraduate research assistant	Sep – Dec 2021
Cali McFarland, undergraduate research assistant	Jun – Aug 2021

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

Gopher Science Olympiad, University of Minnesota Sep 2014 – Jan 2016

Event coordinator for annual middle school Science Olympiad tournament