

# LUCIA BAKER

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## RESEARCH INTERESTS

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

## EDUCATION

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**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

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**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

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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

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**Baker, L.** & Coletti, F. “Experimental investigation of inertial rod and disk particles in a turbulent boundary layer.” Under review for *Journal of Fluid Mechanics*.

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.” Under review for *Flow*.

**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

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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

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**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.

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- 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

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<b>Reviewer</b> <i>Journal of Fluid Mechanics</i> <i>Experiments in Fluids</i> <i>International Communications on Heat and Mass Transfer</i> <i>European Journal of Mechanics / B Fluids</i>	Mar 2019 – present
<b>Laboratory Instructor</b> , University of Minnesota AEM 4601: Instrumentation Laboratory AEM 4602: Aeromechanics Laboratory	Sep 2016 – May 2017
<b>Teaching Assistant</b> , University of Minnesota AEM 2012: Dynamics	Jan – May 2014

### MENTORSHIP & OUTREACH

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<b>Research Mentor</b> , University of Washington Mentees: Anusha Aggarwal, undergraduate research assistant Alexander Erling, undergraduate research assistant Cali McFarland, undergraduate research assistant	Sep 2021 – present Sep – Dec 2021 Jun – Aug 2021
<b>Women of Aeronautics and Astronautics</b> , University of Minnesota Mentor to women undergraduate students in Aerospace Engineering Panelist in panel discussions on graduate school and career paths	Sep 2017 – Jun 2021
<b>Gopher Science Olympiad</b> , University of Minnesota Event coordinator for annual middle school Science Olympiad tournament	Sep 2014 – Jan 2016