
Katherine M. Smith

Postdoctoral Research Associate
Fluid Dynamics and Solid Mechanics Group (T-3)
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Education

- 2013–2017 **Ph.D. Mechanical Engineering**
University of Colorado (CU) - Boulder
Dissertation title: *Effects of Submesoscale Turbulence on Reactive Tracers in the Upper Ocean.*
Advisor: Dr. Peter E. Hamlington.
- 2013–2015 **M.S. Mechanical Engineering**
University of Colorado (CU) - Boulder
- 2007–2012 **B.S. Mechanical Engineering, cum laude**
San Francisco State University, San Francisco, CA

Professional Experience

- 2019–present **Postdoctoral Research Associate**
Climate, Ocean, and Sea-ice Modeling (COSIM) Team
Fluid Dynamics and Solid Mechanics Group (T-3)
Los Alamos National Laboratory, Department of Energy, Los Alamos, NM
- 2017–2019 **Postdoctoral Research Associate**
Environmental and Industrial Fluid Dynamics Group
Department of Applied Mathematics and Theoretical Physics (DAMTP)
University of Cambridge, Cambridge, UK
- 2013–2017 **Graduate Research Assistant,**
Turbulence And Energy Systems Lab (TESLa)
- 2013–2014 **Graduate Teaching Assistant,**
System Dynamics & Measurements II Lab
Department of Mechanical Engineering,
University of Colorado, Boulder, Boulder, CO
- 2014–2016 **Science Instructor**
Fluids & Flow Visualization and LEGO Robotics
CU Science Discovery Learning Summer Camps, Boulder, CO
- 2012–2013 **Research and Design Scientist I - Thermal Fluid Scientist**
- 2012 **Science Undergraduate Laboratory Intern (SULI)**
Energy & Environment Department, Fuels Modeling & Simulation Department
Idaho National Laboratory, Department of Energy, Idaho Falls, ID
- 2011–2012 **Mechanical Engineering Design Intern**
Wastewater Enterprise
San Francisco Public Utilities Commission, San Francisco, CA

Research Interests

Climate science, forecasting and predictability, global carbon cycle, earth system modeling, ocean conservation/sustainability, coastal food security/sovereignty, geophysical flows, biogeochemistry, reduced order modeling, computational fluid dynamics, renewable energy, science literacy and outreach.

Publications

Peer-Reviewed Journal Publications

- [1] Turbulence in Forced Stratified Exchange Flows.
K. M. Smith, C. Caulfield, and J. R. Taylor.
Journal of Fluid Mechanics, accepted 2021.
- [2] The influence of submesoscales and vertical mixing on the export of sinking tracers in large-eddy simulations.
J. R. Taylor, **K. M. Smith**, and C. Vreugdenhil.
Journal of Physical Oceanography, 50(5), 1319-1339, 2020.
- [3] Effects of Langmuir Turbulence on Upper Ocean Carbonate Chemistry.
K. M. Smith, P. E. Hamlington, K. Niemeyer, B. Fox-Kemper, and N. Lovenduski.
Journal of Advances in Modeling Earth Systems, 10, 330-3048, 2018.
- [4] The O₂/N₂ Ratio and CO₂ Airborne Southern Ocean (ORCAS) Study.
B. B. Stephens, M. C. Long, R. F. Keeling, E. A. Kort, C. Sweeney, E. Apel, E. Atlas, S. Beaton, J. D. Bent, N. Blake, J. Bresch, J. Casey, B. C. Daube, M. Biao, E. Diaz, H. Dierssen, V. Donets, H. Ducklow, M. Gierach, R. Green, J. Haag, M. Hayman, A. Hiils, M. S. Hoecker-Martinez, S. Honomichl, R. Hornbrook, J. Jensen, R. Lueb, I. McCubbin, K. McKain, E. Morgan, T. Newberger, S. Nolte, J. Powers, B. Rainwater, K. Randolph, A. Rockwell, M. Reeves, S. Scahffler, M. Smith, **K. Smith**, J. Stith, G. Stossmeister, D. Toohey, A. Watt.
Bulletin of the American Meteorological Society, 99(2). 381-402, 2018.
- [5] Effects of Submesoscale Turbulence on Ocean Tracers.
K. M. Smith, P. E. Hamlington, and B. Fox-Kemper.
Journal of Geophysical Research: Oceans, 121(1), 3597-3624, 2016.
- [6] A Reduced Order Biogeochemical Flux Model For Use In High-Resolution Multi-Scale Biophysical Simulations.
K. M. Smith, S. Kern, P. E. Hamlington, N. Pinardi, M. Zavatarelli, E. F. Klee, and K. E. Niemeyer
Geoscientific Model Development, 2021.

Peer-Reviewed Journal Publications: In Preparation

- [7] Physical Mechanisms of Upper Ocean Mixing in the Arctic.
K. M. Smith, M. Maltrud, and L van Roekel.
- [8] How Useful are Earth System Models in Predicting Arctic Food Security?
G. Gibson, C. Deal, O. Lee, J.M. Sam, N. Jeffery, H. Eicken, and **K. M. Smith**.
- [9] Earth System Model Predictions of Exit Timing Conditions for Arctic Salmon
K. M. Smith and N. Jeffery.

Peer-Reviewed Conference Proceedings

- [10] Examination of Turbulent Flow Effects in Rotating Detonation Engines.
C. A. Z. Towery, **K. M. Smith**, M. Van Schoor, and P. E. Hamlington.
AIAA Paper, AIAA-2014-3031, 2014.

Presentations

Conference Presentations

- 2020 -Desert Oceanography 101: Parameterization of Small-Scale Bio-Physical Interactions in the Upper Ocean.
Science in "3", Los Alamos National Laboratory, Los Alamos, NM, November 2020

- 2019 - Turbulence in Forced Stratified Exchange Flows.
Division of Fluid Dynamics, American Physical Society, Seattle, WA, November 2019
- Turbulence in Forced Stratified Exchange Flows.
Environmental Fluid Dynamics: Confronting Grand Challenges, Ecole de Physique des Houches, Les Houches, France, January, 2019.
- 2018 - Turbulence in Forced Stratified Exchange Flows.
Division of Fluid Dynamics, American Physical Society, Atlanta, GA, November 2018
- Effects of Submesoscale Turbulence on Reactive Tracers.
Physical Oceanography Dissertation Symposium X, University of Hawaii, Kona, HI, October 2018.
- Effects of Submesoscale Processes on Negatively Buoyant Tracers.
Challenger Society for Marine Science, Newcastle University, Newcastle, UK, September, 2018.
- The Global Impact of Sub-Grid Scale Langmuir Turbulence and Upper Ocean Carbonate Chemistry.
Modeling Imbalances in the Atmosphere and Ocean, BIRS, Banff, Canada, February, 2018.
- 2017 - Effects of Langmuir Turbulence on Upper Ocean Carbonate Chemistry.
Graduate Engin. Annual Research & Recruitment Symposium, CU Boulder, Boulder, CO, March, 2017.
- 2016 - A Reduced Order Biogeochemical Flux Model For Use in High-Resolution Multi-Scale Biophysical Simulations. *American Geophysical Union Fall Meeting*, San Francisco, CA, December 2016.
- Effects of Langmuir Turbulence on Upper Ocean Carbonate Chemistry.
RMFM Research Symposium, CU Boulder, Boulder, CO, August 2016.
- Submesoscale Tracer Evolution in the Oceanic Mixed Layer.
Submesoscale Processes, University of Liege, Liege, Belgium, May 2016.
- 2015 - Characteristics and Evolution of Passive Tracers in the Oceanic Mixed Layer.
Division of Fluid Dynamics, American Physical Society, Boston, MA, November 2015.
- Characteristics and Evolution of Reactive Tracers in the Oceanic Mixed Layer.
American Metero. Society, Atmospheric and Oceanic Fluid Dynamics, Minneapolis, MN, June 2015.
- 2014 - Effects of Submesoscale Turbulence on Tracer Evolution in the Oceanic Mixed Layer.
Division of Fluid Dynamics, American Physical Society, San Francisco, CA, November 2014.
- 2013 - Adaptive Mesh Refinement Strategies for Incorporating Discrete Fracture Networks into a High Performance Computing Framework for Geothermal Reservoir Simulations.
Geothermal Resource Council Meeting, Las Vegas, NV, October 2013.

Conference Posters

- 2017 - Effects of Langmuir Turbulence on Upper Ocean Carbonate Chemistry.
American Metero. Society, Atmospheric and Oceanic Fluid Dynamics, Portland, OR, June 2017.
- Reduced-Order Biogeochemical Flux Model for High-Resolution Multi-Scale Biophysical Simulations. *European Geosciences Union General Assembly*, Vienna, Austria, April 2017.
- 2015 - Effects of Submesoscale Turbulence on Oceanic Air-Sea Flux Tracers.
U.S. National Congress on Computational Mechanics, San Diego, CA, July 2015.

Seminars and Lectures

- 2020 - *Seminar*: Effects of Upper Ocean Turbulence on Biogeochemical Tracers.
Coastal, Ocean, and Sea Ice Modeling Seminar, Los Alamos National Laboratory, Los Alamos, NM, January 2020
- 2019 - *Seminar*: Effects of Upper Ocean Turbulence on Biogeochemical Tracers.
WHOI Geophysical Fluid Dynamics Summer Program, Woods Hole, MA, July 2019.

- *Seminar: Effects of Upper Ocean Turbulence on Biogeochemical Tracers. Rhode Island Consortium for Coastal Assessment, Innovation, & Modeling Seminar, University of Rhode Island, Kingston, RI, May, 2019.*
- *Seminar: Effects of Submesoscale Turbulence on Sinking Tracers. DAMTP Fluids Seminar, Cambridge, UK, January 2019.*
- *Seminar: Turbulence in Forced Stratified Exchange Flows. Geophysical and Environmental Processes Seminar, Cambridge, UK, January 2019.*
- 2017 - *Seminar: Effects of Submesoscale Turbulence on Reactive Tracers. BP Institute, Cambridge, UK, October 2017.*
- *Seminar: Effects of Submesoscale Turbulence on Reactive Tracers in the Upper Ocean. Los Alamos National Laboratory (LANL), Los Alamos, NM, January 2017.*
- 2016 - *Seminar: Effects of Turbulence on Upper Ocean Passive Tracers. National Center for Atmospheric Research (NCAR), Boulder, CO, October 2016.*
- *Seminar: Effects of Submesoscale and Small-Scale Turbulence on Ocean Tracers. University of Bologna, Bologna, Italy, April 2016.*
- *Seminar: Characteristics and Evolution of Tracers in the Ocean Mixed Layer. University of Bologna, Ravenna, Italy, March 2016.*
- 2015 - *Seminar: Effects of Submesoscale Turbulence on Tracer Evolution in the Oceanic Mixed Layer. Boulder Fluid and Thermal Sciences Seminar Series, CU Boulder, Boulder, CO, February 2015.*
- *Lecture: Phases, Ideal Gas Law, Cavitation. Undergraduate Fluid Mechanics (MCEN 3021), CU Boulder, Boulder, CO, February 2015.*

Honors and Awards

Fellowships:

- 2017 - CU Graduate School Summer Fellowship, CU Boulder.
- 2016 - Achievement Rewards for College Scientists Scholarship, ARCS Foundation, Colorado Chapter.
- 2015 - CU Science Communication Fellowship, CU Boulder.
- 2013 - Outstanding Mechanical Engineering Research Potential Fellowship, CU Boulder.
- 2013 - Dean's Fellowship, CU Boulder.

Awards:

- 2017 - Best Poster Presentation, Atmospheric and Oceanic Fluid Dynamics (AOFD), AMS, Portland, OR.

Research Supervision

Graduate:

- 2019 - Channing Prend, WHOI GFD Summer Program, Woods Hole Oceanographic Institute (WHOI)
- 2017–present - Skyler Kern, Department of Mechanical Engineering, CU Boulder
- 2013 - Jacob Bradford, Department of Energy - Idaho National Laboratory, Idaho Falls

Undergraduate:

- 2016 - Skyler Kern, SMART Program, CU Boulder/University of Alaska
- 2014–2015 - Allison Leonard, Department of Mechanical Engineering, CU Boulder
- 2015 - Sean Harrison, Department of Mechanical Engineering, CU Boulder
- 2014–2015 - Christine Martini, Department of Mechanical Engineering, CU Boulder

High School:

- 2013–2014 - Allison Leonard, Broomfield High School, Broomfield, CO

Teaching

K-12 Science Instructor:

CU Science Discovery Learning Summer Camps, Boulder, CO

2016 - Fluids & Flow Visualization

2014–2015 - LEGO Robotics

Graduate Teaching Assistant:

Department of Mechanical Engineering, CU Boulder

Spring 2013 - MCEN 4047: Measurements II Lab

Fall 2013 - MCEN 4043: System Dynamics

Service & Workshop Participation

Reviewer:

2018–present - Limnology and Oceanography

Committee Member and Organizer:

2014–2017 - Rocky Mountain Fluid Mechanics Research Symposium, CU Boulder

2013–2016 - Graduate Engineering Annual Research & Recruitment Symposium, CU Boulder

2013–2017 - Boulder Fluid and Thermal Sciences Seminar Series, CU Boulder

Science Workshop Presenter:

2015 - Flow Visualization, Expanding Your Horizons, Amer. Assoc. of Univ. Women, CU Boulder

2015 - Meet a CU Scientist, CU Science Communication Fellowship, Boulder Public Library

2014 **FIRST Lego League Teamwork Judge:**

- Monarch Qualifier, Monarch High School, Louisville, CO

2011–2012 **Corresponding Secretary:**

- Tau Beta Pi - Engineering Honors Society, San Francisco State University

Guest Research & Field Work

Spring 2016, **Laboratorio di Simulazioni Numeriche del Clima e degli Ecosistemi Marini (SiNCEM)**

Fall 2016 University of Bologna, Ravenna, Italy

Spring 2016 **The O₂/N₂ Ratio and CO₂ Airborne Southern Ocean (ORCAS) Study**

Graduate Research Scientist, Punta Arenas, Chile