

# William S. Daniels

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## Appointments

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### Johns Hopkins University

Jul 2025 -

*Postdoctoral Fellow*, Department of Environmental Health and Engineering

*Member*, NASA Orbiting Carbon Observatory Science Team

Mentor: Scot Miller

### Colorado School of Mines

Jan 2025 - Jun 2025

*Research Scientist*, Department of Applied Mathematics and Statistics

Mentor: Dorit Hammerling

## Education

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### Ph.D., Statistics, Colorado School of Mines

Jun 2021 - Dec 2024

*Research Associate*, Payne Institute for Public Policy

*Student Researcher*, Energy Emissions Modeling and Data Lab

Advisor: Dorit Hammerling

### M.S., Statistics, Colorado School of Mines

Jun 2019 - May 2021

Advisor: Dorit Hammerling

### B.S., Physics, Colorado School of Mines

Aug 2015 - May 2019

*Summa cum laude*

Advisor: Lawrence Wiencke

## Awards and Fellowships

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<b>Awards</b>	Rath Research Award, <i>Colorado School of Mines</i>	2024
	· Top recognition at Mines for excellence in doctoral research.	
	Physics Faculty Distinguished Graduate Award, <i>Mines Physics Department</i>	2019
	General Chemistry Student of the Year, <i>Mines Chemistry Department</i>	2016
<b>Fellowships</b>	Johns Hopkins Postdoctoral Research Fellowship	2025
	Colorado Environmental Management Society Scholarship	2024
	Harvey Graduate Fellowship	2019 - 2021
	Harvey Undergraduate Scholarship	2015 - 2019
	Mines Undergraduate Research Fellowship	2017 - 2018
<b>Presentation Recognition</b>	Best talk in Energy session, <i>Mines Graduate Research Symposium</i>	2024
	Poster competition finalist, <i>IISA Conference</i>	2023
	Highly commended poster, <i>IGAC Conference</i>	2021
	Best talk in Environmental Science session, <i>Mines Graduate Research Symposium</i>	2020
	Outstanding oral presentation award, <i>APS April Meeting</i>	2019
	Poster competition winner, <i>Mines Physics Research Symposium</i>	2019

# Publications (\*: submitted, †: equal contribution, underline: mentored student, Google Scholar)

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## Refereed Papers

- \*11. **William S. Daniels** and Dorit M. Hammerling. Sampling variability under extreme skewness: sample size guidance for future methane measurement campaigns. Submitted, *Communications Earth & Environment*, (2026).
- \*10. Yuanrui Zhu, Gregory B. Ross, Jenna Brown, Olga Khaliukova, **William S. Daniels**, Jiayang (Lyra) Wang, Selina A. Roman-White, Fiji C. George, Daniel Zimmerle, Dorit M. Hammerling, and Arvind P. Ravikumar. Tracking U.S. liquefied natural gas supply chain greenhouse gas emissions intensity through direct measurements. In revision, *Environmental Science & Technology*, (2025).
- \*9. **William S. Daniels**, Douglas W. Nychka, and Dorit M. Hammerling. A Bayesian hierarchical model for methane emission source apportionment. In revision, *Annals of Applied Statistics*, (2025).
- 8. Meng Jia<sup>†</sup>, Ryker Fish<sup>†</sup>, **William S. Daniels**, Brennan Sprinkle, and Dorit M. Hammerling. A fast and lightweight implementation of the Gaussian puff model for near-field atmospheric transport of trace gasses. *Scientific Reports*, 15, 18710 (2025).
- 7. Olga Khaliukova, Yuanrui Zhu, **William S. Daniels**, Arvind P. Ravikumar, Gregory B. Ross, Selina A. Roman-White, Fiji C. George, and Dorit M. Hammerling. Investigating aerial data preanalysis schemes and site-level methane emission aggregation methods at liquefied natural gas facilities. *ACS ES&T Air*, 2(6), 1009-1019 (2025).
- 6. **William S. Daniels**<sup>†</sup>, Spencer G. Kidd<sup>†</sup>, Shuting (Lydia) Yang, Shannon Stokes, Arvind P. Ravikumar, and Dorit M. Hammerling. Intercomparison of three continuous monitoring systems on operating oil and gas sites. *ACS ES&T Air*, 2(4), 564-577 (2025).
- 5. **William S. Daniels**, Meng Jia, and Dorit M. Hammerling. Estimating methane emission durations using continuous monitoring systems. *Environmental Science & Technology Letters*, 11(11), 1187-1192 (2024).
- 4. **William S. Daniels**, Meng Jia, and Dorit M. Hammerling. Detection, localization, and quantification of single-source methane emissions on oil and gas production sites using point-in-space continuous monitoring systems. *Elementa: Science of the Anthropocene*, 12(1), 00110 (2024).
- 3. **William S. Daniels**, Jiayang (Lyra) Wang, Arvind P. Ravikumar, Matthew Harrison, Selina A. Roman-White, Fiji C. George, and Dorit M. Hammerling. Toward multiscale measurement-informed methane inventories: reconciling bottom-up site-level inventories with top-down measurements using continuous monitoring systems. *Environmental Science & Technology*, 57(32), 11823-11833 (2023).
- 2. Jiayang (Lyra) Wang, **William S. Daniels**, Dorit M. Hammerling, Matthew Harrison, Kaylyn Burmaster, Fiji C. George, and Arvind P. Ravikumar. Multi-scale methane measurements at oil and gas facilities reveal necessary framework for improved emissions accounting. *Environmental Science & Technology*, 56(20), 14743-14752 (2022).
- 1. **William S. Daniels**, Rebecca R. Buchholz, Helen M. Worden, Fatimah Ahamad, and Dorit M. Hammerling. Interpretable models capture the complex relationship between climate indices and fire season intensity in Maritime Southeast Asia. *Journal of Geophysical Research: Atmospheres*, 127, e2022JD036774 (2022).

## Non-Refereed Papers and Policy Documents

8. Jenna A. Brown, Michael Moy, Arthur Santos, Ethan Rimelman, Winrose Molle, Olga Khaliukova, Callan Okenberg, **William S. Daniels**, Dorit M. Hammerling, Daniel Zimmerle, and Anna L. Hodshire. Colorado Ongoing Basin Emissions (COBE) Final Report. *Submitted to the Colorado Department of Public Health and Environment*, (2025).
7. **William S. Daniels**, Philip Waggoner, and Dorit M. Hammerling. Comment on EPA Docket No. EPA-HQ-OAR-2024-0350. *Submitted to the United States Environmental Protection Agency*, (2024).
6. Kellis Ward, **William S. Daniels**, and Dorit M. Hammerling. Comparison of co-located laser and metal oxide continuous monitoring systems. *Payne Institute Commentary Series: Research*, (2024).
5. **William S. Daniels**, Dorit M. Hammerling, and Morgan D. Bazilian. New method for tracking down methane emissions on oil and gas sites. *Payne Institute Commentary Series: Commentary*, (2024).
4. Dorit M. Hammerling, **William S. Daniels**, Morgan D. Bazilian, and Brooke Bowser. Improving satellite monitoring of methane emissions: data science is fundamental to better emissions tracking. *Payne Institute Commentary Series: Research*, (2021).
3. **William S. Daniels**, James Crompton, Dorit M. Hammerling, and Morgan D. Bazilian. Initial findings from continuous monitoring of oil and gas operations. *Payne Institute Commentary Series: Research*, (2021).
2. Meera Duggal, **William S. Daniels**, Rebecca R. Buchholz, and Dorit M. Hammerling. Optimizing genetic algorithm parameters for atmospheric carbon monoxide modeling. *NCAR Technical Notes* (No. NCAR/TN-566+STR), (2021).
1. **William S. Daniels**, Dorit M. Hammerling, and Rebecca R. Buchholz. regClimateChem: An R package for data driven variable selection applied to atmospheric carbon monoxide. *NCAR Technical Notes* (No. NCAR/TN-562+STR), (2020).

## Software and Data

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### Software Packages

- MDLQ: Methane emission source apportionment using in-situ sensors. [[GitHub](#)]
- puff: Simulate and visualize the Gaussian puff atmospheric dispersion model. [[CRAN](#)]
- PDM: Probabilistic duration model for methane emissions on oil and gas sites. [[GitHub](#)]
- DLQ: Detection, localization, and quantification of methane emissions using in-situ sensors. [[GitHub](#)]

### Data Sets

1. Rebecca R. Buchholz, Helen M. Worden, Fatimah Ahamad, **William S. Daniels**, and Dorit M. Hammerling. Weekly carbon monoxide anomalies over Maritime Southeast Asia and weekly climate indices. *NCAR Geoscience Data Exchange*, (2021).

## Presentations

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### Invited Talks

- 2025 University of Texas at Austin, Energy Emissions Modeling and Data Lab.  
*Developing fully transparent, site-level, measurement-based inventories using continuous monitoring data.*

- 2025 Colorado State University, Energy Institute.  
*Implementing the Gaussian puff atmospheric dispersion model and using it to estimate methane emission rates.*
- 2025 Colorado School of Mines, Payne Institute for Public Policy.  
*Characterizing methane emissions on oil and gas sites*
- 2022 Stanford University, Methane Emissions Technology Alliance (META) Seminar.  
*Multi-scale methane measurements at oil and gas facilities reveal necessary framework for improved emissions accounting.*
- 2022 Colorado School of Mines, Department of Applied Mathematics and Statistics.  
*Leveraging multiple continuous monitoring sensors for emission identification and localization on oil and gas facilities.*
- 2022 University of Colorado Boulder, Quantitative Exploration and Discussion (QED) Supergroup.  
*Building intuition around common statistical learning techniques.*
- 2021 International Global Atmospheric Chemistry (IGAC) Scientific Conference.  
*Using climate mode indices to forecast carbon monoxide variability in fire-prone Southern Hemisphere regions.*

## Conference Talks

- 2025 Energy Emissions Modeling and Data Lab (EEMDL) Annual Meeting. Austin, TX.  
*Estimating methane emission source and rate with continuous monitoring systems.*
- 2025 Orbiting Carbon Observatory (OCO) Science Team Meeting. Fort Collins, CO.  
*Comparing the OCO-2 MIP inversion ensemble to the TRENDY dynamic vegetation models in the tropics and extratropics.*
- 2024 American Chemical Society (ACS) Fall Meeting. Denver, CO.  
*Estimating methane emission durations using continuous monitoring systems.*
- 2024 Joint Statistical Meetings (JSM). Portland, OR.  
*Bayesian hierarchical model for methane emission source apportionment.*
- 2024 Mines Graduate Research and Discovery Symposium (GRADS). Golden, CO.  
*Estimating methane emission durations using continuous monitoring systems.*  
· Received best presentation award in Energy session.
- 2023 American Geophysical Union (AGU) Annual Meeting. San Francisco, CA.  
*Reconciling bottom-up inventories and top-down measurements on individual oil and gas sites using continuous monitoring systems.*
- 2023 International Emissions Inventory Conference. Seattle, WA.  
*Developing methane emissions inventories for oil and gas production sites using point-in-space continuous monitors.*
- 2022 International Association of Wildland Fire - Fire and Climate Conference. Pasadena, CA.  
*Interpretable model captures complex relationship between climate variability and fire season intensity in Maritime Southeast Asia.*
- 2021 American Geophysical Union (AGU) Annual Meeting. New Orleans, LA.  
*Leveraging multiple continuous monitoring sensors for emissions alerting on oil and gas facilities.*
- 2021 American Statistical Association CO/WY Fall Meeting. Online.  
*Predicting fire season intensity in Maritime Southeast Asia with interpretable models.*
- 2021 Spatial and Temporal Statistics Symposium (STSS). Online.  
*Using atmospheric carbon monoxide models to predict fire season intensity.*

- 2020 Mines Graduate Research and Discovery Symposium (GRADS). Golden, CO.  
*Using the climate to model atmospheric carbon monoxide.*  
 · Received best presentation award in Environmental Science session.
- 2019 American Physical Society (APS) April Meeting. Denver, CO.  
*What can elves tell us about very strong lightning?*  
 · Received outstanding presentation award.

## Selected Posters

- 2025 American Geophysical Union (AGU) Annual Meeting. New Orleans, LA.  
*The role of continuous monitoring systems in methane emissions inventories: insights from 2 years of data on 35 production sites in the Appalachian Basin.*
- 2025 American Geophysical Union (AGU) Annual Meeting. New Orleans, LA.  
*Estimating oil and gas methane emissions: why skewness is a challenge.*
- 2024 American Geophysical Union (AGU) Annual Meeting. Washington, D.C.  
*A Bayesian hierarchical model for localizing and quantifying multi-source methane emissions on oil and gas sites using continuous monitoring systems.*
- 2024 American Geophysical Union (AGU) Annual Meeting. Washington, D.C.  
*Estimating methane emission durations using continuous monitoring systems.*
- 2024 American Chemical Society (ACS) Fall Meeting, Sci-Mix Invited Poster Session. Denver, CO.  
*Estimating methane emission durations using continuous monitoring systems.*
- 2023 International Indian Statistical Association (IISA) Conference. Golden, CO.  
*Using continuous methane measurements for inventory development on oil and gas sites: three case studies.*  
 · Finalist in student poster competition.
- 2021 International Global Atmospheric Chemistry (IGAC) Scientific Conference. Online.  
*Using climate mode indices to forecast carbon monoxide variability in fire-prone Southern Hemisphere regions.*  
 · Highly commended poster.
- 2019 Mines Physics Undergraduate Research Symposium. Golden, CO.  
*What can elves tell us about very strong lightning?*  
 · Winner of student poster competition.

## Teaching Experience

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- TEAM-UP Teaching Program** Fall 2017  
*Introduction to Field Based Experience*
- Worked as a teaching assistant in a high school chemistry class.
  - Gave lectures, assisted during labs, and participated in lesson planning.
  - Took an accompanying education course on education psychology and modern STEM education.

## Teaching Assistant Positions

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| · Statistics Practicum (MATH 482), <i>Colorado School of Mines</i> | Spring 2022 |
| · Statistics Practicum (MATH 482), <i>Colorado School of Mines</i> | Spring 2021 |
| · Statistics Practicum (MATH 482), <i>Colorado School of Mines</i> | Spring 2020 |
| · Modern Physics (PHGN 300), <i>Colorado School of Mines</i>       | Fall 2017   |
| · Honors Chemistry, <i>Arvada West High School</i>                 | Fall 2017   |

## Guest Lectures

- Physics I - Mechanics (PHGN 100), *Colorado School of Mines* Spring 2025
- Future Energy Scholars Program (HN 398A), *Colorado School of Mines* Spring 2025
- Introduction to Key Statistical Learning Methods I (DSCI 560), *Colorado School of Mines* Spring 2020

## Workshops Organized

- Advanced monitoring techniques for oil and gas methane emissions, *UT Austin* Fall 2025
- Implementing the Gaussian puff atmospheric dispersion model, *Colorado State University* Spring 2025

## Mentoring (co-mentored students with Prof. Dorit Hammerling)

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### Graduate Students

- Troy Sorensen (PhD, Colorado School of Mines). Site-level methane emissions inventories. 2024-
- Callan Okenberg (PhD, Colorado School of Mines). State-level methane emissions inventories. 2024-2025
- Olga Khaliukova (PhD, Colorado School of Mines). Site-level aggregation methods. 2024-2025
- Spencer Kidd (MS, Colorado School of Mines). Intercomparison of in situ sensor solutions. 2024-2025
- Kellis Ward (MS, Colorado School of Mines). Metal oxide vs laser-based in situ sensors. 2023-2024

### Undergraduate Students

- Michael Basanese (BS, Colorado School of Mines). Dispersion modeling at low wind speeds. 2024-2025
- Zi Li (BS, Colorado School of Mines). Modeling PM2.5 variability in Denver. 2021-2022
- Meera Duggal (BS, Colorado School of Mines). Genetic algorithms for carbon monoxide models. 2020-2021

## Professional Service

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**Reviewer** *Atmospheric Measurement Techniques, Elementa: Science of the Anthropocene, Environmental Science & Technology, Journal of Undergraduate Reports in Physics, Nature Communications, Remote Sensing of Environment, Science of the Total Environment*

Climate Change AI Innovation Grants 2024  
Harvey Undergraduate Scholarship Program 2016 - 2019

International Conference on Learning Representations 2025  
*Workshop on Tackling Climate Change with Machine Learning*

**Convener** Methane Emissions Technology Alliance (META) Seminar Series 2022 - present  
Energy Emissions Modeling and Data Lab (EEMDL) Annual Meeting 2025  
*Technical Session: Advances in Space-Based Methane Emissions Monitoring*  
AGU Annual Meeting (GC51T, GC53L, and GC54D) 2024  
*New Technologies and Frameworks to Detect and Analyze Methane Emissions from the Oil and Gas Supply Chain: Methods, Data, and Insights*

**Volunteer** OSPA Liason, AGU Annual Meeting 2024  
OSPA Reviewer, AGU Annual Meeting 2023-2024  
Volunteer, International Indian Statistical Association (IISA) Conference 2023  
Student Presentation Judge, Mines Undergraduate Research Symposium 2022-2025

<b>Member</b>	NASA Orbiting Carbon Observatory Science Team	2025 - present
	American Geophysical Union (AGU)	2019 - present
	American Statistical Association (ASA)	2024 - 2025
	Society for Industrial and Applied Mathematics (SIAM)	2019 - 2021
	American Physical Society (APS)	2018 - 2019
	Tau Beta Pi Engineering Honor Society	2018 - 2019