William S. Daniels

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Education

Colorado School of Mines (in progress)
PhD Statistics, GPA: 4.0

Colorado School of Mines 2021
M.S. Statistics, GPA: 4.0

Colorado School of Mines 2019
B.S. Engineering Physics, GPA: 3.99 (*summa cum laude*)
Minor: Computational and Applied Mathematics

Research Projects

Monitoring Methane Emissions from Oil and Gas Operations **Apr 2020 - Present**
Colorado School of Mines, Department of Applied Mathematics and Statistics
Colorado School of Mines, Payne Institute for Public Policy
Advisors: Dr. Dorit Hammerling, Dr. Morgan Bazilian

- Working on a variety of projects broadly seeking to more completely and accurately monitor methane emissions from the oil and gas industry.
- Developed a framework for emission event detection, localization, and quantification using high frequency data from continuous monitoring systems.
- Created a hierarchical model to estimate daily methane fields on a very fine grid with uncertainty using coarsely "pixelated" satellite observations.
- Results from this work have been summarized in a journal article, multiple pre-prints, and conference talks.

Modeling Atmospheric Carbon Monoxide **Aug 2019 - Present**
Colorado School of Mines, Department of Applied Mathematics and Statistics
National Center for Atmospheric Research, Atmospheric Chemistry Observations & Modeling
Advisors: Dr. Dorit Hammerling, Dr. Rebecca Buchholz

- Used lagged multiple linear regression to model atmospheric carbon monoxide from climate indices.
- Implemented a regularization method that preserves hierarchical model structure between main effects and interaction effects.
- Created a framework to highlight the optimally performing models over a range of complexities.
- Used cross-validation to quantify stability of selected model terms, aiding model interpretability.
- Results from this work were published in JGR: Atmospheres.

Verifying Elve Simulation using Data Set of Observed Elves **Aug 2018 - May 2019**
Colorado School of Mines, Department of Physics
Advisor: Dr. Lawrence Wiencke

- Used elves, a class of transient luminous events that occur in the ionosphere, to study lighting.
- Analyzed a large elve dataset using ROOT, a data analysis framework written in C++.
- Determined the sensitivity of an elve simulation by mapping the input and output parameter spaces.
- Used this sensitivity study to simulate observed elves and analyze differences between simulation and data, ultimately finding that simulation matches elve shape but not amplitude.
- Results from this work were presented at the American Physical Society (APS) April conference.

Industry Experience

Systems Engineering Intern **May 2019 - Aug 2019**
Northrop Grumman, Colorado Springs

- Worked with the Infrared Hardbody Signatures Team within the Threat Modeling Center (TMC).
- Investigated ways of increasing efficiency of the TMC's production process.
- Created a Python tool to interpolate temperature data, eliminating need for manual calculations and increasing simulation fidelity.
- Wrote Python scripts to automate documentation process, eliminating need to manually produce tables and re-type documents.

Systems Engineering Intern **May 2018 - Aug 2018**
Northrop Grumman, Colorado Springs

- Worked with the Infrared Hardbody Signatures Team within the Threat Modeling Center (TMC).
- Investigated ways of decreasing simulation run time within the TMC's production process.
- Completed investigations into reflectance and false lines of sight, reducing run time by up to 80%.
- Wrote MATLAB scripts for parsing, plotting, and analysis of infrared signature data.
- Collaborated with other interns to implement a MATLAB and Unix based script that predicts the sunlit status of target objects.

Publications

Submitted Papers

1. **William S. Daniels**, Jiayang (Lyra) Wang, Arvind Ravikumar, Matthew Harrison, Selina Roman-White, Fiji George, Dorit M. Hammerling. "Towards multi-scale measurement-informed methane inventories: reconciling bottom-up inventories with top-down measurements using continuous monitoring systems." *Submitted*, doi:10.26434/chemrxiv-2023-jp5nt, (2023).
2. Meng Jia, **William S. Daniels**, Dorit M. Hammerling. "Comparison of the Gaussian plume and puff atmospheric dispersion models on oil and gas facilities." *Submitted*, doi:10.26434/chemrxiv-2023-hc95q, (2023).
3. **William S. Daniels**, Meng Jia, Dorit M. Hammerling. "Methane emission detection, localization, and quantification using continuous point-sensors on oil and gas facilities." *Submitted*, doi:10.26434/chemrxiv-2022-xxkk8, (2022).

Refereed Papers

1. Jiayang (Lyra) Wang, **William S. Daniels**, Dorit M. Hammerling, Matthew Harrison, Kaylyn Burmaster, Fiji C. George, 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, doi:10.1021/acs.est.2c06211, (2022).
2. **William S. Daniels**, Rebecca R. Buchholz, Helen M. Worden, Fatimah Ahamad, 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, doi:10.1029/2022JD036774, (2022).

Non-Refereed Papers and Articles

1. Dorit M. Hammerling, **William S. Daniels**, Morgan D. Bazilian, Brooke Bowser. "Improving satellite monitoring of methane emissions: data science is fundamental to better emissions tracking." *Payne Institute for Public Policy - Commentary Series*, doi:10.25676/11124/14106, (2021).

2. **William S. Daniels**, James Crompton, Dorit M. Hammerling, Morgan D. Bazilian. "Initial findings from continuous monitoring of oil and gas operations." *Payne Institute for Public Policy - Commentary Series*, doi:10.25676/11124/14111, (2021).
3. Meera Duggal, **William S. Daniels**, Rebecca R. Buchholz, Dorit M. Hammerling. "Optimizing genetic algorithm parameters for atmospheric carbon monoxide modeling." *NCAR Technical Notes* (No. NCAR/TN-566+STR), doi:10.5065/h45f-c987, (2021).
4. **William S. Daniels**, Dorit M. Hammerling, 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), doi:10.5065/e8xj-3k89, (2020).

Theses

1. **William S. Daniels**. "Statistical methods for the interpretation, prediction, and localization of remotely sensed atmospheric pollutants." *ProQuest Dissertations & Theses Global* (No. 28497887), Master's Thesis, (2021).

Data Sets

1. Rebecca R. Buchholz, Helen M. Worden, Fatimah Ahamad, **William S. Daniels**, Dorit M. Hammerling. "Weekly carbon monoxide anomalies over Maritime Southeast Asia and weekly climate indices." *NCAR Geoscience Data Exchange*, doi:10.5065/s6rv-rc57, (2021).

Presentations

Invited Talks

1. Dorit M. Hammerling, **William S. Daniels**, Meng Jia. "Estimating methane emissions on oil and gas facilities using continuous monitoring data." *AGU Fall Meeting*, (2022).
2. Lyra Wang, **William S. Daniels**, Dorit M. Hammerling, Matthew Harrison, Kaylyn Burmaster, Fiji C. George, Arvind P. Ravikumar. "Multi-scale methane measurements at oil and gas facilities reveal necessary framework for improved emissions accounting." *Stanford - Methane Emissions Technology Alliance (META)*, (2022).
3. **William S. Daniels**, Meng Jia, Amber Rexwinkle, Dorit M. Hammerling. "Leveraging multiple continuous monitoring sensors for emission identification and localization on oil and gas facilities." *Colorado School of Mines - Applied Mathematics and Statistics (AMS) Graduate Student Colloquium*, (2022).
4. **William S. Daniels**. "Building intuition around common statistical learning techniques." *University of Colorado Boulder - Quantitative Exploration and Discussion (QED) Supergroup*, (2022).
5. **William S. Daniels**, Dorit M. Hammerling, Rebecca R. Buchholz, Helen M. Worden, Fatimah Ahamad. "Using climate mode indices to forecast carbon monoxide variability in fire-prone Southern Hemisphere regions." *International Global Atmospheric Chemistry (IGAC) Scientific Conference - MANGO Session*, (2021).
6. Dorit M. Hammerling, **William S. Daniels**, Meng Jia, Morgan D. Bazilian. "Methane emission monitoring at multiple spatiotemporal resolutions." *Spatial and Temporal Statistics Symposium (STSS)*, (2021).

Contributed Talks

1. **William S. Daniels**, Rebecca R. Buchholz, Helen M. Worden, Fatimah Ahamad, Dorit M. Hammerling. "Interpretable model captures complex relationship between climate variability and fire season intensity in Maritime Southeast Asia." *International Association of Wildland Fire - Fire and Climate Conference*, (2022).

2. **William S. Daniels**, Meng Jia, Dorit M. Hammerling, Shyla Kupis, Nasr Alkadi, Anna Scott. "Leveraging multiple continuous monitoring sensors for emissions alerting on oil and gas facilities." *AGU Fall Meeting*, (2021).
3. **William S. Daniels**, Rebecca R. Buchholz, Helen M. Worden, Fatimah Ahamad, Dorit M. Hammerling. "Predicting fire season intensity in Maritime Southeast Asia with interpretable models." *American Statistical Association CO/WY Fall Meeting*, (2021).
4. **William S. Daniels**, Fatimah Ahamad, Rebecca R. Buchholz, Dorit M. Hammerling, Helen M. Worden. "Using atmospheric carbon monoxide models to predict fire season intensity." *Spatial and Temporal Statistics Symposium (STSS)*, (2021).
5. Meera Duggal, **William S. Daniels**, Dorit M. Hammerling. "Optimizing genetic algorithm parameters for atmospheric carbon monoxide modeling." *Electronic Undergraduate Statistics Research Conference (eUSR)*, (2020).
6. **William S. Daniels**, Rebecca R. Buchholz, Dorit M. Hammerling. "Using the climate to model atmospheric carbon monoxide." *Mines Graduate Research and Discovery Symposium (GRADS)*, 8th Annual, (2020).
   · **Received best talk award in Environmental Science session.**
7. **William S. Daniels**, Kevin-Druis Merenda, Lawrence Wiencke. "What can elves tell us about very strong lightning?" *APS April Meeting*, Volume 64, Number 3, (2019).
   · **Received outstanding presentation award.**

Posters

1. **William S. Daniels**, Meng Jia, Dorit M. Hammerling. "Using continuous monitoring systems for data-driven methane emissions inventories for oil and gas facilities." *Mines Applied Mathematics and Statistics (AMS) Open House*, (2023).
2. Meng Jia, **William S. Daniels**, Dorit M. Hammerling. "Methane emission detection, localization, and quantification using continuous point-sensors on oil and gas facilities." *Mines Applied Mathematics and Statistics (AMS) Open House*, (2023).
3. Zi Li, **William S. Daniels**, Dorit M. Hammerling. "Seasonal and hourly variability of particulate matter 2.5 in Denver." *Mines Undergraduate Research Symposium*, (2022).
4. Meng Jia, **William S. Daniels**, Amber Rexwinkle, Dorit M. Hammerling. "Data-driven detection of methane leaks from oil and gas." *Mines Applied Mathematics and Statistics (AMS) Open House*, (2022).
5. **William S. Daniels**, Dorit M. Hammerling, Rebecca R. Buchholz, Helen M. Worden, Fatimah Ahamad. "Using climate mode indices to forecast carbon monoxide variability in fire-prone Southern Hemisphere regions." *International Global Atmospheric Chemistry (IGAC) Scientific Conference - Southern Hemispheres Session*, (2021).
   · **Poster was Highly Commended in Southern Hemisphere Working Group**.
6. Dorit M. Hammerling, Lewis Blake, **William S. Daniels**, Aidan Dykstal, Sean Crowell. "Student-led investigation of TROPOMI data for the US." *EGU General Assembly*, (2020).
7. Meera Duggal, **William S. Daniels**, Dorit M. Hammerling. "Genetic algorithm optimization study for atmospheric carbon monoxide models." *Mines Undergraduate Research Symposium*, (2020).
8. **William S. Daniels**, Rebecca R. Buchholz, Dorit M. Hammerling. "Improving atmospheric carbon monoxide models." *Mines Applied Mathematics and Statistics (AMS) Open House*, (2019).
9. **William S. Daniels**, Kevin-Druis Merenda, Lawrence Wiencke. "What can elves tell us about very strong lightning?" *Mines Physics Undergraduate Research Symposium*, (2019).
   · **1st place in poster competition**.
10. **William S. Daniels**, Ruoshui Ma, Xiao Zhang. "Characterization of molecular structure and interlinkage network for seven representative biorefinery lignin." *NARA SURE Research Symposium*, (2016).

Teaching Experience

TEAM-UP Teaching Program Fall 2017

Introduction to Field Based Experience

- Worked as a teaching assistant in a high school chemistry class.
- Gave short lectures, assisted during labs, and participated in lesson planning.
- Took an accompanying education course, where we discussed education psychology, modern STEM education, and our teaching experience.

TA Positions

- Colorado School of Mines, MATH 482: Statistics Practicum Spring 2022
- Colorado School of Mines, MATH 482: Statistics Practicum Spring 2021
- Colorado School of Mines, MATH 482: Statistics Practicum Spring 2020
- Colorado School of Mines, PHGN 300: Modern Physics Fall 2017
- Arvada West High School, Honors Chemistry Fall 2017

Funding, Honors, Awards

Fellowships	Harvey Graduate Fellowship	2019 - 2021
	Mines Undergraduate Research Fellowship	2017 - 2018
	Harvey Undergraduate Scholarship	2015 - 2019
Awards	Highly Commended poster, IGAC Science Conference	2021
	Best Talk in Environmental Science Session, Mines GRADS	2020
	Mines Physics Department Distinguished Graduate	2019
	Outstanding Presentation Award, APS April Meeting	2019
	1st Place Poster, Mines Physics Research Symposium	2019
	General Chemistry Student of the Year	2016

Professional Service

Reviewer	Remote Sensing of Environment	
Affiliations	Society for Industrial and Applied Mathematics (SIAM)	2019 - present
	American Physical Society (APS)	2018 - 2019
	Tau Beta Pi Engineering Honor Society	2018 - 2019
Other	Undergraduate research symposium judge	Spring 2022