Lewis T. Kunik

Contact Information

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Research Interests

I focus on understanding climate controls on carbon cycling in temperate forest ecosystems, particularly how heat and drought stress impact forest productivity over regional-to-continental scales. To explore these physical land surface dynamics, I use a broad array of satellite-based remote sensing approaches and ground-based eddy covariance measurements, along with climatological and machine-learning land surface data products. I am ultimately motivated by the broader impacts of changes to montane forests, and their effects on ecosystem wellbeing and human society.

Education

Ph.D. (In Progress) Atmospheric Sciences, University of Utah, Salt Lake City — 2021-present
GPA: 3.95

B.S. Computer Engineering & Computer Science, University of Wisconsin, Madison — 2016
GPA: 3.76

Publications

Yang, J.C., Bowling, D.R., Smith, K.R., **Kunik, L**., Raczka, B., Anderegg, W.R.L., Bahn, M., Blanken, P., Richardson, A.D., Burns, S.P., Bohrer, G., Desai, A.R., Altaf Arain, M., Staebler, R.M., Ouimette, P.A., Munger, J.W. and Litvak, M.E., 2024. Forest carbon uptake as influenced by snowpack and length of photosynthesis season in seasonally snow-covered forests of North America. Agric For Meteorol, 353, 110054. DOI: https://doi.org/10.1016/j.agrformet.2024.110054

Kunik, L., Bowling, D.R., Raczka, B., Frankenberg, C., Köhler, P., Cheng, R., Smith, K.R., Goulden, M., Jung, M. and Lin, J.C., 2023. Satellite-based solar-induced fluorescence tracks seasonal and elevational patterns of photosynthesis in California's Sierra Nevada mountains. Environ Res Lett, 19(1), 014008. DOI: http://doi.org/10.1088/1748-9326/ad07b4

Mallia, D.V., L.E. Mitchell, Gonzalez Vidal, A.E., Wu, D., **L. Kunik**, and J.C. Lin. 2023. Can We Detect Urban-Scale CO2 Emission Changes Within Medium-Sized Cities? J Geophys Res Atmos, 128, e2023JD038686. https://doi. org/10.1029/2023JD038686

Kunik, L., Mallia, D.V., Gurney, K.R., Mendoza, D.L., Oda, T. and Lin, J.C., 2019. Bayesian inverse estimation of urban CO2 emissions: Results from a synthetic data simulation over Salt Lake City, UT. Elem Sci Anth, 7(1), p.36. DOI: http://doi.org/10.1525/elementa.375

Mallia, D.V., L.E. Mitchell, **L. Kunik**, B. Fasoli, R. Bares, K. Gurney, D. Mendoza, and J.C. Lin. 2020. Quantifying urban CO2 emissions using mobile observations from a light-rail public transit platform, Environ Sci Technol, 54(24), p15613-15621. DOI: http://doi.org/10.1021/acs.est.0c04388

Presentations and Workshops

2023

Satellite-based solar-induced fluorescence tracks seasonal and elevational patterns of photosynthesis in California's Sierra Nevada mountains. [Oral Presentation] *AmeriFlux Annual Meeting.* Garner, MA.

Early-career remote sensing workshop instructor. *AmeriFlux Annual Meeting.* Garner, MA.

Satellite-based solar-induced fluorescence tracks seasonal and elevational patterns of photosynthesis in California's Sierra Nevada mountains. [Poster Presentation] *American Geophysical Union Fall Meeting Innovation Session.* San Francisco, CA.

2022

Multi-scale Constraints Towards Understanding Conifer Forest Carbon Uptake in Complex Terrain within the Carbon Monitoring System-Mountains Project. [Poster Presentation] *American Geophysical Union Fall Meeting.* Chicago, IL.

Participant in Fluxcourse: two week early-career workshop focusing on foundations of land-atmosphere flux measurement, modeling and synthesis. *University of Colorado Mountain Research Station.* Niwot Ridge, CO.

2016

Multiscale Observational Constraints on CO_2 Flux Estimation using an Inverse Modeling Approach. *University of Wisconsin – Madison Atmospheric, Oceanic and Space Sciences Poster Reception* Madison, WI.

2015

Multiscale Observational Constraints on CO_2 Fluxes. *NOAA OEd Science and Education Symposium.* Silver Spring, MD.

Awards and Honors

FLUXNET Secondment Award Recipient	2023
National Science Foundation Graduate Research Fellow	2022
Distinction in Computer Sciences & Computer Engineering Majors - UW-Madison	2016
U.S. DOE Science Undergraduate Laboratory Internship (SULI) Scholar	2016
Best Oral Presentation Award – NOAA Student Science and Education Symposium	2015
Meyerhoff Undergraduate Excellence Award for Leadership, Service, and Scholarship	2015

NOAA Ernest F. Hollings Undergraduate Fellow 2014

Technical Skills

Linux/Unix (Shell scripting, batch processing, Slurm, module management)

Programming in R, Python, Java, C; Experience with Git, CoPilot, OpenAI, JavaScript, MATLAB, Android Studio, HTML

NetCDF metadata organization (CF-6.1 convention), large dataset processing, Bayesian statistics

ArcGIS, QGIS

USGS LP-DAAC data querying

Land surface modeling (Community Land Model)

Eddy covariance flux data processing (partitioning through REddyProc R package)

Atmospheric dispersion modeling (WRF-STILT, HYSPLIT, AERMOD)

, data visualization, Excel, database management

Languages Spoken: English (native), Spanish (proficient), Sesotho (proficient)

Professional Experience

Graduate Research Assistant, University of Utah, Salt Lake City, UT 2021-present

- Conducted research on forest carbon cycling over Western US mountain regions.

Air Quality Consultant, Ramboll Group, Salt Lake City, UT 2019-2021

- Performed comprehensive regulatory emissions and modeling analyses for industrial and commercial clients.

Research Associate, Land-Atmosphere Interactions Research Group, University of Utah, Salt Lake City, UT 2017-2019

- Applied Bayesian statistics to urban greenhouse gas data and models to constrain emissions and quantify uncertainties.

Secondary Education Math Teacher, U.S. Peace Corps, Lesotho, 2018

- Taught high school math in a rural district of Lesotho (sub-Saharan Africa) using English and Sesotho.

Contract Researcher, NOAA Earth System Research Laboratory, Boulder, CO 2017

- Assessed network densities and meteorological drivers for data assimilation studies using aircraft and in-situ CO_2 data.

Electrical Engineering Intern, National Renewable Energy Laboratory, Golden, CO 2016

- Developed a custom control board and solid-state relay configuration for residential "smart" appliances.

Research Assistant, Desai Ecometeorology Lab, Dept. of Atmospheric Sciences, University of Wisconsin, Madison, WI, 2015-2016

- Integrated ground-based spectrometer data into regional Bayesian inversion techniques to constrain upper tropospheric carbon fluxes.

Hollings Fellow, NOAA Earth System Research Laboratory, Boulder, CO 2015

- Performed synthetic data analyses of Bayesian statistical modeling techniques to aid in regional CO_2 flux model development.

Lab Member, Holloway Air Quality Research Group, University of Wisconsin, Madison, WI 2013

- Examined trends in air pollution and temperature extremes over cities in the US Midwest.

Teaching and Mentoring Experience

2022
Software programming mentor, REALM– Research Experience for Undergraduates (REU) program, University of Utah, Salt Lake City, UT

2018
Instructor, U.S. Peace Corps Math Education Sector, Lesotho

2017
Instructor, Bayesian Inverse Modeling Workshop, University of Utah, Salt Lake City, UT

Instructor, Bayesian Inverse Modeling Workshop, NOAA Earth System Research Lab, Boulder, CO

Professional Service and Volunteerism

Adult English Language Tutor, Guadalupe School, Salt Lake City, UT 2024

Software programming and English language mentor volunteer, Smithsonian Tropical Research Institute, Gamboa, Panama 2023

Mentor, City of South Salt Lake Promise Program, South Salt Lake, UT 2020

Mentor, Madison Middle School Science Symposium, Wright Middle School, Madison, WI 2016

Vice President and Project Manager, Engineers without Borders, University of Wisconsin, Madison, WI 2015-2016

Education Outreach Coordinator, Engineers without Borders, University of Wisconsin, Madison, WI 2014

STEM Education Volunteer, Madison Children's Museum, Madison, WI 2014

Mentor, Science Olympiad, Edgewood High School, Madison, WI 2013 – 2014

Professional Organizations and Certifications

Member - American Geophysical Union 2022-present

Member - Air & Waste Management Association, Great Basin Chapter 2019-2020

EPA Method 9 Visible Emissions Certification (through AeroMet Engineering) 2020

Languages Spoken

English (native), Spanish (working proficiency)

Personal Interests and Accomplishments

Long distance hiking; completion of Superior Hiking Trail (2015), Pacific Crest Trail (2017), Arizona Trail (2018), Uinta Highline Trail (2018), Hayduke Trail (2021), and Wind River High Route (2022)

Cross country skiing; 10-time finisher of American Birkebeiner (Cable, WI)

Curling Instructor at the Utah Olympic Oval, Kearns, UT (2018 – 2022)

Backcountry skiing, canoeing, mountain biking, trail running, climbing, bicycle touring, canyoneering, classical piano