

Dien Wu

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Education

University of Utah	Ph.D. in Atmospheric Sciences Advisor: Prof. John C. Lin	2016 – 2020	Salt Lake City, US
University of Utah	M.S. in Atmospheric Sciences Advisor: Prof. John C. Lin	2014 – 2016	Salt Lake City, US
Florida State University	B.S. in Meteorology Advisor: Prof. Jon E. Ahlquist	2012 – 2014	Tallahassee, US
Nanjing University of Information Science and Technology	B.S. in Meteorology	2010 – 2012	Nanjing, China

Employment

Staff Scientist (Supervisor: Prof. Paul Wennberg)	Division of Geological and Planetary Sciences, California Institute of Technology	July 2023 – present
Postdoctoral Scholar Research Associate (Supervisor: Prof. Paul Wennberg)	Division of Geological and Planetary Sciences, California Institute of Technology	July 2020 – July 2023
Graduate Research Assistant	Dept. of Atmospheric Sciences, University of Utah	Aug 2014 – June 2020

Professional Experience

NASA Orbiting Carbon Observatory (OCO-2/3) Science Team Member, 2016 – present

Co-convenor of Global Environmental Change session, AGU 2023

“Attributing, Projecting, and Linking Greenhouse Gas Emissions to Sources, Air Quality and Climate Impacts.”

List of Peer-Reviewed Publications [[Google Scholar](#)]

In review/in prep

22. **Wu, D.**, Cawse-Nicholson, K., Liu, J., and Wennberg, P. O.: Quantifying irrigation impacts on crop productivity and evapotranspiration at the ranch scale from Space, In prep.
21. **Wu, D.**, Liu, J., Laughner, J. L., Miyazaki, K., Hasheminassab, S., and Wennberg, P. O.: Simultaneous quantifications of anthropogenic CO, CO₂, and NO_x emissions from space. In prep (*manuscript available upon request*).
20. Wilmot, Y. T., Lin C. J., **Wu, D.**, Oda, T., and Kort A. E.: Toward a satellite-based monitoring system for urban CO₂ emissions in support of emission reduction targets, *Environ. Res. Lett*, in review.

Published

19. Madsen, S., **Wu, D.**, Halim, M. A., Wunch D.: CO₂ Fluxes of Vegetation in the Greenbelt of Ontario and Ecosystem Emissions Associated with its Removal, *Elem. Sci. Anth.*, accepted.
18. Li, M., Kort, E.A., Bloom, A.A., **Wu, D.**, Plant, G., Gerlein-Safdi, C. and Pu, T.: Underestimated Dry Season Methane Emissions from Wetlands in the Pantanal. *Environ. Sci. Technol.* 58, 7, 3278–3287, <https://doi.org/10.1021/acs.est.3c09250>, 2024.
17. **Wu, D.**, Laughner, J. L., Liu, J., Palmer, P. I., Lin, J. C., and Wennberg, P. O.: A simplified non-linear chemistry transport model for analyzing NO₂ column observations: STILT-NO_x, *Geosci. Model Dev.*, 16, 6161–6185, <https://doi.org/10.5194/gmd-16-6161-2023>, 2023.

16. Zazzeri, G., Graven, H., Xu, X., Saboya, E., Blyth, L., Manning, A.J., Chawner, H., **Wu, D.** and Hammer, S.: Radiocarbon measurements reveal underestimated fossil CH₄ and CO₂ emissions in London. *Geophys. Res. Lett.*, 50(15), p.e2023GL103834, <https://doi.org/10.1029/2023GL103834>, 2023.
15. Mallia, D.V., Mitchell, L.E., Gonzalez Vidal, A.E., **Wu, D.**, Kunik, L. and Lin, J.C.: Can We Detect Urban-Scale CO₂ Emission Changes Within Medium-Sized Cities? *J. Geophys. Res.-Atmos.*, 128(11), p.e2023JD038686, <https://doi.org/10.1029/2023JD038686>, 2023.
14. Wu, K., Palmer, P. I., **Wu, D.**, Jouglet, D., Feng, L., and Oda, T.: Theoretical assessment of the ability of the MicroCarb satellite city-scan observing mode to estimate urban CO₂ emissions, *Atmos. Meas. Tech.*, 16, 581–602, <https://doi.org/10.5194/amt-16-581-2023>, 2023.
13. **Wu, D.**, Liu, J., Wennberg, P. O., Palmer, P. I., Nelson, R. R., Kiel, M., and Eldering, A.: Towards sector-based attribution using intra-city variations in satellite-based emission ratios between CO₂ and CO, *Atmos. Chem. Phys.*, 22, 14547–14570, <https://doi.org/10.5194/acp-22-14547-2022>, 2022.
12. Roten, D., Lin, J. C., Kunik, L., Mallia, D., **Wu, D.**, Oda, T., and Kort, E. A.: The Information Content of Dense Carbon Dioxide Measurements from Space: A High-Resolution Inversion Approach with Synthetic Data from the OCO-3 Instrument, *Atmos. Chem. Phys. Discuss.* [preprint], <https://doi.org/10.5194/acp-2022-315>, in review, 2022.
11. Lei, R., Feng, S., Danjou, A., Broquet, G., **Wu, D.**, Lin, J.C., O'Dell, C.W. and Lauvaux, T.: Fossil fuel CO₂ emissions over metropolitan areas from space: A multi-model analysis of OCO-2 data over Lahore, Pakistan. *Remote Sens. Environ.*, 264, p.112625, <https://doi.org/10.1016/j.rse.2021.112625>, 2021.
10. **Wu, D.**, Lin, J. C., Duarte, H. F., Yadav, V., Parazoo, N. C., Oda, T., and Kort, E. A.: A model for urban biogenic CO₂ fluxes: Solar-Induced Fluorescence for Modeling Urban biogenic Fluxes (SMURF v1), *Geosci. Model Dev.*, 14, 3633–3661, <https://doi.org/10.5194/gmd-14-3633-2021>, 2021.
9. Qu, Z., **D. Wu**, Henze, D. K., Li, Y., Sonenberg, M., and Mao, F.: Transboundary transport of ozone pollution to a US border region: a case study of Yuma. *Environmental Pollution*, 273, Pp. 116421, <https://doi.org/10.1016/j.envpol.2020.116421>, 2021.
8. Roten, D., **Wu, D.**, Fasoli, B., Oda, T., & Lin, J. C.: An interpolation method to reduce the computational time in the Stochastic Lagrangian particle dispersion modeling of spatially dense XCO₂ retrievals. *Earth and Space Science*, 8, e2020EA001343. <https://doi.org/10.1029/2020EA001343>, 2021.
7. Ye, X., T. Lauvaux, E.A. Kort, T. Oda, S. Feng, J.C. Lin, E. Yang, and **D. Wu**: Constraining fossil fuel CO₂ emissions from urban area using OCO-2 observations of total column CO₂. *J. Geophys. Res.-Atmos.*, 125, e2019JD030528. <https://doi.org/10.1029/2019JD030528>, 2020.
6. Yang, E.G., E.A. Kort, **D. Wu**, J.C. Lin, T. Oda, X. Ye, and T. Lauvaux: Using space-based observations and Lagrangian modeling to evaluate urban carbon dioxide emissions in the Middle East. *J. Geophys. Res.-Atmos.*, 125, e2019JD031922. <https://doi.org/10.1029/2019JD031922>, 2020.
5. **Wu, D.**, J.C. Lin, T. Oda, and E.A. Kort: Space-based quantification of per capita CO₂ emissions from cities, *Environ. Res. Lett.*, <https://doi.org/10.1088/1748-9326/ab68eb>, 2020. ([NASA media coverage](#))
4. Hernandez, A.J., Morales-Rincon, L.A., **Wu, D.**, Mallia, D., Lin, J.C. and Jimenez, R.: Transboundary transport of biomass burning aerosols and photochemical pollution in the Orinoco River Basin. *Atmos. Environ.*, <https://doi.org/10.1016/j.atmosenv.2019.01.051>, 2019.
3. **Wu, D.**, Lin, J. C., Fasoli, B., Oda, T., Ye, X., Lauvaux, T., Yang, E. G., and Kort, E. A.: A Lagrangian approach towards extracting signals of urban CO₂ emissions from satellite observations of atmospheric column CO₂ (XCO₂): X-Stochastic Time-Inverted Lagrangian Transport model (“X-STILT v1”), *Geosci. Model Dev.*, 11, 4843–4871, <https://doi.org/10.5194/gmd-11-4843-2018>, 2018.
2. Mallia, D.V., A. Kochanski, **D. Wu**, C. Pennell, W. Oswald, and J.C. Lin: Wind-Blown Dust Modeling Using a Backward-Lagrangian Particle Dispersion Model. *J. Appl. Meteor. Climatol.*, 56, 2845–2867, <https://doi.org/10.1175/JAMC-D-16-0351.1>, 2017.

1. Lin, J. C., Mallia, D. V., **Wu, D.**, and Stephens, B. B.: How can mountaintop CO₂ observations be used to constrain regional carbon fluxes?, *Atmos. Chem. Phys.*, 17, 5561-5581, <https://doi.org/10.5194/acp-17-5561-2017>, 2017.

Past Research Grants

Aug 2021 – July 2024	NASA A.51 Science Team for the OCO Missions: <i>Beyond quantification of carbon emissions from global cities: attribution to socioeconomic sectors using the OCO missions and multiple remote sensing products</i> (PI: Eric Kort, UMichigan); My Role: Co-I
2021 - 2023	NASA Research and Technology Development Fund: Quantification of Urban Emissions using OCO-3 Snapshot Area Maps (PI: Annmarie Eldering, NIST); My Role: Co-I
June 2021 – May 2024	NASA A.5 Carbon Cycle Science: <i>2020 California Carbon Dioxide Budget in a Changing Environment</i> (PI: Seongeun Jeong, LBNL); My Role: Collaborator
Not selected	NASA A.31 Science Team for the OCO Missions: <i>Investigating CO₂ and Water Vapor Fluxes from Productive Agricultural Land</i> ; submitted in Jun 2023; My Role: Science PI

Invited Talks

3. Colloquia at Dept. of Atmospheric Science, Colorado State University, “Seeing Human Impacts on the Environment Through Satellite Lenses”, https://www.atmos.colostate.edu/dept/abstracts/2024spring/2.15.24_Wu_abstract.pdf, Feb 15, **2024**.
2. Annual seminar series at Institute of Atmospheric Physics of Chinese Academy of Sciences: “Constraining urban CO₂ emissions using satellites”, June **2023**.
1. Noble seminar series, Earth, Atmospheric, and Planetary Physics (EAPP) at the University of Toronto: “Monitoring urban CO₂ emissions from space: from city-level towards sector-level”, <https://www.physics.utoronto.ca/research/eapp/atmospheric-physics-seminars/dien/>, Oct 31, **2022**.

Teaching and mentoring experiences

Guest lecture, ESE 104, Caltech “Seeing Urban Emissions through Satellite Lenses”	Feb 2024
Caltech’s Center for Teaching, Learning, and Outreach (CTLO) workshop “Transforming your research into classes”	Spring, Summer, 2023
Kevin Do (undergraduate student, Dept. of Computer Sciences, Caltech) Project: <i>Estimation of global CO₂ mass using TCCON</i>	2023
Zixuan Xiao (graduate student, Dept. of Physics, University of Toronto) Project: <i>Power plant CO₂ emission estimates using X-STILT</i>	2023
Dr. Ariana Tribby (former graduate student, Dept. of Env Sci & Eng, Caltech) Project: <i>CH₄ emission estimates for oil & gas using TCCON</i>	2023

Peer Review Activities

Proposal Reviewer: NOAA [Atmospheric Chemistry, Carbon Cycle and Climate \(AC4\)](#) Calls (FY23)

Paper Reviewer: Journal of Geophysical Research: Atmospheres (JGR-A), Geophysical Research Letters (GRL), Environmental Research Letters (ERL), Remote Sensing of Environment (RSE), Atmospheric Chemistry and Physics (ACP), Atmospheric Measurement Techniques (AMT), Biogeosciences (BG), Scientific Reports, and Environmental Science & Technology (EST).

Selected Conference Presentations

- Wu, D.**, Cawse-Nicholson, K., Liu, J., Duarte, F. H., Wennberg, P.: Interpreting Atmospheric Imprints of Intensive Agricultural Activities using Multiple Satellites, *AGU Fall Meeting*, San Francisco, CA, Dec 11-15, **2023** (oral).

Wu, D., Liu, J., Wennberg, P., Palmer, P. I., Nelson, R. R., Laughner, J. L., and Eldering, A.: Informing intra-city emission characteristics using satellite observations of CO₂ and co-emitted species, *AGU Fall Meeting*, Chicago, IL, Dec 12-16, **2022** (poster).

Wu, D., Liu, J., Wennberg, P., Palmer, P. I., Nelson, R. R., Laughner, J. L., and Eldering, A.: Towards the quantification of emission ratios between CO₂ and CO and linkage to sectoral activities, IWGGMS-17, Virtual, **2021** (poster).

Wu, D., J.C. Lin, B. Fasoli, T. Oda, E.A. Kort, and Duarte, H., Towards quantifying urban CO₂ emissions for global cities using column CO₂ and SIF data, *AGU Fall Meeting*, San Francisco, CA, Dec 09-13, **2019** (eLightning).

Wu, D., J.C. Lin, H. Duarte, G. Wei, K. Wu, S. Richardson, N. Miles, K. Davis, E. A. Kort: Towards improving the modeling of urban biosphere using Solar-induced Fluorescence (SIF), *AGU Chapman Conference on understanding carbon climate feedbacks*, San Diego, CA, Aug 26-29, **2019** (poster).

Wu, D., J. C. Lin, T. Oda, and E. A. Kort: Do denser cities emit less CO₂? A first estimate using a CO₂ satellite, *OCO-2/OCO-3 Science Team telecon*, May 14, **2019** (oral).

Wu, D., J. C. Lin, Oda, T., Ye, X., Lauvaux, T., Yang, E., and Kort, E. A., Towards Interpreting the Signal of CO₂ Emissions from Megacities by Applying a Lagrangian Receptor-oriented Model to OCO-2 XCO₂ data, *AGU Fall Meeting*, New Orleans, LA, Dec 11-15, **2017** (oral).

Mallia, D. V., A. Kochanski, **D. Wu**, S. Urbanski, and J. C. Lin, Integrating wildfire plume rises within atmospheric transport models, *AGU Fall meeting*, San Francisco, CA, Dec 12-16, **2016**.

Wu, D., D. V. Mallia, S. P. Urbanski, J. C. Lin, Top-down Constraints on CO Emissions from Wildfire Inventories Using a Receptor-oriented Lagrangian Particle Dispersion Model, *AMS Third Conference on Biogeoscience*, Salt Lake City, UT, June 20-25, **2016** (oral).

Lin, J. C., B. B. Stephens, D. V. Mallia, **D. Wu**, H. Duarte, S. Urbanski, and J. Ehleringer, How can we constrain regional carbon fluxes in the American Rockies from atmospheric measurements? *5th NCAP and AmeriFlux Joint Meeting*, Washington, D.C, Jan 26-29, **2015**.

Lin, J. C., D. V. Mallia, **D. Wu**, S. Urbanski, and B. B. Stephens, Quantifying the influence of biomass burning on measurements site in the western U.S., *AGU Fall Meeting*, San Francisco, CA, Dec 15-19, **2014**.

Master Thesis

Wu, D. Top-down constraints on CO emissions from wildfire inventories using a receptor-oriented Lagrangian particle dispersion model, [Link](#).

Outreach activities

Conference co-convenor: Phillips, C.A., Laughner, J., **Wu, D.** and Sadai, S.: December. Attributing, Projecting, and Linking Greenhouse Gas Emissions to Sources, Air Quality, and Climate Impacts I Oral. In *AGU23*.

Media coverage: "NASA Satellite Offers Urban Carbon Dioxide Insights", <https://www.nasa.gov/centers-and-facilities/jpl/nasa-satellite-offers-urban-carbon-dioxide-insights/>, March 2020

Technical Skills

Programming languages and skills: R, Fortran, Python, Bash, LaTeX, Machine Learning (neural network)
Modeling experience: HYSPLIT-STILT, WRF-ARW, WRF-Chem

Model Assets

1. Column-Stochastic Time-Inverted Lagrangian Transport (X-STILT) model
Github: <https://github.com/uataq/X-STILT> with DOI: [10.5281/zenodo.1241515](https://doi.org/10.5281/zenodo.1241515)
2. Solar-Induced Fluorescence for Modeling Urban biogenic Fluxes (SMUrF) model
Github: <https://github.com/wde0924/SMUrF> with DOI: [10.5281/zenodo.4018124](https://doi.org/10.5281/zenodo.4018124)

Data citation: Wu, D., and J.C. Lin. 2021. Urban Biogenic CO₂ fluxes: GPP, R_{eco} and NEE Estimates from SMUrF, 2010-2019. ORNL DAAC, Oak Ridge, Tennessee, USA. <https://doi.org/10.3334/ORNLDAAC/1899>

3. Stochastic Time-Inverted Lagrangian Transport model for NO_x chemistry (STILT-NO_x)
DOI: <https://zenodo.org/records/8057850>

Professional Association

American Geophysical Union

NASA Orbiting Carbon Observatory (OCO-2/3) Science Team Member

Scholarships and Honors

- Edward J. Zipser Award, Excellence in Graduate Research, University of Utah, May 2020
- Pass the Graduate Qualifying Exam with distinction, University of Utah, May 2015
- Graduate with Magna cum laude, Florida State University, May 2014
- Dean's List, Florida State University, Fall 2012, Spring 2013, Fall 2013, Spring 2014
- Prize for being one of the excellent class leaders, NUIST, June 2012
- Second-tier scholarship (top 10%), NUIST, 2010, 2011