

## 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, Division of Geological and Planetary Sciences, California Institute of Technology, July 2023 – present

Postdoctoral Scholar Research Associate, Division of Geological and Planetary Sciences, California Institute of Technology, July 2020 – July 2023 (Supervisor: Prof. Paul Wennberg)

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

21. **Wu, D.**, Laughner, J. L., Liu, J., and Wennberg, P. O.: Simultaneous quantifications of anthropogenic CO<sub>2</sub>, and NO<sub>x</sub> 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 CO<sub>2</sub> emissions in support of emission reduction targets, *Environ. Res. Lett.*, in review.

#### Published

19. Madsen, S., **Wu, D.**, Halim, M. A., Wunch D.: CO<sub>2</sub> Fluxes of Vegetation in the Greenbelt of Ontario and Ecosystem Emissions Associated with its Removal, *Elementa: Science of the Anthropocene*, 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 NO<sub>2</sub> column observations: STILT–NO<sub>x</sub>, *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 CH<sub>4</sub> and CO<sub>2</sub> emissions in London. *Geophysical Research Letters*, 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 CO<sub>2</sub> Emission Changes Within Medium-Sized Cities?. *Journal of Geophysical Research: Atmospheres*, 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 CO<sub>2</sub> 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 CO<sub>2</sub> 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 CO<sub>2</sub> emissions over metropolitan areas from space: A multi-model analysis of OCO-2 data over Lahore, Pakistan. *Remote Sensing of Environment*, 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 CO<sub>2</sub> 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 XCO<sub>2</sub> 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 CO<sub>2</sub> emissions from urban area using OCO-2 observations of total column CO<sub>2</sub>. *Journal of Geophysical Research: Atmospheres*, 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. *Journal of Geophysical Research: Atmospheres*, 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 CO<sub>2</sub> emissions from cities, *Environ. Res. Lett.*, <https://doi.org/10.1088/1748-9326/ab68eb>, 2020. (NASA highlight, <https://www.nasa.gov/centers-and-facilities/jpl/nasa-satellite-offers-urban-carbon-dioxide-insights/>)
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. *Atmospheric Environment*, <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 CO<sub>2</sub> emissions from satellite observations of atmospheric column CO<sub>2</sub> (XCO<sub>2</sub>): 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 CO<sub>2</sub> observations be used to constrain regional carbon fluxes?, *Atmos. Chem. Phys.*, 17, 5561–5581, <https://doi.org/10.5194/acp-17-5561-2017>, 2017.

## Master Thesis

**Wu, D.** Top-down constraints on CO emissions from wildfire inventories using a receptor-oriented Lagrangian particle dispersion model, <https://www.proquest.com/openview/939f55dde5c87ba60d6b59e98d28fa72/1?pq-origsite=gscholar&cbl=18750>.

## 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](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 CO<sub>2</sub> emissions using satellites”, June **2023**.
1. Noble seminar series, Earth, Atmospheric, and Planetary Physics (EAPP) at the University of Toronto: “Monitoring urban CO<sub>2</sub> emissions from space: from city-level towards sector-level”, <https://www.physics.utoronto.ca/research/eapp/atmospheric-physics-seminars/dien/>, Oct 31, **2022**.

## Selected Oral and Poster Presentations

- Wu, D.**, Cawse-Nicholson, K., Liu, J., Duarte, F. H., Wennberg, P.: Interpreting Atmospheric Imprints of Intensive Agricultural Activities using Multiple Satellites, AGU, **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 CO<sub>2</sub> and co-emitted species, AGU, **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 CO<sub>2</sub> 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 CO<sub>2</sub> emissions for global cities using column CO<sub>2</sub> 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 CO<sub>2</sub>? A first estimate using a CO<sub>2</sub> 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 CO<sub>2</sub> Emissions from Megacities by Applying a Lagrangian Receptor-oriented Model to OCO-2 XCO<sub>2</sub> data, *AGU Fall Meeting*, New Orleans, LA, Dec 11-15, **2017** (oral).
- Wu, D.**, J. C. Lin, Oda, T., Ye, X., Lauvaux, T., Yang, E., and Kort, E. A., Towards interpreting the signal of CO<sub>2</sub> emissions from Megacities by applying a Lagrangian receptor-oriented model (STILT) to OCO-2 XCO<sub>2</sub> data, *OCO-2 Science Team Meeting*, Pasadena, CA, March 20-24, **2017** (oral and poster).
- 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**.

## Peer Review Activities

Reviewer for NOAA AC4 Proposal

Reviewer for 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).

## Teaching and mentoring experiences

Caltech's CTLO workshop on "transforming your research into classes", Spring, Summer, 2023  
 Kevin Do (undergraduate student at Caltech; estimation of global CO<sub>2</sub> mass using TCCON)  
 Zixuan Xiao (graduate student at U of Toronto: power plant CO<sub>2</sub> emission estimates using X-STILT)  
 Ariana Tribby (graduate student at Caltech; CH<sub>4</sub> emission estimates for oil & gas using TCCON)

## 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*. AGU.

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 CO<sub>2</sub> fluxes: GPP, R<sub>eco</sub> and NEE Estimates from SMUrF, 2010-2019. ORNL DAAC, Oak Ridge, Tennessee, USA. <https://doi.org/10.3334/ORNLDAAAC/1899>
3. Stochastic Time-Inverted Lagrangian Transport model for NO<sub>x</sub> chemistry (STILT-NO<sub>x</sub>)  
 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, 05/2020
- Pass the Graduate Qualifying Exam with distinction, University of Utah, 05/2015
- Graduate with Magna cum laude, Florida State University, 05/2014
- Dean's List, Florida State University, Fall 2012, Spring 2013, Fall 2013, Spring 2014
- Prize for being one of the excellent class leaders, NUIST, 06/2012
- Second-tier scholarship (top 10%), NUIST, 2010, 2011