Alexander J. Turner

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Atmospheric Sciences-Geophysics (ATG) Building, Office 706, University of Washington, Seattle, WA 98195

Education

Ph.D., Harvard University 2012 – 2017
Atmospheric Chemistry, Advisor: Daniel J. Jacob

B.S., University of Colorado at Boulder 2008 – 2012
Mechanical Engineering, Advisor: Daven K. Henze

Professional Experience

Assistant Professor, University of Washington 2021 –
Research Affiliate, NASA Jet Propulsion Lab 2018 – 2021
Miller Postdoctoral Fellow, University of California at Berkeley 2017 – 2020
Graduate Research Assistant, Harvard University 2012 – 2017

Awards and Fellowships

AGU James R. Holton Junior Scientist Award 2020
Miller Fellowship at UC Berkeley 2017 – 2020
Atmospheric Chemistry Colloquium for Emerging Senior Scientists (ACCESS XIV) 2017
DOE Computational Science Graduate Fellowship (CSGF) 2013 – 2017
National Defense Science and Engineering Graduate (NDSEG) fellowship, *declined* 2013
CU Boulder College of Engineering's "Outstanding Graduate for Research" 2012
NOAA Ernest F. Hollings Scholar 2010 – 2012

Publications (group member, *submitted, ‡esi highly cited paper)

h-index = 23, total citations = 2040 *(as of July 1, 2022 on Google scholar)*

*36. X. Yu, D. B. Millet, D. K. Henze, **A. J. Turner**, A. L. Delgado, A. A. Bloom, and J. Sheng (submitted), A high-resolution satellite-based map of global methane emissions reveals missing fossil fuel and monsoon sources, *submitted*.

35. K. D. Hajny, C. Floerchinger, I. Lopez-Coto, J. Pitt, C. Gately, K. Gurney, L. Hutyra, T. Jayarathne, R. Kaeser, G. Roest, M. Sargent, B. H. Stirm, J. Tomlin, **A. J. Turner**, P. B. Shepson, and S. Wofsy (2022), Measurements of anthropogenic CO_2 emissions from New York City compared to inventories, *Elem. Sci. Anth.*, *10*:1, doi:10.1525/elementa.2021.00121.

34. J. Kim, **Turner, A. J.**, H. Fitzmaurice, E. Delaria, C. Newman, P. J. Wooldridge, and R. C. Cohen (2022), Observing annual trends in vehicular CO_2 emissions, A gridded national inventory of US methane emissions, *Env. Sci. Technol.*, *56*, 3925–3931, doi:10.1021/acs.est.1c06828.

33. J. Gensheimer, **A. J. Turner**, P. Köhler, C. Frankenberg, and J. Chen (2022), A convolutional neural network for spatial downscaling of satellite-based solar-induced chlorophyll fluorescence (SIFnet), *Biogeosci.*, *19*, 1777-1793, doi:10.5194/bg-19-1777-2022.

32. H. Fitzmaurice, **Turner, A. J.**, J. Kim, K. Chan, E. Delaria, C. Newman, P. J. Wooldridge, and R. C. Cohen (2022), Assessing vehicle fuel efficiency using a dense network of CO_2 observations, *Atmos. Chem. Phys.*, *22*, 3891–3900, doi:10.5194/acp-22-3891-2022.

31. X. Wang, J. A. Biederman, J. F. Knowles, R. L. Scott, **A. J. Turner**, M.P. Dannenberg, P. Köhler, C. Frankenberg, M. E. Litvak, G. N. Flerchinger, B. E. Law, H. Kwon, S. C. Reed, W. J. Parton, G. A. Barron-Gafford, and W. K. Smith (2022), Satellite solar-induced chlorophyll fluorescence and near-infrared reflectance observations capture complimentary aspects of dryland vegetation dynamics, *Remote Sens. Environ.*, *270*, 112858–112869, doi:10.1016/j.rse.2021.112858.

30. **Turner, A. J.**, P. Köhler, T. S. Magney, C. Frankenberg, I. Fung, and R. C. Cohen (2021), Extreme events driving year-to-year differences in gross primary productivity across the US, *Biogeosci.*, *18*, 6579–6588, doi:10.5194/bg-18-6579-2021.

29. E. R. Delaria, B. K. Place, **A. J. Turner**, Q. Zhu, X. Jin, and R. C. Cohen (2021), Development of a solar induced fluorescence-canopy conductance model and its application to stomatal reactive nitrogen deposition, *ACS Earth Space Chem.*, *5*, 3414–3428, doi:10.1021/acsearthspacechem.1c00260.

28. Laughner, J. L., J. L. Neu, D. Schimel, P. O. Wennberg, K. Barsanti, K. Bowman, A. Chatterjee, B. Croes, H. Fitzmaurice, D. K. Henze, J. Kim, E. A. Kort, Z. Liu, K. Miyazaki, **A. J. Turner**, S. Anenberg, J. Avise, H. Cao, D. Crisp, J. de Gouw, A. Eldering, J. Fyfe, D. L. Goldberg, K. R. Gurney, S. Hasheminassab, F. Hopkins, C. E. Ivey, D. B. A. Jones, J. Liu, N. S. Lovenduski, R. V. Martin, G. A. McKinley, L. Ott, B. Poulter, M. Ru, S. P. Sander, N. Swart, Y. L. Yung, Z. Zeng, and KISS COVID-19 workshop team (2021), Societal shifts due to COVID-19 reveal large-scale complexities and feedbacks between atmospheric chemistry and climate change, *Proc. Natl. Acad. Sci.*, *118*, doi:10.1073/pnas.2109481118.

27. J. Gensheimer, **A. J. Turner**, A. Shekhar, A. Wenzel, F. N. Keutsch, and J. Chen (2021), What are different measures of mobility changes telling us about emissions during the COVID-19 pandemic?, *J. Geophys. Res.*, *126*, doi:10.1029/2021JD034664.

26. **Turner, A. J.**, J. Kim, H. Fitzmaurice, C. Newman, K. Worthington, K. Chan, P. J. Wooldridge, P. Köhler, C. Frankenberg, and R. C. Cohen (2020), Observed impacts of COVID-19 on urban CO_2 emissions, *Geophys. Res. Lett.*, *47*, doi:10.1029/2020GL090037.

25. **Turner, A. J.**, P. Köhler, T. S. Magney, C. Frankenberg, I. Fung, and R. C. Cohen (2020), A double peak in the seasonality of California's photosynthesis as observed from space, *Biogeosci.*, *17*, 405–422, doi:10.5194/bg-17-405-2020.

24. Nguyen, N., **A. J. Turner**, Y. Yin, M. Prather, and C. Frankenberg (2020), Effects of chemical feedbacks on decadal methane emissions estimates, *Geophys. Res. Lett.*, *47*, doi:10.1029/2019GL085706.

‡23. **Turner, A. J.***, C. Frankenberg*, and E. A. Kort* (2019), Interpreting contemporary trends in atmospheric methane, *Proc. Natl. Acad. Sci.*, *116*, 2805–2813, doi:10.1073/pnas.1814297116.

22. Cusworth, D. H., D. J. Jacob, J. X. Sheng, J. Benmergui, **A. J. Turner**, J. Brandman, L. White, and C. A. Randles (2018), Detecting high-emitting methane sources in oil/gas fields using satellite observations, *Atmos. Chem. Phys.*, *18*, 16885–16896, doi:10.5194/acp-18-16885-2018.

21. **Turner, A. J.**, I. Fung, V. Naik, L. W. Horowitz, and R. C. Cohen (2018), Modulation of hydroxyl variability by ENSO in the absence of external forcing, *Proc. Natl. Acad. Sci.*, *115*, 8931–8936, doi:10.1073/pnas.1807532115.

20. Sheng, J. X., D. J. Jacob, **A. J. Turner**, J. D. Maasakkers, J. Benmergui, A. A. Bloom, C. Ardnt, R. Gautam, D. Zavala-Araiza, H. Boesch, and R. J. Parker (2018), 2010–2016 methane trends over Canada, the United States, and Mexico observed by the GOSAT satellite: contributions from different source sectors, *Atmos. Chem. Phys.*, *18*, 12257–12267, doi:10.5194/acp-18-12257-2018.

19. **Turner, A. J.**, D. J. Jacob, J. Benmergui, J. Brandman, L. White, and C. A. Randles (2018), Assessing the capability of different satellite observing configurations to resolve the distribution of methane emissions at kilometer scales, *Atmos. Chem. Phys.*, *18*, 8265–8278, doi:10.5194/acp-18-8265-2018.

18. Sheng, J. X., D. J. Jacob, **A. J. Turner**, J. D. Maasakkers, M. P. Sulprizio, A. A. Bloom, A. E. Andrews, and D. Wunch (2018), High-resolution inversion of methane emissions in the Southeast US using SEAC^{4}RS aircraft observations of atmospheric methane: anthropogenic and wetlands sources, *Atmos. Chem. Phys.*, *18*, 6483–6491, doi:10.5194/acp-18-6483-2018.

17. Bloom, A. A., K. Bowman, M. Lee, **A. J. Turner**, R. Schroeder, J. R. Worden, R. J. Weidner, K. McDonald, and D. J. Jacob (2017), A global wetland methane emissions and uncertainty dataset for atmospheric chemical transport models (WetCHARTs version 1.0), *Geosci. Mod. Dev*, *10*, 2141–2156, doi:10.5194/gmd-10-2141-2017.

16. Buchwitz, M, O. Schneising, M. Reuter, J. Heymenn, S. Krautwurst, H. Bovensmann, J. P. Burrows, H. Boesch, R. J. Parker, P. Somkuti, R. G. Detmers, O. P. Hasekamp, I. Aben, A. Butz, C. Frankenberg, and **A. J. Turner** (2017), Satellite-derived methane hotspot emission estimates using a fast data-driven method, *Atmos. Chem. Phys.*, *17*, 5751–5744, doi:10.5194/acp-17-5751-2017.

‡15. **Turner, A. J.**, C. Frankenberg, P. O. Wennberg, and D. J. Jacob (2017), Ambiguity in the causes for decadal trends in atmospheric methane and hydroxyl, *Proc. Natl. Acad. Sci.*, *114*, 5367–5372, doi:10.1073/pnas.1616020114.

14. Tzompa-Sosa, Z. A., E. V. Fischer, E. Mahieu, B. Franco, C. A. Keller, **A. J. Turner**, D. Helmig, A. Fried, D. Richter, P. Weibring, J. Walega, T. I. Yacovitch, S. C. Herndon, D. R. Blake, F. Hase, J. Hannigan, S. Conway, K. Strong, and M. Schneider (2017), Revisiting global fossil fuel and biofuel emissions of ethane, *J. Geophys. Res.*, *122*, 2493–2512, doi:10.1002/2016JD025767.

13. Bader, W., B. Bovy, S. Conway, K. Strong, D. Smale, **A. J. Turner**, T. Blumenstock, C. Boone, M. C. Coen, A. Coulon, O. Garcia, D. W. T. Griffith, F. Hase, P. Hausmann, N. Jones, P. Krummel, I. Murata, I. Morino, H. Nakajima, S. O'Doherty, C. Paton-Walsh, J. Robinson, R. Sandrin, M. Schneider, C. Servais, R. Sussmann, and E. Mahieu (2017), The recent increase of atmospheric methane from 10 years of ground-based NDACC FTIR observations since 2005, *Atmos. Chem. Phys.*, *17*, 2255–2277, doi:10.5194/acp-17-2255-2017.

12. Maasakkers, J. D., D. J. Jacob, M. Sulprizio, **A. J. Turner**, M. Weitz, T. Wirth, C. Hight, M. DeFigueiredo, M. Desai, R. Schmeltz, L. Hockstad, A. A. Bloom, K. W. Bowman, S. Jeong, and M. L. Fischer (2016), A gridded national inventory of US methane emissions, *Env. Sci. Technol.*, *50*, 13123–13133, doi:10.1021/acs.est.6b02878.

11. Jacob, D. J., **A. J. Turner**, J. D. Maasakkers, J. Sheng, K. Sun, X. Liu, K. Chance, I. Aben, J. McKeever, and C. Frankenberg (2016), Satellite observations of atmospheric methane and their application to constrain emissions, *Atmos. Chem. Phys.*, *16*, 14371–14396, doi:10.5194/acp-16-14371-2016.

10. **Turner, A. J.**, A. A. Shusterman, B. C. McDonald, V. Teige, R. A. Harley, and R. C. Cohen (2016), Network design for quantifying urban CO_2 emissions: assessing trade-offs between precision and network density, *Atmos. Chem. Phys.*, *16*, 13465–13475, doi:10.5194/acp-16-13465-2016.

9. Shusterman, A. A., V. Teige, **A. J. Turner**, C. Newman, J. Kim, and R. C. Cohen (2016), The BErkeley Atmospheric CO_2 Observation Network: Initial Evaluation, *Atmos. Chem. Phys.*, *16*, 13449–13463, doi:10.5194/acp-16-13449-2016.

8. Tan, Z., Q. Zhuang, D. K. Henze, C. Frankenberg, E. Dlugokencky, C. Sweeney, **A. J. Turner**, M. Sasakawa, and T. Machida (2016), Inverse modeling of pan-Arctic methane emissions at high spatial resolution: What can we learn from assimilating satellite retrievals and using different process-based wetland and lake biogeochemical models?, *Atmos. Chem. Phys.*, *16*, 12649–12666, doi:10.5194/acp-16-12649-2016.

7. Bousserez, N., D. K. Henze, B. Rooney, A. Perkins, K. J. Wecht, **A. J. Turner**, V. Natraj, and J. R. Worden (2016), Constraints on methane emissions in North America from future geostationary remote sensing measurements, *Atmos. Chem. Phys.*, *16*, 6175–6190, doi:10.5194/acp-16-6175-2016.

‡6. **Turner, A. J.**, D. J. Jacob, J. Benmergui, S. C. Wofsy, J. D. Maasakkers, A. Butz, O. Hasekamp, and S. C. Biraud (2016), A large increase in U.S. methane emissions over the past decade inferred from satellite data and surface observations, *Geophys. Res. Lett.*, *43*, doi:10.1002/2016GL067987.

5. Worden, J. R., **A. J. Turner**, A. Bloom, S. S. Kulawik, J. Liu, M. Lee, R. Weidner, K. Bowman, C. Frankenberg, R. J. Parker, and V. H. Payne (2015), Quantifying Lower Tropospheric Methane Concentrations Using Near-IR and Thermal IR Satellite Measurements: Comparison to the GEOS-Chem model, *Atmos. Meas. Tech.*, *8*, 3433–3445, doi:10.5194/amt-8-3433-2015.

‡4. **Turner, A. J.**, D. J. Jacob, K. J. Wecht, J. D. Maasakkers, E. Lundgren, A. E. Andrews, S. C. Biraud, H. Boesch, K. W. Bowman, N. M. Deutscher, M. K. Dubey, D. W. T. Griffith, F. Hase, A. Kuze, J. Notholt, H. Ohyama, R. Parker, V. H. Payne, R. Sussmann, C. Sweeney, V. A. Velazco, T. Warneke, P. O. Wennberg, and D. Wunch (2015), Estimating global and North American methane emissions with high spatial resolution using GOSAT satellite data, *Atmos. Chem. Phys.*, *15*, 7049–7069, doi:10.5194/acp-15-7049-2015.

3. **Turner, A. J.** and D. J. Jacob (2015), Balancing aggregation and smoothing errors in inverse models, *Atmos. Chem. Phys.*, *15*, 7039–7048, doi:10.5194/acp-15-7039-2015.

2. **Turner, A. J.**, A. M. Fiore, L. W. Horowitz, and M. Bauer (2013), Summertime cyclone frequencies over the Great Lakes Storm Track from 1860–2100: variability, trends, and association with ozone pollution, *Atmos. Chem. Phys.*, *13*, 565–578, doi:10.5194/acp-13-565-2013.

1. **Turner, A. J.**, D. K. Henze, R. V. Martin, and A. Hakami (2012), The spatial extent of source influences on modeled column concentrations of short-lived species, *Geophys. Res. Lett.*, *39*, L12806, doi:10.1029/2012GL051832.

Invited Seminars

2022 Stanford University
2022 NASA Goddard Space Flight Center
2022 NASA Ames Research Center
2022 University of Rochester
2021 Environment and Climate Change Canada
2021 University of Toronto
2021 UC Berkeley Climate and Impacts Group
2021 Imperial College
2020 NASA Jet Propulsion Laboratory (JPL)

2020 University of California at Berkeley
2020 University of Washington
2019 Bay Area Air Quality Management District (BAAQMD)
2019 OneNOAA Science Seminar
2018 Stanford University
2018 University of California at Berkeley
2018 Technical University of Munich (TUM), Germany
2018 NASA Ames Research Center
2018 NOAA Geophysical Fluid Dynamics Laboratory (GFDL)
2018 University of Washington
2017 Japanese Aerospace Exploration Agency (JAXA)
2017 California Institute of Technology (Caltech)
2016 Massachusetts Institute of Technology (MIT)
2016 NASA Jet Propulsion Laboratory (JPL)
2016 NOAA Earth System Research Laboratory (ESRL)
2016 IBM Thomas J. Watson Research Center
2014 DOE Lawrence Livermore National Laboratory (LLNL)
2014 NOAA Earth System Research Laboratory (ESRL)

Selected Oral Conference Presentations (†invited)

2022 OCO-2 Science Team Meeting
2021 Telluride Science Workshop: Mapping Urban Air
2020† AGU Fall Meeting: James R. Holton Award talk in the Frontiers of Atmospheric Science session
2020† AGU Fall Meeting: Union Session on COVID-19 in the Earth system
2020 AGU Fall Meeting: Session on Solar-Induced chlorophyll Fluorescence
2020 Air Sensors International Conference (ASIC) virtual fall series
2020† COVID-19: Identifying Unique Opportunities for Earth Science, Keck Institute for Space Studies
2019† CO_2-Urban Synthesis and Analysis (CO_2-USA) Workshop, Boston University
2019† Frontiers of Atmospheric Science and Chemistry (FASCINATE 2019), NCAR, Boulder, CO
2019† Global Air Quality Sensing Forum, Berkeley, CA
2017 AGU Fall Meeting, New Orleans, LA
2017† UN Climate Change Conference (COP23), Bonn, Germany
2017 Atmospheric Chemistry Colloquium for Emerging Senior Scientists (ACCESS) XIV, Brookhaven National Lab
2017† DOE Computational Science Graduate Fellowship Program Review, Washington, DC
2016 AGU Fall Meeting, San Francisco, CA
2015 11th International Workshop on Greenhouse Gas Measurements from Space, Caltech
2015 7th International GEOS-Chem Meeting, Harvard University
2015 5th North American Carbon Program Meeting, Washington, DC
2014 AGU Fall Meeting, San Francisco, CA
2013 AGU Fall Meeting, San Francisco, CA
2011 AGU Fall Meeting, San Francisco, CA
2011 5th International GEOS-Chem Meeting, Harvard University

Teaching Experience

University of Washington:

- ATM S 358 (Atmospheric Chemistry, *undergraduate*): Sp 2021, Sp 2022
- ATM S 501 (Atmospheric Physics & Chemistry, *graduate*): Au 2021, Au 2022
- ATM S 532 (Atmospheric Radiation, *graduate*): Wi 2022
- Climate & Environmental Justice Faculty Development Workshop: Wi 2022

Prior to University of Washington:

- Global Air Quality & Health (UC Berkeley; guest lecturer): 2019
- Atmospheric Science Seminar Course (Columbia; guest lecturer): 2019
- Environmental Modeling (Harvard; guest lecturer): 2015
- Atmospheric Chemistry (Harvard; TA): 2014
- Numerical Methods (CU Boulder; TA): 2010, 2011
- First-Year Engineering Projects (CU Boulder; TA): 2010

Mentoring

Postdocs:

- Dr. Tai-Long He, 2022 – *present*

Graduate students:

- Nikhil Dadheech, 2021 – *present*

Undergraduates:

- Ryan Boyd, 2021 – *present*

Alumni:

- Johannes Gensheimer (TUM), MS 2020 – 2021. Next position: PhD student at MPI Jena.
- Connor Dolan (UC Berkeley), BS 2019. Next position: PhD student at UCSD
- Erik Tamre (Harvard), BA 2014. Next position: PhD student at MIT

Committees as member:

- Carley Fredrickson (UW ATM S), Generals Exam 2022
- Claire Zarakas (UW ATM S), Generals Exam 2022
- Emily Tansey (UW ATM S), Generals Exam 2022
- Shuting Zhai (UW ATM S), Generals Exam 2021
- Dr. Susanna Michael (UW Ocean), PhD Committee 2022

Service Activities

Departmental committees and duties:

- ATM S graduate curriculum committee member, 2021–*present*.
- Member, Harvard University EPS student advisory committee for faculty search, 2017.

College/University committees and duties:

- Co-Director of UW Computing for the Environment Initiative, 2022–*present*.
- UW faculty senator, 2021–*present*.
- Member, Miller Institute at UC Berkeley symposium planning committee, 2018–2020.

National committees and duties:

- Co-organizer, Telluride Science Research Conference on *"Mapping Urban Air: Linking Observations and Processes"*, 2021.
- Team Lead, NASA Keck Institute for Space Sciences workshop on *"COVID-19 and the Earth System"*, 2021.
- Co-author, white paper from Microsoft Research workshop on Urban Futures: *"Why all cities should have 'Clean Air as a City Service'"*, 2020.

International committees and duties:

- Lead chapter author, Japanese National Institute for Environmental Studies (NIES) report: *"A guidebook on the use of satellite greenhouse gases observation data to evaluate and improve greenhouse gas emission inventories"*, 2018.
- Co-chair, session at AGU Fall Meeting, 2019, 2020.
- Guest editor for *PNAS*.
- Proposal reviewer for *NASA*, *NOAA*, and *Deutsche Forschungsgemeinschaft*.
- Peer reviewer for 14 scientific journals: *PNAS*, *Nature Geoscience*, *Nature Climate Change*, *Science Advances*, *Geophysical Research Letters*, *Atmospheric Chemistry and Physics*, *Biogeosciences*, *Journal of Geophysical Research*, *Atmospheric Measurement Techniques*, *Environmental Science & Technology*, *GeoHealth*, *Geoscientific Model Development*, *IEEE Transactions on Geoscience and Remote Sensing*, and *Atmospheric Environment*.

Research Grants

A dense air quality monitoring network in Seattle to address air pollution, climate, and equity
$50,000, Alexander J. Turner

- University of Washington's Computing for the Environment Initiative
- June 20, 2022 – June 19, 2023

Development of a high-fidelity emulator of a full physics model for dense observing systems
$576,965, Alexander J. Turner (sole PI)

- NASA Early Career Faculty (ECF) Grant 80NSSC21K1808; Claudia Meyer (hq-ecf-call@mail.nasa.gov)
- October 12, 2021 – October 11, 2024

2020 California Carbon Dioxide Budget in a Changing Climate
$808,506, Seonguen Jeong (PI); Turner is a Co-I ($25,049)

- NASA ROSES Grant 80HQTR21T0101; Richard Eckman (richard.s.eckman@nasa.gov)
- June 3, 2021 – June 2, 2024