

# ALEXANDER J. TURNER

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

## EDUCATION

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<b>Ph.D., Harvard University</b> Atmospheric Chemistry, Advisor: Daniel J. Jacob	2012 – 2017
<b>B.S., University of Colorado at Boulder</b> Mechanical Engineering, Advisor: Daven K. Henze	2008 – 2012

## PROFESSIONAL EXPERIENCE

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

## AWARDS AND FELLOWSHIPS

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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, <i>declined</i>	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)

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h-index = 21, total citations = 1581 (*as of September 7, 2021 on Google scholar*)

- \*34. J. Kim, **Turner, A. J.**, H. Fitzmaurice, E. Delaria, C. Newman, P. J. Wooldridge, and R. C. Cohen (submitted), Observing annual trends in vehicular CO<sub>2</sub> emissions, *submitted*.
- \*33. H. Fitzmaurice, **Turner, A. J.**, J. Kim, K. Chan, E. Delaria, C. Newman, P. J. Wooldridge, and R. C. Cohen (submitted), Assessing vehicle fuel efficiency using a dense network of CO<sub>2</sub> observations, *submitted*.
- \*32. K. D. Hajny, C. Floerchinger, J. Pitt, J. Tomlin, R. Kaeser, B. H. Stirm, T. Jayarathne, C. Gately, M. Sargent, K. Gurney, G. Roest, I. Lopez-Coto, **A. J. Turner**, L. Hutyra, P. B. Shepson, S. Wofsy (submitted), Measurements of anthropogenic CO<sub>2</sub> emissions from New York City compared to inventories, *submitted*.
- \*31. E. R. Delaria, B. K. Place, **A. J. Turner**, Q. Zhu, and R. C. Cohen (submitted), Development of a solar induced fluorescence-canopy conductance model and its application to stomatal reactive nitrogen deposition, *submitted*.
- \*30. X. Wang, J. A. Biederman, J. F. Knowles, R. L. Scott, **A. J. Turner**, 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 (submitted), Satellite solar-induced chlorophyll fluorescence and near-infrared reflectance observations capture complimentary aspects of dryland vegetation dynamics, *submitted*.
- \*29. **Turner, A. J.**, P. Köhler, T. S. Magney, C. Frankenberg, I. Fung, and R. C. Cohen (submitted), Extreme events driving year-to-year differences in gross primary productivity across the US, *submitted*.
- 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, 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 (submitted), What can COVID-19 teach us about 2030 and beyond? A perspective on air pollution and climate, *Proc. Natl. Acad. Sci.*, XXX, XXXX–XXXX, doi:10.1073/pnas.XXXX.
- 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<sub>2</sub> 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.**<sup>\*</sup>, C. Frankenberg<sup>\*</sup>, and E. A. Kort<sup>\*</sup> (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. Maasackers, J. Benmergui, A. A. Bloom, C. Arndt, 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. Maasackers, 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<sup>4</sup>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. Heymann, 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. Maasackers, 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. Maasackers, 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<sub>2</sub> 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<sub>2</sub> 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.

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## INVITED SEMINARS

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 (<sup>†</sup>INVITED)

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- 2021 Telluride Science Workshop: Mapping Urban Air
- 2020<sup>†</sup> AGU Fall Meeting: James R. Holton Award talk in the Frontiers of Atmospheric Science session
- 2020<sup>†</sup> 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<sup>†</sup> COVID-19: Identifying Unique Opportunities for Earth Science, Keck Institute for Space Studies
- 2019<sup>†</sup> CO<sub>2</sub>-Urban Synthesis and Analysis (CO<sub>2</sub>-USA) Workshop, Boston University
- 2019<sup>†</sup> Frontiers of Atmospheric Science and Chemistry (FASCINATE 2019), NCAR, Boulder, CO
- 2019<sup>†</sup> Global Air Quality Sensing Forum, Berkeley, CA
- 2017 AGU Fall Meeting, New Orleans, LA
- 2017<sup>†</sup> UN Climate Change Conference (COP23), Bonn, Germany
- 2017 Atmospheric Chemistry Colloquium for Emerging Senior Scientists (ACCESS) XIV, Brookhaven National Lab
- 2017<sup>†</sup> 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

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### University of Washington:

- ATM S 501 (Atmospheric Physics & Chemistry): A 2021
- ATM S 358 (Atmospheric Chemistry): S 2021

### 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

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### Past and present graduate students:

- Nikhil Dadhech (UW), PhD 2021 – *present*
- Johannes Gensheimer (TUM), MS 2020 – 2021. Next position: PhD student at MPI Jena.

### Past and present undergraduates:

- Ryan Boyd (UW), 2021 – *present*
- Connor Dolan (UC Berkeley), 2019. Next position: PhD student at UCSD
- Erik Tamre (Harvard), 2014. Next position: PhD student at MIT

### Graduate student committees as member:

- Carley Fredrickson (ATM S), PhD expected 2023
- Shuting Zhai (ATM S), PhD expected 2021

## SERVICE ACTIVITIES

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### Departmental committees and duties:

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

### College/University committees and duties:

- 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.
- 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**

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**Development of a high-fidelity emulator of a full physics model for dense observing systems**

\$576,965, Alexander J. Turner (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