

Daniel L. Goldberg, Ph.D.

Assistant Research Professor
George Washington University
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Professional Preparation

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| 2015 | Ph.D. | University of Maryland, Atmospheric & Oceanic Science |
| 2013 | M.S. | University of Maryland, Atmospheric & Oceanic Science |
| 2009 | B.S. | Lafayette College, Chemical Engineering |

Professional Appointments

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| 2021–present | Assistant Research Professor | George Washington University |
| 2019–2021 | Staff Research Scientist | George Washington University |
| 2019–2021 | Staff Research Scientist | Argonne National Laboratory |
| 2016–2019 | Postdoctoral Scientist | Argonne National Laboratory |
| 2010–2015 | Graduate Research Assistant | University of Maryland |
| 2009–2010 | Environmental Engineer | TRC Solutions |

Scientific and Technical Background

Dr. Goldberg combines satellite data with model output and measurement data to quantify the human exposures to air pollution around the world. His most recent work involves using the TROPOMI satellite instrument to identify changes in air pollution emissions and concentrations due to the COVID-19 lockdowns. Results from his ongoing analyses have allowed the scientific community to gain better insight on NO_x and GHG emissions on a city-scale, and to better estimate pollutant exposures for health impact assessments. He holds a “Tiger Team” leadership position on the NASA HAQAST science team, and has made impactful contributions to several additional NASA-sponsored science teams, including DISCOVER-AQ, KORUS-AQ, and OWLETS-2. He actively collaborates with scientists and policymakers at NASA, NOAA, EPA, IHME, CDC, state agencies, non-profit organizations, and other academic institutions.

Service & Leadership

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| 2021-2022 | Technical Advisory | Metro Washington DC Air Quality Committee |
| 2021 | Mentor | NASA DEVELOP Internship Program |
| 2021 | Session Organizer | American Meteorological Society |
| 2019–2020 | Session Organizer | American Geophysical Union |
| 2016–2018 | Executive Board Member | Argonne Postdoctoral Society |
| 2016–2017 | Mentor | ACT-SO High School Science Competition |
| 2011–2013 | Executive Board Member | UMD Atmospheric Science Graduate Students |
| 2007–2008 | Student President | Lafayette College Environmental Club |

Awards & Honors

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| 2020 | Impact Argonne Award for Extraordinary Effort |
| 2015 | Outstanding Graduate Assistant Award for top 2% of all graduate students |
| 2012 | Service Award for dedicated service to UMD Atmospheric Science Dept |
| 2009 | American Chemical Society (ACS) Award for top chemical engineer in class |
| 2008 | Tau Beta Pi Engineering Honor Society for top 20% of engineering class |

Teaching Experience

2020 – 2021 George Washington University, Global Climate Change and Air Pollution
Guest Lecture on the use of measurements and models to estimate air pollution

2012 – 2013 University of Maryland, AOSC200: Introduction to Weather and Climate
Head TA. Taught 2 lectures per week. Graded all exams, quizzes, and projects.

Junior Scientists Advised

Postdoc: Dr. Arash Mohegh (2019 – 2021), Dr. Gaige Kerr (2020 – present), Dr. Doyeon Ahn (2021 – present), Dr. Katelyn O'Dell (2021 – present)

Masters: Nigel Martis (2021 – present), Perrin Krisko (2021 – present), Xavier Nogueira (2021 – 2022)

Undergraduate: Duncan Quevedo (2020 – 2021)

Related Professional Experience

2012 – 2014 National Atmospheric Deposition Program Primary Site Operator

2012 – 2014 Clean Air Status & Trends Network Primary Site Operator

Editorial Review

Peer reviewer for academic journals: Atmospheric Chemistry and Physics (6); Atmospheric Environment (7); Atmospheric Measurement Techniques (1); Atmosphere (3); Environmental Research Letters (4); Environmental Science and Technology (4); Elementa (2); Geophysical Research Letters (2); Journal of Atmospheric and Oceanic Technology (1); Journal of Geophysical Research – Atmospheres (1); Nature Communications (1); Remote Sensing (2); Science of the Total Environment (1); Scientific Advances (1)

Peer reviewer for academic proposals: NASA Research Opportunities in Space and Earth Science (ROSES), NASA Postdoctoral Program (NPP), National Science Foundation (NSF), Netherlands Organization for Scientific Research Innovative Research Incentives Scheme (Vici)

Professional Membership

American Geophysical Union (AGU)

American Meteorological Society (AMS)

International Society for Environmental Epidemiology (ISEE)

Skills & Proficiencies

Mastery of: TROPOMI (NO₂, HCHO, CO) OMI (NO₂, HCHO, SO₂), MODIS AOD (Dark Target & Deep Blue), MAIAC AOD, CAMx air quality model, IDL, Linux, HDF & NetCDF file formats

Understanding of: WRF, ERA5 re-analysis, CMAQ, WRF-Chem, Geos-Chem, Python, Visual Basic, HTML, C-shell, Fortran

Peer-Reviewed Publications (12 first-author, 30 total; h-index: 14)

1. Tzortziou, M., Kwong, C. F., **Goldberg, D. L.**, Schiferl, L., Commane, R., Abuhassan, N., Szykman, J. and Valin, L.: Declines and peaks in NO₂ pollution during the multiple waves of the COVID-19 pandemic in the New York metropolitan area, *Atmos. Chem. Phys.*, 1–30, doi:10.5194/ACP-2021-592, **2022**.
2. Jing, P. and **Goldberg, D. L.**: Influence of conducive weather on ozone in the presence of reduced NO_x emissions: A case study in Chicago during the 2020 lockdowns, *Atmos. Pollut. Res.*, 13(2), 101313, doi:10.1016/J.APR.2021.101313, **2022**.
3. Anenberg, S. C., Mohegh, A., **Goldberg, D. L.**, Kerr, G. H., Brauer, M., Burkart, K., Hystad, P., Larkin, A., Wozniak, S. and Lamsal, L.: Long-term trends in urban NO₂ concentrations and associated paediatric asthma incidence: estimates from global datasets, *Lancet Planet. Heal.*, 6(1), e49–e58, doi:10.1016/S2542-5196(21)00255-2, **2022**.
4. Nawaz, M. O., Henze, D. K., Harkins, C., Cao, H., Nault, B., Jo, D., Jimenez, J., Anenberg, S. C., **Goldberg, D. L.** and Qu, Z.: Impacts of sectoral, regional, species, and day-specific emissions on air pollution and public health in Washington, DC, *Elem. Sci. Anthr.*, 9(1), doi:10.1525/elementa.2021.00043, **2021**.
5. Laughner, J. L., ..., **Goldberg, D. L.**, ..., Zeng, Z.-C.: Societal shifts due to COVID-19 reveal large-scale complexities and feedbacks between atmospheric chemistry and climate change, *Proc. Natl. Acad. Sci.*, 118(46), doi:10.1073/PNAS.2109481118, **2021**.
6. **Goldberg, D. L.**, Anenberg, S. C., Lu, Z., Streets, D. G., Lamsal, L., McDuffie, E. and Smith, S.: Urban NO_x emissions around the world declined faster than anticipated between 2005 and 2019, *Environ. Res. Lett.*, doi:10.1088/1748-9326/AC2C34, **2021**.
7. **Goldberg, D. L.**, Anenberg, S. C., Kerr, G. H., Lu, Z. and Streets, D. G.: TROPOMI: A revolutionary new satellite instrument measuring NO₂ air pollution, *Environ. Manag.*, **2021**.
8. Anenberg, S., Kerr, G. H. and **Goldberg, D. L.**: Leveraging satellite data to address air pollution inequities, *Environ. Manag.*, **2021**.
9. Kondragunta, S., Wei, Z., McDonald, B. C., **Goldberg, D. L.** and Tong, D. Q.: COVID-19 Induced Fingerprints of a New Normal Urban Air Quality in the United States, *J. Geophys. Res. Atmos.*, e2021JD034797, doi:10.1029/2021JD034797, **2021**.
10. Kerr, G. H., **Goldberg, D. L.** and Anenberg, S. C.: COVID-19 pandemic reveals persistent disparities in nitrogen dioxide pollution, *Proc. Natl. Acad. Sci.*, 118(30), e2022409118, doi:10.1073/pnas.2022409118, **2021**.
11. **Goldberg, D. L.**, Anenberg, S. C., Mohegh, A., Lu, Z. and Streets, D. G.: TROPOMI NO₂ in the United States: A detailed look at the annual averages, weekly cycles, effects of temperature, and correlation with surface NO₂ concentrations, *Earth's Future*, doi: 10.1029/2020EF001665, **2021**.
12. Gorris, M. E., Anenberg, S. C., **Goldberg, D. L.**, Kerr, G. H., Stowell, J. D., Tong, D. and Zaitchik, B. F.: Shaping the future of science: COVID-19 highlighting the importance of GeoHealth, *GeoHealth*, 5(5), e2021GH000412, doi:10.1029/2021gh000412, **2021**.
13. **Goldberg, D. L.**, Anenberg, S. C., Griffin, D., McLinden, C. A., Lu, Z. and Streets, D. G.: Disentangling the Impact of the COVID-19 Lockdowns on Urban NO₂ From Natural Variability, *Geophys. Res. Lett.*, 47(17), doi:10.1029/2020GL089269, **2020**.

14. Mohegh, A., **Goldberg, D. L.**, Achakulwisut, P. and Anenberg, S. C.: Sensitivity of estimated NO₂-attributable pediatric asthma incidence to grid resolution and urbanicity, *Environ. Res. Lett.*, doi:10.1088/1748-9326/abce25, **2020**.
15. Anenberg, S. C., Bindl, M., Brauer, M., Castillo, J. J., Cavalieri, S., Duncan, B. N., Fiore, A. M., Fuller, R., **Goldberg, D. L.**, Henze, D. K., Hess, J., Holloway, T., James, P., Jin, X., Kheirbek, I., Kinney, P. L., Liu, Y., Mohegh, A., Patz, J., Jimenez, M. P., Roy, A., Tong, D., Walker, K., Watts, N. and West, J. J.: Using Satellites to Track Indicators of Global Air Pollution and Climate Change Impacts: Lessons Learned From a NASA-Supported Science-Stakeholder Collaborative, *GeoHealth*, 4(7), doi:10.1029/2020GH000270, **2020**.
16. Saide, P. E., Gao, M., Lu, Z., **Goldberg, D. L.**, Streets, D. G., ... , and Crawford, J. H.: Understanding and improving model representation of aerosol optical properties for a Chinese haze event measured during KORUS-AQ, *Atmos. Chem. Phys.*, 20(11), 6455–6478, doi:10.5194/acp-20-6455-2020, **2020**.
17. Liu, F., Duncan, B. N., Krotkov, N. A., Lamsal, L. N., Beirle, S., Griffin, D., McLinden, C. A., **Goldberg, D. L.** and Lu, Z.: A methodology to constrain carbon dioxide emissions from coal-fired power plants using satellite observations of co-emitted nitrogen dioxide, *Atmos. Chem. Phys.*, 20(1), 99–116, doi:10.5194/acp-20-99-2020, **2020**.
18. **Goldberg, D. L.**, Saide, P. E., Lamsal, L. N., De Foy, B., Lu, Z., Woo, J.-H., Kim, Y., Kim, J., Gao, M., Carmichael, G. and Streets, D. G.: A top-down assessment using OMI NO₂ suggests an underestimate in the NO_x emissions inventory in Seoul, South Korea, during KORUS-AQ, *Atmos. Chem. Phys.*, 19(3), doi:10.5194/acp-19-1801-2019, **2019**.
19. **Goldberg, D. L.**, Lu, Z., Streets, D. G., de Foy, B., Griffin, D., McLinden, C. A., Lamsal, L. N., Krotkov, N. A. and Eskes, H.: Enhanced Capabilities of TROPOMI NO₂: Estimating NO_x from North American Cities and Power Plants, *Environ. Sci. Technol.*, acs.est.9b04488, doi:10.1021/acs.est.9b04488, **2019**.
20. **Goldberg, D. L.**, Lu, Z., Oda, T., Lamsal, L. N., Liu, F., Griffin, D., McLinden, C. A., Krotkov, N. A., Duncan, B. N. and Streets, D. G.: Exploiting OMI NO₂ satellite observations to infer fossil-fuel CO₂ emissions from U.S. megacities, *Sci. Total Environ.*, 695, 133805, doi:10.1016/j.scitotenv.2019.133805, **2019**.
21. **Goldberg, D. L.**, Gupta, P., Wang, K., Jena, C., Zhang, Y., Lu, Z. and Streets, D. G.: Using gap-filled MAIAC AOD and WRF-Chem to estimate daily PM 2.5 concentrations at 1 km resolution in the Eastern United States, *Atmos. Environ.*, 199, 443–452, doi:10.1016/j.atmosenv.2018.11.049, **2019**.
22. Ring, A. M., Canty, T. P., Anderson, D. C., Vinciguerra, T. P., He, H., **Goldberg, D. L.**, Ehrman, S. H., Dickerson, R. R. and Salawitch, R. J.: Evaluating commercial marine emissions and their role in air quality policy using observations and the CMAQ model, *Atmos. Environ.*, 173(June 2017), 96–107, doi:10.1016/j.atmosenv.2017.10.037, **2018**.
23. **Goldberg, D. L.**, Lamsal, L. N., Loughner, C. P., Swartz, W. H., Lu, Z. and Streets, D. G.: A high-resolution and observationally constrained OMI NO₂ satellite retrieval, *Atmos. Chem. Phys.*, 17(18), 11403–11421, doi:10.5194/acp-17-11403-2017, **2017**.

24. Ren, X., Luke, W. T., Kelley, P., Cohen, M. D., Artz, R., Olson, M. L., Schmeltz, D., Puchalski, M., **Goldberg, D. L.**, Ring, A., Mazzuca, G. M., Cummings, K. A., Wojdan, L., Preaux, S. and Stehr, J. W.: Atmospheric mercury measurements at a suburban site in the Mid-Atlantic United States: Inter-annual, seasonal and diurnal variations and source-receptor relationships, *Atmos. Environ.*, 146, 141–152, doi:10.1016/j.atmosenv.2016.08.028, **2016**.
25. **Goldberg, D. L.**, Vinciguerra, T. P., Anderson, D. C., Hemberck, L., Canty, T. P., Ehrman, S. H., Martins, D. K., Stauffer, R. M., Thompson, A. M., Salawitch, R. J. and Dickerson, R. R.: CAMx ozone source attribution in the eastern United States using guidance from observations during DISCOVER-AQ Maryland, *Geophys. Res. Lett.*, 43(5), 2249–2258, doi:10.1002/2015GL067332, **2016**.
26. **Goldberg, D. L.**, Vinciguerra, T. P., Hosley, K. M., Loughner, C. P., Canty, T. P., Salawitch, R. J. and Dickerson, R. R.: Evidence for an increase in the ozone photochemical lifetime in the eastern United States using a regional air quality model, *J. Geophys. Res. Atmos.*, 120(24), 12778–12793, doi:10.1002/2015JD023930, **2015**.
27. Canty, T. P., Hemberck, L., Vinciguerra, T. P., Anderson, D. C., **Goldberg, D. L.**, Carpenter, S. F., Allen, D. J., Loughner, C. P., Salawitch, R. J. and Dickerson, R. R.: Ozone and NO_x chemistry in the eastern US: Evaluation of CMAQ/CB05 with satellite (OMI) data, *Atmos. Chem. Phys.*, 15(19), 10965–10982, doi:10.5194/acp-15-10965-2015, **2015**.
28. Stauffer, R. M., Thompson, A. M., Martins, D. K., Clark, R. D., **Goldberg, D. L.**, Loughner, C. P., Delgado, R., Dickerson, R. R., Stehr, J. W. and Tzortziou, M. A.: Bay breeze influence on surface ozone at Edgewood, MD during July 2011, *J. Atmos. Chem.*, 72(3–4), 335–353, doi:10.1007/s10874-012-9241-6, **2015**.
29. **Goldberg, D. L.**, Loughner, C. P., Tzortziou, M., Stehr, J. W., Pickering, K. E., Marufu, L. T. and Dickerson, R. R.: Higher surface ozone concentrations over the Chesapeake Bay than over the adjacent land: Observations and models from the DISCOVER-AQ and CBODAQ campaigns, *Atmos. Environ.*, 84, 9–19, doi:10.1016/j.atmosenv.2013.11.008, **2014**.
30. Loughner, C. P., Tzortziou, M., Follette-Cook, M., Pickering, K. E., **Goldberg, D. L.**, Satam, C., Weinheimer, A., Crawford, J. H., Knapp, D. J., Montzka, D. D., Diskin, G. S. and Dickerson, R. R.: Impact of bay-breeze circulations on surface air quality and boundary layer export, *J. Appl. Meteorol. Climatol.*, 53(7), 1697–1713, doi:10.1175/JAMC-D-13-0323.1, **2014**.

Manuscripts Under Review

1. Kerr, G. H., **Goldberg, D. L.**, Anenberg, S. C., ... : Diesel passenger vehicle market shares influenced COVID-19 changes in nitrogen dioxide pollution in global cities

Manuscripts In Preparation

1. **Goldberg, D. L.**, M. Harkey, J. Johnson, G. Yarwood, S. C. Anenberg, T. A. Holloway: Evaluating the NO_x emissions and ozone production sensitivities in Texas using TROPOMI NO₂ and HCHO
2. Bechle, M., ..., **Goldberg, D.L.**, Zhang, Y., Bell, M., Marshall, J. D.: Intercomparison of national PM_{2.5} exposure models.

Competitive Grants Selected for Funding

1. "Value of GeoXO atmospheric composition data for estimating air pollution-related health impacts", NOAA, August 2021 – July 2022, \$200,000, *Co-Investigator* (PI: Susan Anenberg, George Washington University)
2. "Using satellite NO₂ observations for public health surveillance and environmental policy planning at global, national, and urban scales", NASA HAQAST, December 2020 – November 2024, \$500,000, *Co-Investigator* (PI: Susan Anenberg, George Washington University)
3. "Inconsistent effects of social distancing on air quality in global cities: lessons for protecting near-term public health and designing longer-term urban transportation policies", NASA Rapid Response, June 2020 – May 2021, \$100,000, *Co-Principal Investigator* (Co-PI: Susan Anenberg, George Washington University)
4. "Updating the Wisconsin Horizontal Interpolation Program for Satellites (WHIPS)", Texas Commission on Environmental Quality Research Program, June 2020 – November 2021, *Co-Investigator* (PI: Tracey Holloway, University of Wisconsin)
5. "Integrating satellites, ground monitoring, and modeling to estimate long-term NO₂ exposures and associated pediatric asthma impacts", Health Effects Institute, November 2019 – November 2021, \$120,000, *Co-Investigator* (PI: Susan Anenberg, George Washington University)
6. "The Changing Atmosphere in North America for 2000 – 2020: High-resolution modeling and satellite analysis", NASA ACMAP, May 2019 – April 2022, \$300,000, *Co-Investigator* (PI: Greg Carmichael, University of Iowa)
7. "Taking OMI NO₂ to the next level: Inferring global fossil fuel CO₂ emissions using OMI NO₂ Data Improved with Critical Algorithm Updates", NASA ACMAP, June 2017 – May 2020, \$225,000, *Co-Investigator* (PI: Nickolay Krotkov, NASA Goddard)

Pending Grants

1. "Structural Racism: Assessing and Addressing Community Exposures to Environmental Contaminants", Submitted August 2021, Pending, *Co-Investigator* (co-PIs: Susan Anenberg, George Washington University and Sacoby Wilson, University of Maryland)
2. "From space to the street: Using satellite remote sensing to address environmental injustice from transportation-related air pollution", Submitted June 2021, Pending, *Co-Investigator* (PI: Susan Anenberg, George Washington University)

Competitive Grants Not Selected for Funding

1. "A comparative study of atmospheric impacts due to changes in anthropogenic activity during the COVID-19 pandemic in the greater Chicago and New York City regions", Submitted November 2020, Pending, *Co-Principal Investigator* (co-PIs Greg Carmichael and Charles Stanier, University of Iowa)
2. "Developing a near-real-time satellite-based framework to estimate urban NOX emissions in preparation for the TEMPO satellite mission: Using TROPOMI and model simulations as test-beds", Submitted September 2020, Not Selected, *Principal Investigator*

3. “Using Satellites to Monitor Energy Usage and Inform Responses to Disasters”, Submitted June 2020, Not Selected, *Co-Investigator* (PI: Jason West, University of North Carolina)
4. “Application of Remote Sensing Tools to Verify, Validate, and Improve Emissions of NO₂ and SO₂ for Texas Air Quality Modeling”, Submitted January 2020, Not Selected, *Co-Investigator* (PI: Nathan Pavlovic, Sonoma Technology)
5. “Preparing for TEMPO: Considering future applications of the HCHO/NO₂ ratio using lessons learned from OMI and TROPOMI”, NASA Aura Science Team, Submitted Sept 2019, Not Selected, *Principal Investigator*
6. “Assessing tropospheric ozone pollution and precursors in African cities using OMI”, NASA Aura Science Team, Submitted Sept 2019, Not Selected, *Co-Investigator* (PI: Susanne Bauer, NASA GSFC)
7. "Quantification of Air Pollution from Natural Gas Development and Relationship to Health Outcomes: A Quasi-Experimental Investigation", Submitted Sept 2018 & Sept 2019, *Co-Investigator* (PI: Charlotte Ward, Dartmouth College)
8. “Coupled Energy-Air Quality-Health System: A Data-Driven Decision Tool for Cost-Benefit Assessment”, NASA Applied Sciences, Submitted Nov 2017, Not Selected, *Co-Investigator* (PI: Yang Zhang, North Carolina State University)

Media Interactions

1. NASA Earth Observatory, October 28, 2021, Scientific Questions Arrive in Ports, <https://earthobservatory.nasa.gov/images/149004/scientific-questions-arrive-in-ports>
2. NBC Connecticut, July 26, 2021, A Look at How Western Wildfire Smoke Makes Its Way to Connecticut, <http://nbcct.co/Czz0Ari>
3. New York Times, April 15, 2021, Subject Matter Expert for Freelance Journalist Lisa Collins, <https://www.linkedin.com/in/lisa-m-collins-3162815/>
4. Washington Post, June 16, 2020, Commentary in, “Washington has yet to see unhealthful pollution levels this year. That’s a record”, <https://www.washingtonpost.com/weather/2020/06/16/washington-dc-record-low-pollution/>
5. WAMU 88.5, NPR Radio, May 19, 2020, Subject Matter Expert for The Kojo Nnamdi Show, <https://thekojonnamdishow.org/audio/#/shows/2020-05-19/reducing-air-pollution-during-the-pandemic/116753/@00:00>
6. Washington Post, April 22, 2020, Commentary in, “Washington has its cleanest spring air in 25 years: How air quality has improved during the coronavirus crisis”, <https://www.washingtonpost.com/weather/2020/04/22/washington-dc-air-quality-coronavirus/>
7. Nature, April 10, 2020, Commentary in, “Why pollution is plummeting in some cities – but not others”, <https://www.nature.com/articles/d41586-020-01049-6> doi: 10.1038/d41586-020-01049-6
8. New York Times, April 3, 2020, Subject Matter Expert for Visual Investigations Journalist Christoph Koettl, <https://www.nytimes.com/by/christoph-koettl>

9. WTOP Radio, April 1, 2020, Commentary in, “Despite telework, stay-at-home orders, not much change to air quality in DC area”,
<https://wtop.com/local/2020/04/despite-telework-stay-at-home-orders-not-much-change-to-air-quality-in-dc-area/>
10. Science Magazine, February 12, 2020, Commentary in, “Deadly air pollution is blowing into your state from a surprisingly large source”,
<https://www.sciencemag.org/news/2020/02/deadly-air-pollution-blowing-your-state-surprisingly-large-source>
11. Washington Post, February 3, 2020, Commentary in, “Why a toxic brown haze loomed over the Capitol on Monday”,
<https://www.washingtonpost.com/weather/2020/02/03/how-toxic-brown-haze-loomed-over-capitol-monday/>
12. Washington Post, July 5, 2019, Commentary in, “Lost in a wall of smoke: Why so many people couldn’t see Washington’s Fourth of July fireworks”,
<https://www.washingtonpost.com/weather/2019/07/05/lost-wall-smoke-why-so-many-people-couldnt-see-washingtons-july-th-fireworks/>
13. Washington Post, February 4, 2019, Commentary in, “There’s an air quality alert in Washington, the sky is hazy and it’s February. What’s going on?”,
<https://www.washingtonpost.com/weather/2019/02/04/theres-an-air-quality-alert-washington-sky-is-hazy-its-february-whats-going/>
14. Washington Post, July 10, 2018, Commentary in, “Washington posted first Code Red day since 2012 on Monday due to ‘unhealthy’ pollution levels”,
<https://www.washingtonpost.com/news/capital-weather-gang/wp/2018/07/10/washington-posted-first-code-red-day-since-2012-monday-due-to-unhealthy-pollution-levels/>

First-Author Oral Presentations

1. **Goldberg, D. L.**, S. C. Anenberg, D. Griffin, C. A. McLinden, Z. Lu, D. Streets, (February 2022). Elucidating the “new normal” of NO_x emissions in urban areas. Presented at Boston University. *Invited*
2. **Goldberg, D. L.**, S. C. Anenberg, A. Fiore, T. Holloway, T. Russell, J. Kaiser, D. Tong, (January 2022). Using NO₂ satellite data for urban planning. Presented at the Health and Air Quality Applied Sciences Team (HAQAST) January 2022 Update Meeting.
3. **Goldberg, D. L.**, G. H. Kerr, (January 2022). Using NO₂ satellite data for urban environmental justice applications and lessons learned during the COVID-19 lockdowns. Presented at the New York State BAQAR/NYSERDA Seminar. *Invited*
4. **Goldberg, D. L.**, S. C. Anenberg, Z. Lu, L. N. Lamsal, E. E. McDuffie, S. Smith, D. G. Streets, (December 2021). Reconciling differences between satellite-inferred NO_x emissions and inventories in global cities. Presented at the American Geophysical Union (AGU) Fall Meeting.
5. **Goldberg, D. L.**, S. C. Anenberg, Z. Lu, L. N. Lamsal, E. E. McDuffie, S. Smith, D. G. Streets, (December 2021). Estimating NO_x emissions from cities using satellite data.

Presented at the Western States Air Resources (WESTAR) Council Annual Meeting.

Invited

6. **Goldberg, D. L.**, S. C. Anenberg, Z. Lu, L. N. Lamsal, E. E. McDuffie, S. Smith, D. G. Streets, (September 2021). Satellite-derived NO_x emissions for 80 global megacities between 2005 and 2019. Presented at the International Global Atmospheric Chemistry (IGAC) Biannual Meeting. [Virtually](#).
7. **Goldberg, D. L.**, S. C. Anenberg, D. Griffin, C. A. McLinden, Z. Lu, D. Streets, (April 2021). Estimating NO_x emissions from global cities using satellite data. Presented at the National Centers for Atmospheric Research (NCAR) Atmospheric Chemistry Observation & Modeling (ACOM) Weekly Seminar. [Virtually](#). *Invited*
8. **Goldberg, D. L.**, S. C. Anenberg, G. Kerr, (March 2021). Changes in NO₂ following the COVID-19 lockdowns: Disentangling anthropogenic changes from natural variability. Presented at the Mid-Atlantic Regional Air Management Association (MARAMA) Mobile Sources Workshop. *Virtually*. *Invited*
9. **Goldberg, D. L.**, S. C. Anenberg, Z. Lu, D. Streets, (January 2021). Top-down NO_x emissions estimates for 50 global cities during the last 15 years. Presented at the American Meteorological Society Annual Meeting. *Virtually*.
10. **Goldberg, D. L.**, S. C. Anenberg, D. Griffin, C. A. McLinden, Z. Lu, D. Streets, (December 2020). Using TROPOMI and re-analysis meteorology to disentangle the impact of the COVID-19 lockdowns on urban NO₂ natural variability. Presented at the American Geophysical Union (AGU) Fall Meeting. [Virtually](#). *Invited*
11. **Goldberg, D. L.**, S. C. Anenberg, G. Kerr, (December 2020). Changes in NO₂ following the COVID-19 lockdowns: Disentangling anthropogenic changes from natural variability. Presented at the Mid-Atlantic Regional Air Management Association (MARAMA) Science Team Meeting. *Virtually*. *Invited*
12. **Goldberg, D. L.**, S. C. Anenberg, G. Kerr, (November 2020). Health impacts of NO₂ and its changes during the COVID-19 lockdowns. Co-presentation at the Ozone Transport Commission Annual Meeting. *Virtually*. *Invited*
13. **Goldberg, D. L.**, S. C. Anenberg, D. Griffin, C. A. McLinden, Z. Lu, D. Streets, (October 2020). Oversampling TROPOMI NO₂ in the US & using it to estimate effects of COVID-19 lockdowns on urban NO_x emissions. Presented at the OMI-TROPOMI Science Team Meeting. *Virtually*.
14. **Goldberg, D. L.**, S. C. Anenberg, D. Griffin, C. A. McLinden, A. Mohegh, Z. Lu, D. Streets, (October 2020). Disentangling the impact of the COVID-19 lockdowns on urban NO₂ from natural variability. Presented at the 19th Annual Community Modeling and Analysis System (CMAS) Conference. [Virtually](#).
15. **Goldberg, D. L.**, S. C. Anenberg, G. Kerr, (September 2020). Health impacts of NO₂ and its changes during the COVID-19 lockdowns. Co-presentation at the NCAR Climate and Health Seminar Series. *Virtually*. *Invited*
16. **Goldberg, D. L.**, Z. Lu, D. Streets, S. C. Anenberg, A. Mohegh, L. N. Lamsal, N. A. Krotkov, B. N. Duncan, F. Liu, D. Griffin, C. McLinden, H. Eskes (August 2020). The satellite data revolution: How new satellite instruments can provide better estimates of NO_x pollution.

Presented at the International Society of Environmental Epidemiology Annual Meeting. Virtually.

17. **Goldberg, D. L.**, Z. Lu, D. Streets, S. C. Anenberg, A. Mohegh, L. N. Lamsal, N. A. Krotkov, B. N. Duncan, F. Liu, D. Griffin, C. McLinden, H. Eskes (June 2020). Estimating air pollution emissions, exposures, and public health impacts in cities worldwide. Presented at the TOLNET and Pandora Science Team Meeting. Virtually.
18. **Goldberg, D. L.**, Z. Lu, D. Streets, S. C. Anenberg, A. Mohegh, T. Canty, R. J. Salawitch, R. R. Dickerson (February 2020) Using models and satellite data to estimate air pollution in the Baltimore-Washington area. Presented at The Baltimore-Washington Regional Air Quality Symposium. College Park, MD. *Invited*
19. **Goldberg, D. L.**, Z. Lu, D. G. Streets, A. Mohegh, V. Southerland, S. C. Anenberg (January 2020) Using satellite data to estimate air pollution at high spatiotemporal resolution. Presented at The Applications for Big Data and the Environment. Davis, CA. *Invited*
20. **Goldberg, D. L.**, Z. Lu, D. Streets, S. C. Anenberg, A. Mohegh, V. Southerland, L. N. Lamsal, N. A. Krotkov, B. N. Duncan, F. Liu, D. Griffin, C. McLinden, H. Eskes (January 2020). Estimating air pollution emissions, exposures, and public health impacts in cities worldwide. Presented at the American Meteorological Society Annual Meeting, Boston, MA.
21. **Goldberg, D. L.**, Z. Lu, D. G. Streets, B. de Foy, L. N. Lamsal, N. A. Krotkov, B. N. Duncan, F. Liu, D. Griffin, C. McLinden, P. Achakulwisut, A. Mohegh, V. Southerland, S. C. Anenberg (December 2019). Using NASA satellite data to estimate exposure to air pollution. Presented at the George Washington University Environmental and Occupational Health Seminar. Washington, DC. *Invited*
22. **Goldberg, D. L.**, Z. Lu, D. Streets, S. C. Anenberg, A. Mohegh, V. Southerland, L. N. Lamsal, N. A. Krotkov, B. N. Duncan, F. Liu, D. Griffin, C. McLinden, H. Eskes (October 2019). Estimating air pollution emissions, exposures, and public health impacts in cities worldwide. Presented at the New Applications in the Use of Satellite Data Monitoring for Population Health. Huntsville, AL.
23. **Goldberg, D. L.**, Z. Lu, T. Oda, L. N. Lamsal, N. A. Krotkov, B. N. Duncan, F. Liu, D. Griffin, C. McLinden, D. G. Streets (August 2019). Using OMI NO₂ to infer fossil-fuel emissions of CO₂ from large metropolitan areas in the United States. Presented at the Aura Science Team Meeting. Pasadena, CA.
24. **Goldberg, D. L.**, Z. Lu, D. G. Streets, B. de Foy, L. N. Lamsal, N. A. Krotkov, B. N. Duncan, F. Liu, D. Griffin, C. McLinden, P. Achakulwisut, A. Mohegh, V. Southerland, S. C. Anenberg (July 2019). Policy-relevant applications of satellite data: Estimating air pollution emissions, exposures, and public health impacts in cities worldwide. Presented at the Health and Air Quality Applied Sciences Team (HAQAST6) Meeting. Pasadena, CA.
25. **Goldberg, D. L.**, Z. Lu, B. de Foy, D. G. Streets (May 2019). Investigating NO_x emissions from megacities using re-processed OMI NO₂ and TROPOMI NO₂. Presented at the OWLETS Science Team Meeting. College Park, MD.
26. **Goldberg, D. L.**, Z. Lu, D. G. Streets, (March 2019) Using satellite data to estimate air pollution at high spatiotemporal resolution. Presented at The Workshop in Environmental Economics and Data Science (TWEEDS). Portland, OR. *Invited*

27. **Goldberg, D. L.**, L. N. Lamsal, P. Saide, G. Carmichael, B. de Foy, D. Henze, Z. Lu, D. G. Streets (December 2018). Recent Advances in Deriving NO_x Emission Estimates from Satellite Data. Presented at the American Geophysical Union (AGU) Fall Meeting. Washington, D.C.
28. **Goldberg, D. L.**, Z. Adelman, D. Kenski, M. Janssen, T. Nergui, Z. Lu (December 2018). Linking Surface Monitors, Satellite Data, and Emissions Inventories to Investigate Regional Haze Trends in the Eastern U.S. Presented at the American Geophysical Union (AGU) Fall Meeting. Washington, D.C.
29. **Goldberg, D. L.**, P. Gupta, K. Wang, C. Jena, Y. Zhang, Z. Lu, D. G. Streets (October 2018). Using MAIAC AOD and WRF-Chem to estimate daily PM_{2.5} concentrations at 1 km resolution in the eastern United States. Presented at the 17th Annual Community Modeling and Analysis System (CMAS) Conference. Chapel Hill, NC.
30. **Goldberg, D. L.**, L. N. Lamsal, P. Saide, G. Carmichael, Z. Lu, D. G. Streets (August 2018) A top-down assessment using OMI NO₂ suggests an underestimate in the NO_x emissions inventory in Seoul, Korea during KORUS-AQ. Presented at the KORUS-AQ Science Team Meeting. Irvine, CA.
31. **Goldberg, D. L.**, L. N. Lamsal, C. P. Loughner, W. H. Swartz, P. Saide, G. Carmichael, D. Henze, Z. Lu, D. G. Streets (July 2018). Recent advances in estimating NO_x emissions from OMI. Presented at the Health and Air Quality Applied Sciences Team (HAQAST4) Meeting. Madison, WI.
32. **Goldberg, D. L.**, L. N. Lamsal, C. P. Loughner, W. H. Swartz, P. Saide, G. Carmichael, D. Henze, Z. Lu, D. G. Streets (December 2017). Estimating NO_x emissions and surface concentrations at high spatial resolution. Presented at the American Geophysical Union (AGU) Fall Meeting. New Orleans, LA.
33. **Goldberg, D. L.**, L. N. Lamsal, C. P. Loughner, W. H. Swartz, P. Saide, G. Carmichael, D. Henze, Z. Lu, D. G. Streets (November 2017). Estimating NO_x emissions and surface concentrations at high spatial resolution. Presented at the Health and Air Quality Applied Sciences Team (HAQAST3) Meeting. Palisades, NY.
34. **Goldberg, D. L.**, L. N. Lamsal, C.P. Loughner, Z. Lu, D. G. Streets, T. P. Canty, T.P. Vinciguerra, D. C. Anderson, R. J. Salawitch & R. R. Dickerson (October 2017) Ground measurements, satellite observations, and model simulations of air quality in the Chesapeake Bay region. Presented at the OWLETS Science Team Meeting. Baltimore, MD. *Invited*
35. **Goldberg, D. L.**, L. N. Lamsal, C.P. Loughner, P. Saide, G. Carmichael, Z. Lu, D. G. Streets, (September 2017) A new satellite technique to derive high-resolution tropospheric NO₂ columns in the eastern United State. Presented at the OMI Science Team Meeting. Greenbelt, MD. *Invited*
36. **Goldberg, D. L.**, L. N. Lamsal, C.P. Loughner, Z. Lu, D. G. Streets, T. P. Canty, T.P. Vinciguerra, D. C. Anderson, R. J. Salawitch & R. R. Dickerson (August 2017) Innovative techniques to observe and model air pollution in the eastern United States. Presented at Northwestern University. Evanston, IL. *Invited*
37. **Goldberg, D. L.**, L. N. Lamsal, C.P. Loughner, Z. Lu, D. G. Streets, T. P. Canty, T.P. Vinciguerra, D. C. Anderson, R. J. Salawitch & R. R. Dickerson (June 2017) Innovative

techniques to observe and model air pollution in the eastern United States. Presented at the University of Wisconsin-Madison. Madison, WI. *Invited*

38. **Goldberg, D. L.**, L. N. Lamsal, P. Saide, G. Carmichael, Z. Lu, D. G. Streets (February 2017) Validation of a satellite technique to derive high-resolution tropospheric NO₂ columns in Korea. Presented at the KORUS-AQ Science Team Meeting. Seogwipo, Jeju, South Korea.
39. **Goldberg, D. L.**, C. P. Loughner, L. N. Lamsal, Z. Lu, D. G. Streets (October 2016). High-resolution OMI satellite retrievals of tropospheric NO₂ in the eastern United States. Presented at the 15th Annual Community Modeling and Analysis System (CMAS) Conference. Chapel Hill, NC.
40. **Goldberg, D. L.**, T. P. Canty, T.P. Vinciguerra, C.P. Loughner, D. C. Anderson, R. J. Salawitch & R. R. Dickerson (February 2016) Lifetime and distribution of ozone air pollution in the eastern United States. Presented at Carnegie Mellon University. Pittsburgh, PA. *Invited*
41. **Goldberg, D. L.**, T. P. Canty, L. Hemberck, T. P. Vinciguerra, R. J. Salawitch & R. R. Dickerson. (October 2015). Evidence for an increasing geographic region of influence on ozone air pollution in the eastern United States. Presented at the 14th Annual Community Modeling and Analysis System (CMAS) Conference. Chapel Hill, NC.
42. **Goldberg, D. L.**, T. P. Canty, T. P. Vinciguerra, H. He, R. J. Salawitch & R. R. Dickerson. (July 2015). Recent ozone modeling results in the Mid-Atlantic. Presented at the Mid-Atlantic Regional Air Management Association (MARAMA) Science Team Meeting. Richmond, VA.
43. **Goldberg, D. L.**, T. P. Canty, L. Hemberck, C. P. Loughner, D. C. Anderson, R. J. Salawitch & R. R. Dickerson. (June 2015). Evidence for an increasing geographic region of influence on ozone air pollution in the Eastern United States. Presented at the NASA Air Quality Applied Sciences Team (AQAAT) Summer 2015 Meeting. St Louis, MO.
44. **Goldberg, D. L.**, T. P. Canty, T. P. Vinciguerra, H. He, R. J. Salawitch & R. R. Dickerson. (April 2015). Scientific insight from CAMx OSAT modeling. Presented at the Ozone Transport Commission (OTC) Spring Meeting. Washington, DC.
45. **Goldberg, D. L.**, C. P. Loughner, M. A. Tzortziou, J. W. Stehr, K. E. Pickering & R. R. Dickerson. (January 2015). The Impact of the Chesapeake Bay Climate and Boundary Layer Dynamics on Air Pollutant Concentrations during Smog Episodes. Presented at the American Meteorological Society (AMS) 2015 Annual Meeting. Phoenix, AZ.
46. **Goldberg, D. L.**, T. P. Canty, C. P. Loughner, L. Hemberck, D. C. Anderson, T. P. Vinciguerra, R. J. Salawitch, R. R. Dickerson. (October 2014) Recent Improvements in Regional Air Quality Models and their Impacts on Ozone Source Attribution. Presented at the 13th Annual Community Modeling and Analysis System (CMAS) Conference. Chapel Hill, NC.
47. **Goldberg, D. L.**, C. P. Loughner, M. A. Tzortziou, J. W. Stehr, K. E. Pickering, & R. R. Dickerson. (October 2014). Increased Air Pollution over the Chesapeake Bay and its Effect on Deposition to the Bay. Presented at the NADP 2014 Fall Meeting. Indy, IN.
48. **Goldberg, D. L.**, C. P. Loughner, M. A. Tzortziou, L. T. Marufu, J. W. Stehr, K. E. Pickering & R. R. Dickerson. (February 2014). Higher surface ozone concentrations over the

Chesapeake Bay than over adjacent land: Observations and models from DISCOVER-AQ. Presented at the Winter 2014 DISCOVER-AQ Science Team Meeting. Newport News, VA.

Conference Poster Presentations

1. **Goldberg, D. L.**, Z. Lu, D. G. Streets, B. de Foy, D. Griffin, C. McLinden, B. N. Duncan, N. A. Krotkov, Lok N. Lamsal, F. Liu, M. O. Nawaz, D. Henze, M.A. Mohegh, S. C. Anenberg (December 2019). High-resolution NO₂ exposure estimates and top-down NO_x emissions using OMI NO₂ and TROPOMI NO₂. Presented at the American Geophysical Fall Meeting. San Francisco, CA.
2. **Goldberg, D. L.**, P. Gupta, K. Wang, Y. Zhang, Z. Lu, D. G. Streets (June 2019). Using MAIAC AOD to estimate daily PM_{2.5} and its long-term trends (2008 – 2018) at 1 km resolution in the Eastern United States. Presented at the EPA Air Climate & Energy (ACE) Centers Annual Meeting. Pittsburgh, PA.
3. **Goldberg, D. L.**, P. Gupta, K. Wang, Y. Zhang, Z. Lu, D. G. Streets (May 2019). Using MAIAC AOD to estimate daily PM_{2.5} and its long-term trends (2008 – 2018) at 1 km resolution in the Eastern United States. Presented at the OWLETS Science Team Meeting. College Park, MD.
4. **Goldberg, D. L.**, L. N. Lamsal, C. P. Loughner, W. H. Swartz, P. Saide, G. Carmichael, D. Henze, Z. Lu, D. G. Streets (July 2018). Using MODIS AOD and WRF-Chem to infer daily PM_{2.5} concentrations at 1 km resolution in the eastern United States. Presented at the Health and Air Quality Applied Sciences Team Bi-annual Meeting. Madison, WI.
5. **Goldberg, D. L.**, Z. Lu, L. N. Lamsal, C. P. Loughner, R. C. Levy, P. Gupta, Y. Zhang, D. G. Streets. (December 2016). High resolution satellite retrievals of NO₂ and Aerosol Optical Depth for health impact studies. Presented at the American Geophysical Union (AGU) Fall 2016 Meeting. San Francisco, CA.
6. **Goldberg, D. L.**, T. P. Vinciguerra, L. Hembeck, D. C. Anderson, T. P. Canty, R. J. Salawitch & R. R. Dickerson. (January 2016). CAMx Ozone Source Attribution in the Eastern United States using Guidance from Observations during DISCOVER-AQ Maryland. Presented at the NASA Air Quality Applied Sciences Team (AQAST) Winter 2016 Meeting. RTP, NC.
7. **Goldberg, D. L.**, T. P. Vinciguerra, L. Hembeck, D. C. Anderson, S. Carpenter, T. P. Canty, R. J. Salawitch & R. R. Dickerson. (December 2014). Using Source Apportionment to Evaluate the Cross State Transport of Ozone in the Eastern United States. Presented at the American Geophysical Union (AGU) Fall 2014 Meeting. San Francisco, CA.
8. **Goldberg, D. L.**, T. P. Vinciguerra, L. Hembeck, D. C. Anderson, S. Carpenter, T. P. Canty, R. J. Salawitch & R. R. Dickerson. (June 2014). Using CAMx and CMAQ to Investigate Cross-state Transport of Ozone in the Eastern United States. Presented at the NASA Air Quality Applied Sciences Team (AQAST) Summer 2014 Meeting. Boston, MA.
9. **Goldberg, D. L.**, T. P. Vinciguerra, L. Hembeck, D. C. Anderson, T. P. Canty, R. J. Salawitch & R. R. Dickerson. (December 2013). CAMx and CMAQ Model Intercomparison for July 2007 in the Baltimore-Washington Metropolitan Region. Presented at the American Geophysical Union (AGU) Fall 2013 Meeting. San Francisco, CA.