

Daniel L. Goldberg, Ph.D.

Postdoctoral Scholar

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Education

Ph.D., University of Maryland – College Park, Atmospheric & Oceanic Science 2015

Advisors: Dr. Russell Dickerson, Dr. Timothy Canty & Dr. Ross Salawitch

Thesis title: Lifetime and distribution of ozone and related pollutants in the eastern USA

M.S., University of Maryland – College Park, Atmospheric & Oceanic Science 2013

Advisor: Dr. Russell Dickerson

Thesis title: Surface ozone and reactive nitrogen concentrations over the Chesapeake Bay

B.S., Lafayette College, Chemical Engineering, Minor: Environmental Science 2009

Work Experience

Postdoctoral scholar, Argonne National Laboratory 3/2016 – Present

Advisor: Dr. David Streets

- Using satellite data to evaluate NO_x and CO₂ emissions inventories in the US & Asia
- Estimating PM_{2.5} concentrations by combining satellite, model and observational data
- Developing techniques to re-process OMI NO₂ satellite data to higher spatial resolution

Graduate research assistant, University of Maryland – College Park 8/2010 – 3/2016

Advisors: Dr. Russell Dickerson, Dr. Timothy Canty & Dr. Ross Salawitch

- Modeling ozone and related chemical precursors using a chemical transport model
- Determining the lifetime and distribution of ozone
- Measuring air pollutant concentrations over water bodies

Environmental Engineer II, TRC Solutions 6/2009 – 7/2010

- Hazardous waste site remediation

Engineering Intern, ENVIRON International Corp (Now Ramboll) 6/2008 – 8/2008

- Accounting of GHG emissions from clients' activities and researching GHG legislation

Research Scholar, Lafayette College 5/2007 – 9/2007

- Developed adsorbent for efficient removal of perchlorate from contaminated groundwater
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Skills & Proficiencies

Mastery of: CAMx air quality model, TROPOMI NO₂, OMI NO₂, OMI SO₂, MODIS AOD (Dark Target & Deep Blue), MAIAC AOD, IDL, Visual Basic, HTML, HDF file formats, netCDF file formats, & Linux

Understanding of: CMAQ air quality model, WRF, WRF-Chem, Geos-Chem, CAM-Chem, OMI HCHO, VIIRS AOD, Matlab, Python, Fortran, & C-shell

Service & Leadership

Executive board member, Argonne Postdoctoral Society	2016-2017
Mentor, ACT-SO High School Science Competition	2016-2017
Conference Organizer, Postdoctoral Symposium Committee	2016
Student Seminar Coordinator, University of Maryland, Atmospheric & Oceanic Science	2013
Graduate Student President, University of Maryland, Atmospheric & Oceanic Science	2012
Graduate Student Vice President, University of Maryland, Atmospheric & Oceanic Science	2011
Student President, Lafayette College Environmental Club	2007-2008

Awards & Honors

Outstanding Graduate Assistant Award, for top 2% of all graduate students	2015
Graduate Research Interaction Day Travel Grant, for top presentation	2014
Service Award, for dedicated service to UMD Atmos. Sci. Dept.	2012
Graduate Research Interaction Day Travel Grant, for top presentation	2012
American Chemical Society (ACS) Award, for top chemical engineer	2009
Tau Beta Pi Engineering Honor Society, for top 20% of engineering class	2008

Related Professional Experience

National Atmospheric Deposition Program Primary Site Operator	2012-2014
Clean Air Status & Trends Network Primary Site Operator	2012-2014

Teaching Experience

University of Maryland, AOSC200: Introduction to Weather and Climate	2012-2013
Taught two lectures per week for 2 semesters. Graded all exams, quizzes, and projects.	

Professional Organizations

Member of the American Meteorological Society (AMS)
Member of the American Geophysical Union (AGU)
Member of the Community Modeling and Analysis System community (CMAS)
Contributor to the Ozone Transport Commission (OTC)
Contributor to the Lake Michigan Air Directors Consortium (LADCO)
Contributor to the NASA Aura Science Team
Contributor to the Health and Air Quality Applied Sciences Team (HAQAST)

Peer-Reviewed Publications

Goldberg, D. L., P. E. Saide, L. N. Lamsal, B. de Foy, Z. Lu, J.-H. Woo, Y. Kim, J. Kim, M. Gao, G. Carmichael, D. G. Streets (2019), 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, 1801-1818, <https://doi.org/10.5194/acp-19-1801-2019>.

Goldberg, D. L., P. Gupta, K. Wang, C. Jena, Y. Zhang, Z. Lu, D. G. Streets (2019), Using 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, <https://doi.org/10.1016/j.atmosenv.2018.11.049>.

- Ring, A. M., T. P. Canty, D. C. Anderson, T. P. Vinciguerra, H. He, **D. L. Goldberg**, S. E. Ehrman, R. R. Dickerson, and R. J. Salawitch (2018), Evaluating Commercial Marine Vessel Emissions Inventory Improvements Using Observations and the CMAQ Model: Impacts on Air Quality Attainment Strategies, *Atmos. Environ.*, 173, 96-107, <https://dx.doi.org/10.1016/j.atmosenv.2017.10.037>
- Goldberg, D. L.**, L. N. Lamsal, C.P. Loughner, W. H. Swartz, Z. Lu, D. G. Streets (2017), A high-resolution and observationally constrained OMI NO₂ satellite retrieval, *Atmos. Chem. Phys.*, 17, 11403-11421, <https://doi.org/10.5194/acp-17-11403-2017>.
- Ren, X., W. T. Luke, P. Kelley, M. D. Cohen, R. Artz, M. L. Olson, D. Schmeltz, **D. L. Goldberg**, A. Ring, G. M. Mazzuca, K. A. Cummings, L. Wojdan, S. Preaux, J. W. Stehr (2016), 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.*, 142, <https://dx.doi.org/10.1016/j.atmosenv.2016.08.028>
- Goldberg, D. L.**, T. P. Vinciguerra, D. C. Anderson, L. Hembeck, T. P. Canty, S. H. Ehrman, D. K. Martins, R. M. Stauffer, A. M. Thompson, R. J. Salawitch, and R. R. Dickerson (2016), CAMx ozone source attribution in the eastern United States using guidance from observations during DISCOVER-AQ Maryland, *Geophys. Res. Lett.*, 43, <https://dx.doi.org/10.1002/2015GL067332>.
- Goldberg, D. L.**, T. P. Vinciguerra, K. M. Hosley, C. P. Loughner, T. P. Canty, R. J. Salawitch, and R. R. Dickerson (2015), 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, 12,778–12,793, <https://dx.doi.org/10.1002/2015JD023930>.
- Stauffer, R. M., A. M. Thompson, D. K. Martins, R. D. Clark, **D. L. Goldberg**, C. P. Loughner, R. Delgado, R. R. Dickerson, J. W. Stehr, M. A. Tzortziou (2015), Bay breeze influence on ozone at Edgewood, MD during July 2011, *J. of Atmos. Chem.*, <https://dx.doi.org/10.1007/s10874-012-9241-6>.
- Canty, T. P., L. Hembeck, T. P. Vinciguerra, D. C. Anderson, **D. L. Goldberg**, S.F., Carpenter, D. J. Allen, C. P. Loughner, R. J. Salawitch, and R. R. Dickerson (2015), Ozone and NO_x chemistry in the eastern US: Evaluation of CMAQ/CB05 with satellite (OMI) data, *Atmos. Chem. Phys.* 15, 10965 – 10982. <https://dx.doi.org/10.5194/acp-15-10965-2015>
- Goldberg, D. L.**, C. P. Loughner, M. Tzortziou, J. W. Stehr, K. E. Pickering, L. T. Marufu, J. H. Crawford, A. Mannino, and R. R. Dickerson (2014), 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, <https://dx.doi.org/10.1016/j.atmosenv.2013.11.008>.
- Loughner, C. P., M. Tzortziou, M. Follette-Cook, K. E. Pickering, **D. L. Goldberg**, C. Satam, A. Weinheimer, J. H. Crawford, D. K. Knapp, D. D. Montzka, G. B. Diskin, L. T. Marufu, and R. R. Dickerson (2014), Impact of bay breeze circulations on surface air quality and boundary layer export, *J. Appl. Met. Clim.*, 53, 1697 – 1713, <https://dx.doi.org/10.1175/JAMC-D-13-0323.1>.

Invited Oral Presentations

- 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.
- 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
- 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.
- 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.
- 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.
- Goldberg, D. L.**, L. N. Lamsal, C.P. Loughner, Z. Lu, D. G. Streets, (December 2016) A new satellite technique to derive high-resolution tropospheric NO₂ columns in the eastern United State. Presented at the *OMI Bi-Weekly Science Team Meeting*.
- 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.
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Conference Oral Presentations

- 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. To be presented at the *Aura Science Team Meeting*. Pasadena, CA.
- 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. To be presented at the *EPA Air Climate & Energy (ACE) Centers Annual Meeting*. Pittsburgh, PA.
- 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. To be presented at the *OWLETS Science Team Meeting*. College Park, MD.
- 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 *AGU Fall Meeting*. Washington, D.C.
- 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 *AGU Fall Meeting*. Washington, D.C.
- 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.
- 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.

- 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 Bi-annual Meeting*. Madison, WI.
- Goldberg, D. L.,** P. Gupta, K. Wang, C. Jena, Y. Zhang, Z. Lu, D. G. Streets (**June 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 *EPA Air Climate & Energy (ACE) Centers Annual Meeting*. Presented electronically.
- 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 *AGU Fall Meeting*. New Orleans, LA.
- 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 Bi-annual Meeting*. Palisades, NY.
- 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.
- 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.
- Goldberg, D. L.,** T. P. Canty, L. Hembeck, 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.
- 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.
- Goldberg, D. L.,** T. P. Canty, L. Hembeck, 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 (AQAST) Summer 2015 Meeting*. St Louis, MO.
- 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.
- 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.
- Goldberg, D. L.,** T. P. Canty, C. P. Loughner, L. Hembeck, 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.
- 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 *National Atmospheric Deposition Program (NADP) Fall 2014 Meeting*. Indianapolis, IN

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

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. To be presented at the *OWLETS Science Team Meeting*. College Park, MD.

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.

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.

Goldberg, D. L., C. P. Loughner, L. N. Lamsal, Z. Lu, D. G. Streets. (**December 2016**). Developing a high resolution satellite technique to remotely observe air pollution. Presented at the *Argonne National Laboratory 2016 Annual Postdoc Symposium*. Lemont, IL.

Goldberg, D. L., T. P. Vinciguerra, L. Hemberck, 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 (AQA) Winter 2016 Meeting*. RTP, NC.

Goldberg, D. L., T. P. Vinciguerra, L. Hemberck, 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.

Goldberg, D. L., T. P. Vinciguerra, L. Hemberck, 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 (AQA) Summer 2014 Meeting*. Boston, MA.

Goldberg, D. L., T. P. Vinciguerra, L. Hemberck, 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.

Goldberg, D. L., C. P. Loughner, M. A. Tzortziou, L. T. Marufu & R. R. Dickerson. (**June 2012**). Impact of the Chesapeake Bay climate and boundary layer dynamics on air pollutant concentrations during smog episodes. Presented at the *American Chemical Society (ACS) Spring 2012 Mid-Atlantic Regional Meeting (MARM)*. Catonsville, MD.