

Daniel M. Westervelt, PhD

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Research and Teaching Interests

Air quality, climate change, atmospheric chemistry, global atmospheric modeling, particulate matter, aerosol-cloud-climate interactions, aerosol health effects, sustainability, environmental engineering and science, environmental policy

Education

- Ph.D. Civil and Environmental Engineering. Carnegie Mellon University. Pittsburgh, PA. May 2013
Thesis: “Characterizing the sources of cloud condensation nuclei using a global aerosol modeling approach”
Advisor: Peter Adams
- M.S. Civil and Environmental Engineering. Carnegie Mellon University, Pittsburgh, PA. May 2009
- B.S. Civil Engineering. Purdue University. West Lafayette, IN. May 2008.

Funded research grants

(Pending) NASA New Investigator Program. 17-NIP17-0109. \$255,275. 4/1/18 – 3/31/20.
“Development of a brown carbon aerosol parameterization in a global chemistry-climate model: implications for climate, air quality, and atmospheric photochemistry”. Lead PI.

Columbia University Global Policy Center. \$200,000. 6/1/16 – 5/31/18. “Assessing future Chinese air pollution impacts on mortality in China and the U.S.” Co-PI with lead PIs Dr. Patrick Kinney (Columbia University Mailman School of Public Health) and Dr. Arlene Fiore (Lamont-Doherty Earth Observatory)

National Science Foundation. Atmospheric and Geospace Science (AGS). \$602,918. 11/1/16 – 10/31/19
“Understanding Forced and Natural Asian Monsoon Variability and Change in Observations and CMIP5 Models.” Co-PI with lead Dr. Mingfang Ting (Lamont-Doherty Earth Observatory)

NASA Atmospheric Chemistry, Modeling, Analysis and Prediction (ACMAP). \$748,955. 1/1/17 – 12/31/19. “Variability and trends in tropospheric oxidation: Interactions with regional air quality, global atmospheric composition, and climate”. Co-PI with lead PI Dr. Arlene Fiore (Lamont-Doherty Earth Observatory)

Columbia University Earth Institute. \$15,000. 9/1/2015 – 12/19/2016. “Can satellite observations help us better understand the air quality problem in India?” Lead PI, collaborative work with Dr. Ruth DeFries and Dr. Arlene Fiore. Funding used to support 3 semesters of undergraduate research assistant under Dr. Westervelt’s supervision.

Research Experience

Associate Research Scientist

8/2015 - present

Columbia University, Lamont-Doherty Earth Observatory
Fiore Atmospheric Chemistry Group

Projects:

- Global chemistry-climate modeling with GFDL-CM3, GISS-E2, NCAR-CESM1
- Local and remote climate response to regional aerosol emissions perturbations
- Particulate matter levels in a changing climate
- Future projections of air quality and related health effects over China
- Estimating the impacts of aerosol forcing on the south Asian monsoon
- Trends and variability in air quality in India from a modeling and observations perspective

Science Collaborator

9/2016 - present

NASA Goddard Institute for Space Studies (NASA GISS)
Mentors: Gavin Schmidt and Kostas Tsigaridis

Project:

- Development, evaluation, and scientific investigation with the Two-Moment Aerosol Sectional microphysics algorithm in GISS ModelE2 (GISS-TOMAS)

Air Quality Science Advisor

11/2017 -present

United States Department of State Air Quality Monitoring program
In Cooperation with the US EPA.

https://airnow.gov/index.cfm?action=airnow.global_summary

Project:

- Developing an air quality monitoring station in the megacity of Kinshasa, Democratic Republic of the Congo

Postdoctoral Research Associate in Science, Technology, and Environmental Policy

8/2013 – 8/2015

Princeton University and Geophysical Fluid Dynamics Lab (GFDL)

Advisor: Denise Mauzerall

Projects:

- Global chemistry-climate modeling with GFDL CM3
- Effect of decreasing future aerosol concentrations on radiative forcing and climate
- Effect of climate change on future PM_{2.5} levels
- The role of nitrate aerosol in future climate change

Graduate Research Assistant in the Center for Atmospheric Particle Studies Carnegie Mellon University

8/2009 – 5/2013

Advisor: Peter Adams

Projects:

- Developer of two global aerosol models: GISS-TOMAS and GEOS-Chem-TOMAS
- Development of particle survival analysis code to determine fraction of nucleated particles that reach climate-relevant sizes
- Development of particle number tagging and source apportionment algorithm for use in global models
- Effect of primary marine organic emissions on climate
- Effect of new particle formation (nucleation) on clouds and climate

Peer-reviewed Publications

Liu T., Marlier M.E., DeFries R.S., **Westervelt D.M.**, Xia K.R., Fiore A.M., Mickley L.J., Cusworth D.H., and Milly G. Seasonal impact of regional outdoor biomass burning on air pollution in three Indian cities: Delhi, Bengaluru, and Pune. 172, 83-92, <https://doi.org/10.1016/j.atmosenv.2017.10.024>, 2018

Westervelt, D. M., A. J., Conley, A. M., Fiore, J.-F., Lamarque, D., Shindell, M., Previdi, G., Faluvegi, G., Correa, and L. W., Horowitz (2017), Multimodel precipitation responses to removal of U.S. sulfur dioxide emissions, *J. Geophys. Res. Atmos.*, 122, doi:10.1002/2017JD026756.

Westervelt, D.M., L.W. Horowitz, V. Naik, A.P.K. Tai, A.M. Fiore, D.L. Mauzerall, Quantifying PM_{2.5}-meteorology sensitivities in a global climate model, *Atmospheric Environment*, ISSN 1352-2310, <http://dx.doi.org/10.1016/j.atmosenv.2016.07.040>, 2016

Westervelt, D. M., Horowitz, L. W., Naik, V., Golaz, J.-C., and Mauzerall, D. L.: Radiative forcing and climate response to projected 21st century aerosol decreases, *Atmos. Chem. Phys.*, 15, 12681-12703, doi:10.5194/acp-15-12681-2015, 2015

Pierce, J. R., **Westervelt, D. M.**, Atwood, S. A., Barnes, E. A., and Leaitch, W. R.: New-particle formation, growth and climate-relevant particle production in Egbert, Canada: analysis from 1 year of size-distribution observations, *Atmos. Chem. Phys.*, 14, 8647-8663, doi:10.5194/acp-14-8647-2014, 2014

Westervelt, D. M., Pierce, J. R., and Adams, P. J.: Analysis of feedbacks between nucleation rate, survival probability and cloud condensation nuclei formation, *Atmos. Chem. Phys.*, 14, 5577-5597, doi:10.5194/acp-14-5577-2014, 2014.

D'Andrea, S. D., Hakkinen, S. A. K., **Westervelt, D. M.**, Kuang, C., Levin, E. J. T., Kanawade, V. P., Leaitch, W. R., Spracklen, D. V., Riipinen, I., and Pierce, J. R.: Understanding global secondary organic aerosol amount and size-resolved condensational behavior, *Atmos. Chem. Phys.*, 13, 11519-11534, doi:10.5194/acp-13-11519-11534, 2013

Westervelt, D. M., Pierce, J. R., Riipinen, I., Trivitayanurak, W., Hamed, A., Kulmala, M., Laaksonen, A., Decesari, S., and Adams, P. J.: Formation and growth of nucleated particles into cloud condensation nuclei: model-measurement comparison, *Atmos. Chem. Phys.*, 13, 7645-7663, doi:10.5194/acp-13-7645-2013, 2013

Hennigan, C. J., **Westervelt, D.M.**, I. Riipinen, G. J. Engelhart, T. Lee, J. L. Collett Jr., S. N. Pandis, P. J. Adams, and A. L. Robinson (2012), New particle formation and growth in biomass burning plumes: An important source of cloud condensation nuclei, *Geophys. Res. Lett.*, 39, L09805, doi:10.1029/2012GL050930.

Westervelt, D. M., Moore, R. H., Nenes, A., and Adams, P. J.: Effect of primary organic sea spray emissions on cloud condensation nuclei concentrations, *Atmos. Chem. Phys.*, 12, 89-101, doi:10.5194/acp-12-89-2012,2012.

Pierce, J. R., Leaitch, W. R., Liggio, J., **Westervelt, D. M.**, Wainwright, C. D., Abbatt, J. P. D., Ahlm, L., Al-Basheer, W., Cziczo, D. J., Hayden, K. L., Lee, A. K. Y., Li, S.-M., Russell, L. M., Sjostedt, S. J., Strawbridge, K. B., Travis, M., Vlasenko, A., Wentzell, J. J. B., Wiebe, H. A., Wong, J. P. S., and Macdonald, A. M.: Nucleation and condensational growth to CCN sizes during a sustained pristine biogenic SOA event in a forested mountain valley, *Atmos. Chem. Phys.*, 12, 3147-3163, doi:10.5194/acp-12-3147-2012, 2012

Snow-Kropla, E. J., Pierce, J. R., **Westervelt, D. M.**, and Trivittayanurak, W.: Cosmic rays, aerosol formation and cloud-condensation nuclei: sensitivities to model uncertainties, *Atmos. Chem. Phys.*, 11, 4001-4013, doi:10.5194/acp-11-4001-2011, 2011

Book chapters

Donahue, N. M., Posner, L. N., **Westervelt, D. M.**, Li, Z., Shrivastava, M., Presto, A. A., Sullivan, R. C., Adams, P. J., Pandis, S. N., Robinson, A. L.: Where Did This Particle Come From? Sources of Particle Number and Mass for Human Exposure Estimates. *Airborne Particulate Matter: Sources, Atmospheric Processes, and Health*. pp. 35–71., doi:10.1039/9781782626589-00035, 2016.

Publications under review

Westervelt, D. M., A. J., Conley, A. M., Fiore, J.-F., Lamarque, D., Shindell, M., Previdi, N.R. Mascioli, G., Faluvegi, G., Correa, and L. W., Horowitz (2017), Connecting regional aerosol emissions reductions to local and remote precipitation responses. Under review at Journal of Geophysical Research: Atmospheres.

Conley, A.J., **Westervelt, D.M.**, Lamarque, J.-F., Fiore, A.M., Shindell, D., Correa, G., Faluvegi, G., Horowitz, L.W. Multi-model surface temperature responses to removal of U.S. sulfur dioxide emissions. Under review at Journal of Geophysical Research: Atmospheres.

Presentations

Invited

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| New York University, Department of Environmental Engineering Department | Mar 2017 |
| Seminar. “All about atmospheric aerosols: from air quality to climate change”. New York, NY | |
| American Geophysical Union Fall Meeting 2016 | Dec 2016 |

- San Francisco, CA. “The impact of sulfate removal on global and regional precipitation in three coupled climate models”. A11L: Tropospheric Chemistry-Climate Interactions
- Lamont-Doherty Earth Observatory Ocean and Climate Physics Seminar** Jan 2016
Palisades, NY. “Taming the aerosol monster: a multimodel approach to elucidating the cloud and precipitation response to regional changes in aerosol emissions”
- Princeton Environmental Engineering Department Seminar** Feb 2015
Princeton University. “Radiative forcing and climate response to 21st century aerosol decreases”
- NASA Goddard Institute for Space Studies seminar.** New York, NY. GISS Jan 2015
Lunchtime Seminar. “Radiative forcing and climate response to future projected aerosol declines.”
- Atmospheric Chemistry and Climate at Columbia University (ACCU) seminar.** July 2014
New York, NY. “Impact of Future Decreasing Aerosol Concentrations on Radiative Forcing and Climate”
- Geophysical Fluid Dynamics Lab Atmospheric Chemistry Seminar.** Princeton, June 2014
NJ. “Future projections of aerosol optical depth, radiative forcing, and climate response due to diminishing aerosol emissions in the Representative Concentration Pathways”
- Contributed**
- American Geophysical Union (AGU) Fall 2017 Meeting** 2017
New Orleans, LA. Connecting regional aerosol emissions changes to local and remote precipitation responses. (Oral)
- American Association for Aerosol Research (AAAR) 35th annual meeting** 2016
Portland, Oregon. “Aerosol, cloud, and precipitation responses to northern hemisphere aerosol emissions reductions in three climate models”
- Yoram Kaufman 10th anniversary Memorial Symposium.** Goddard Space Flight 2016
Center. Greenbelt, MD. “Impact of regional aerosol emissions on global and regional precipitation in three global climate models”
- American Association for Aerosol Research (AAAR) 34th annual meeting,** 2015
Minneapolis, MN. “The effect of climate change on PM_{2.5} in GFDL CM3”
- American Geophysical Union (AGU) fall meeting,** San Francisco, CA. “Future 2014
projections of aerosol optical depth, radiative forcing, and climate response due to diminishing aerosol emissions in the Representative Concentration Pathways”
- AAAR 33rd annual meeting,** Orlando, FL. “The effect of decreasing aerosols on 2014
future climate” (Poster)
- AAAR 32nd annual meeting,** Portland, OR. “Development and application of a 2013
particle number source apportionment algorithm”

6th International GEOS-Chem Users' Meeting. Boston, MA. "New particle formation in GEOS-Chem-TOMAS: Evaluation, sensitivity, and particle number tagging"	2013
American Institute of Chemical Engineers (AIChE) annual meeting. Pittsburgh, PA. "Formation and growth on nucleated particles: Constraints on cloud condensation nuclei budgets"	2012
AAAR 31st annual meeting. Minneapolis, MN. "Potential factors limiting growth of nucleated particles into cloud condensation nuclei"	2012
European Geophysical Union (EGU) annual meeting. Vienna, Austria. "Formation and growth of nucleated particles into cloud condensation nuclei: comparison of a global aerosol microphysics model with observations" (Poster)	2012
AGU 2011 fall meeting. San Francisco, CA. "Evaluation of the GEOS-Chem-TOMAS global aerosol microphysics model"	2011
AAAR 30th annual meeting. Orlando, FL. "Formation and growth of nucleated particles into cloud condensation nuclei"	2011
5th International GEOS-Chem Users' Meeting. Boston, MA. "New particle formation modeling with GEOS-Chem-TOMAS"	2011
AAAR 29th annual meeting. Portland, OR. "Effect of organic sea spray emissions on cloud condensation nuclei concentrations"	2010
AGU 2009 Fall meeting. San Francisco, CA. "Effect of organic sea spray emissions on cloud condensation nuclei" (Poster)	2009

Teaching Experience

Faculty, New Jersey Scholars Program, The Lawrenceville School	Summer 2015
Taught summer course on "Climate Change and the Human Experience" to 39 rising high school seniors from diverse backgrounds across the state of New Jersey	
Lead faculty member for climate science	
Encouraging Networks between Geoscience and Geoscience Education (ENGAGE) workshop	Jan 2015
Held in Washington, DC. Sponsored and funded by National Science Foundation. Goals included promoting cross-disciplinary awareness and relationships in geoscience and development of strategies and action items to improve quality of geoscience education.	
Eberly Center for Teaching Excellence Future Faculty Program	2012-2013
Completed teaching observations, course and syllabus development, attended seminars	
Lecturer, Introduction to Atmospheric Chemistry. Columbia University. Sulfate-nitrate-ammonium atmospheric thermodynamics. Introduction to atmospheric	Mar 2016, 2017

aerosols. Taught 3 lectures total.

Guest Lecturer, Fundamentals of Atmospheric Aerosols (CU).	April 2017
Taught 1 lecture (3 hours) on aerosol microphysics	
Lecturer, Fundamentals of Atmospheric Aerosols (CMU)	2013
Taught 3 lectures on single particle dynamics, aerosol size distributions, and aerosol and cloud optical properties	
Teaching and Lab Assistant, Introduction to Environmental Engineering	2012
Assisted lab sessions, held weekly office hours, administered exams, grading	
Teaching Assistant and Guest Lecturer, Advanced Topics in Air Quality Engineering	2011, 2012
Taught 4 lectures, held review sessions, held weekly office hours, grading	
Teaching Assistant, Probability and Estimation for Environmental Engineers	2010
Covered 1 lecture, held weekly office hours, grading	

Student advising Experience

Advisor to LDEO Summer Intern Clara T. Ma	Summer 2017
Impact of future emissions and climate change on Chinese ozone and particulate matter air pollution	
Oral presentation given by Clara at AGU Fall Meeting 2017	
Advisor to Jean Guo, Lamont-Doherty Graduate Student	2017-present
Project: Variability in modeled and observed PM _{2.5}	
Advisor to Columbia Earth Institute Undergraduate Intern	2015-2017
Karen Xia (BS Computer Science and Statistics expected 2018)	
Project: Modes of variability in PM _{2.5} and AOD measurements over India	
Poster presented at AAAR 35 th annual fall meeting. "On the Applicability of Aerosol Optical Depth Retrievals as a Proxy for Surface Particulate Matter in India"	
Advisor to Undergraduate Researchers at Carnegie Mellon	2010-2012
Mentored two undergraduate students, Tiana Warren (BS ChemE 2011) and Karen Yu (BS Civil Eng 2012, PhD Harvard 2017 expected)	
Projects: Evaluation of a global aerosol model; Predictions of future aerosol number concentrations in a warmer climate	

Professional Development

Session Convener and Chair

"Interactions of Air Quality and Meteorology on Local to Synoptic Scales". AGU Fall Meeting 2017.

New Orleans, LA

Session Chair

“Carbonaceous Aerosols in the Atmosphere”. American Association for Aerosol Research 34th annual meeting. Minneapolis, MN. Oct. 2015

Peer reviewer

Atmospheric Chemistry and Physics, Geoscientific Model Development, Atmospheric Environment, Journal of the Advances of Modeling Earth Systems, Aerosol Science and Technology, Environmental Science and Technology, Journal of Geophysical Research, Geophysical Research Letter, Nature Climate Change

Member

American Geophysical Union (AGU), European Geophysical Union (EGU), American Association for Aerosol Research (AAAR)

Engineer-in-Training

Fundamentals of Engineering exam passed in April 2008

President

American Association of Aerosol Research Carnegie Mellon Chapter (2012)
Secured funding and started guest speaker series, supervised creation of an air quality community awareness blog

Poster Judge, student poster competition

AGU 2014, 2016. AAAR 2014, 2015, 2016

Outreach Activities

New York State Science and Engineering Fair Judge, March 2017, New York, NY

Lamont-Doherty Earth Observatory Open House. Oct 2016. Palisades, NY. Designed and conducted a “clouds in a jar” experiment at the Ocean and Climate Physics booth.

Invited guest speaker, St. Thomas Aquinas College Earth Day Fair, 2016

Early career researcher panel member, 2015-2016, Various occasions at LDEO

Judge, 2012 Pittsburgh Regional Middle and High School Science Fair

Co-founder and contributing author, Air Quality awareness blog
www.particulatematters.net

Volunteer, Trinity Mission Clinic, West Lafayette, IN, 2006-2007

Honors and awards

Science, Technology, and Environmental Policy Research Fellowship (2013-2014)

Dean’s Fellowship, Carnegie Mellon University (2009-2010)

American Association for Aerosol Research Conference Travel Grant (2012)

Carnegie Mellon Graduate Student Association Travel Grant (2010, 2011, 2012)