

## Peter J. Adams

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**Research Interests:** Aerosol microphysics, chemistry, and thermodynamics; global and regional scale chemical transport models; policy applications of air quality models; aerosols and climate; cloud condensation nuclei; process-based emissions models; atmospheric ammonia; organic aerosol modeling.

### Education

Ph.D., Chemical Engineering, California Institute of Technology, 2001  
MS, Chemical Engineering, California Institute of Technology, 1998  
BS, Chemical Engineering, Cornell University, 1996

### Professional Positions

Carnegie Mellon University, Department of Civil and Environmental Engineering and Department of Engineering and Public Policy, Assistant Professor (August 2001-June 2006), Associate Professor (July 2006-June 2010), and Full Professor (July 2010-present).  
Center for Atmospheric Particle Studies (Carnegie Mellon University), Director, July 2013-present.  
University of Maryland Baltimore County and NASA Goddard Space Flight Center, Visiting Senior Research Scientist, June – August 2010.  
Intel, Summer Intern in Microcontamination, Summer 1996.  
Sandia National Laboratories, Co-op Intern, Combustion Research Facility, Fall 1994 and Summer, 1995.

### Teaching Experience

Professor, Carnegie Mellon University: Air Quality Engineering, Climate Change Science and Policy, Engineering and Public Policy Project, Fluid Mechanics, Fundamentals of Atmospheric Aerosols, Grand Challenge Freshman Seminar: Climate Change; Introduction to Meteorology, Mathematical Modeling of Environmental Systems.  
Teaching Assistant, Caltech: Atmospheric Chemistry, Thermodynamics.  
Teaching Assistant, Cornell: Introduction to Chemical Engineering.

### Honors

Fulbright Scholar, “Global Implications of Emerging Organic Aerosol Chemistry”, resident at the Institute of Atmospheric Sciences and Climate of the Italian National Research Council (ISAC-CNR) in Bologna, Italy; January – April 2012.  
Visiting Senior Research Scientist, University of Maryland Baltimore County and NASA Goddard Space Flight Center, June – August 2010.  
Environmental Science and Technology: Editor’s Choice Paper Award, Policy Analysis: First Runner-Up, January 2008.

American Association for Aerosol Research: Sheldon K. Friedlander Award (Outstanding Dissertation), 2004.

Journal of Geophysical Research Excellence in Refereeing (2003); Fannie and John Hertz Foundation Graduate Fellow (1996-2001); AIChE Twin Tiers Outstanding Undergraduate Scholar (1996); Cornell Alumni Association of Greater Rochester Scholarship (1995-1996).

### Journal Articles

1. Adams, P. J. (2009), SOCED 7-Airborne particles, clouds, and climate change, *Abstracts of Papers of the American Chemical Society*, 238.
2. Adams, P. J., and J. H. Seinfeld (2002), Predicting global aerosol size distributions in general circulation models, *Journal of Geophysical Research*, 10.1029/2001JD001010.
3. Adams, P. J., and J. H. Seinfeld (2003), Disproportionate impact of particulate emissions on global cloud condensation nuclei concentrations, *Geophysical Research Letters*, 10.1029/2002GL016303.
4. Adams, P. J., J. H. Seinfeld, and D. M. Koch (1999), Global concentrations of tropospheric sulfate, nitrate, and ammonium aerosol simulated in a general circulation model, *Journal of Geophysical Research-Atmospheres*, 104(D11), 13791-13823.
5. Adams, P. J., N. M. Donahue, and S. N. Pandis (2013), Atmospheric Nanoparticles and Climate Change, *Aiche Journal*, 59(11), 4006-4019.
6. Adams, P. J., S. N. Pandis, J. P. Dawson, and P. N. Racherla (2009), Air quality in a changing climate, *Geochimica Et Cosmochimica Acta*, 73(13), A9-A9.
7. Adams, P. J., J. H. Seinfeld, D. Koch, L. Mickley, and D. Jacob (2001), General circulation model assessment of direct radiative forcing by the sulfate-nitrate-ammonium-water inorganic aerosol system, *Journal of Geophysical Research-Atmospheres*, 106(D1), 1097-1111.
8. Bahadur, R., L. M. Russell, M. Z. Jacobson, K. Prather, A. Nenes, P. Adams, and J. H. Seinfeld (2012), Importance of composition and hygroscopicity of BC particles to the effect of BC mitigation on cloud properties: Application to California conditions, *Journal of Geophysical Research-Atmospheres*, 117.
9. Barrett, A. M., and P. J. Adams (2011), Chlorine Truck Attack Consequences and Mitigation, *Risk Analysis*, 31(8), 1243-1259.
10. Chen, W. T., Y. H. Lee, P. J. Adams, A. Nenes, and J. H. Seinfeld (2010a), Will black carbon mitigation dampen aerosol indirect forcing?, *Geophysical Research Letters*, 37(L09801), doi:10.1029/2010GL042886.
11. Chen, W. T., A. Nenes, H. Liao, P. J. Adams, J. L. F. Li, and J. H. Seinfeld (2010b), Global climate response to anthropogenic aerosol indirect effects: Present day and year 2100, *Journal of Geophysical Research-Atmospheres*, 115.
12. Dawson, J. P., P. J. Adams, and S. N. Pandis (2007a), Sensitivity of PM2.5 to climate in the Eastern US: a modeling case study, *Atmospheric Chemistry and Physics*, 7, 4295-4309.
13. Dawson, J. P., P. J. Adams, and S. N. Pandis (2007b), Sensitivity of ozone to summertime climate in the eastern USA: A modeling case study, *Atmospheric Environment*, 41(7), 1494-1511.
14. Dawson, J. P., P. N. Racherla, B. H. Lynn, P. J. Adams, and S. N. Pandis (2008), Simulating present-day and future air quality as climate changes: model evaluation, *Atmospheric Environment*, 42(19), 4551-4566.
15. Dawson, J. P., P. N. Racherla, B. H. Lynn, P. J. Adams, and S. N. Pandis (2009), Impacts of climate change on regional and urban air quality in the eastern United States: Role of meteorology, *Journal of Geophysical Research-Atmospheres*, 114.

16. Donahue, N. M., W. Chuang, S. A. Epstein, J. H. Kroll, D. R. Worsnop, A. L. Robinson, P. J. Adams, and S. N. Pandis (2013), Why do organic aerosols exist? Understanding aerosol lifetimes using the two-dimensional volatility basis set, *Environmental Chemistry*, 10(3), 151-157.
17. Donahue, N. M., L. N. Posner, D. M. Westervelt, Z. J. Li, M. Shrivastava, A. A. Presto, R. C. Sullivan, P. J. Adams, S. N. Pandis, and A. L. Robinson (2016), Where Did This Particle Come From? Sources of Particle Number and Mass for Human Exposure Estimates, in *Airborne Particulate Matter: Sources, Atmospheric Processes and Health*, edited by R. E. Hester, R. M. Harrison and X. Querol, pp. 35-71.
18. Farina, S. C., P. J. Adams, and S. N. Pandis (2010), Modeling global secondary organic aerosol formation and processing with the volatility basis set: Implications for anthropogenic secondary organic aerosol, *Journal of Geophysical Research-Atmospheres*, 115(D09202), doi:10.1029/2009JD013046.
19. Ghan, S. J., S. J. Smith, M. Wang, K. Zhang, K. J. Pringle, K. S. Carslaw, J. R. Pierce, S. E. Bauer, and P. J. Adams (2013), A simple model of global aerosol indirect effects, *Journal of Geophysical Research-Atmospheres*, 118(12), 6688-6707.
20. Gilmore, E. A., L. B. Lave, and P. J. Adams (2006), The costs, air quality, and human health effects of meeting peak electricity demand with installed backup generators, *Environmental Science & Technology*, 40(22), 6887-6893.
21. Gilmore, E. A., P. J. Adams, and L. B. Lave (2010a), Using Backup Generators for Meeting Peak Electricity Demand: A Sensitivity Analysis on Emission Controls, Location, and Health Endpoints, *Journal of the Air & Waste Management Association*, 60(5), 523-531.
22. Gilmore, E. A., J. Apt, R. Walawalkar, P. J. Adams, and L. B. Lave (2010b), The air quality and human health effects of integrating utility-scale batteries into the New York State electricity grid, *Journal of Power Sources*, 195(8), 2405-2413.
23. Hennigan, C. J., D. M. Westervelt, I. Riipinen, G. J. Engelhart, T. Lee, J. L. Collett, 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, *Geophysical Research Letters*, 39.
24. Heo, J., S. T. McCoy, and P. J. Adams (2015), Implications of ammonia emissions from post-combustion carbon capture for airborne particulate matter, *Environmental Science & Technology*, 49(8), 5142-5150.
25. Heo, J., P. J. Adams, and H. O. Gao (2016a), Reduced-form modeling of public health impacts of inorganic PM<sub>2.5</sub> and precursor emissions, *Atmospheric Environment*, 137, 80-89.
26. Heo, J., P. J. Adams, and H. O. Gao (2016b), Public Health Costs of Primary PM<sub>2.5</sub> and Inorganic PM<sub>2.5</sub> Precursor Emissions in the United States, *Environmental Science & Technology*, 50(11), 6061-6070.
27. Heo, J., P. J. Adams, and H. O. Gao (2017), Public health costs accounting of inorganic PM<sub>2.5</sub> pollution in metropolitan areas of the United States using a risk-based source-receptor model, *Environment International*, 106, 119-126.
28. Jathar, S. H., S. C. Farina, A. L. Robinson, and P. J. Adams (2011), The influence of semi-volatile and reactive primary emissions on the abundance and properties of global organic aerosol, *Atmospheric Chemistry and Physics*, 11(15), 7727-7746.
29. Jathar, S. H., N. M. Donahue, P. J. Adams, and A. L. Robinson (2014), Testing secondary organic aerosol models using smog chamber data for complex precursor mixtures: influence of precursor volatility and molecular structure, *Atmospheric Chemistry and Physics*, 14(11), 5771-5780.
30. Jathar, S. H., M. A. Miracolo, A. A. Presto, N. M. Donahue, P. J. Adams, and A. L. Robinson (2012), Modeling the formation and properties of traditional and non-

- traditional secondary organic aerosol: problem formulation and application to aircraft exhaust, *Atmospheric Chemistry and Physics*, 12(19), 9025-9040.
31. Jathar, S. H., M. A. Miracolo, D. S. Tkacik, N. M. Donahue, P. J. Adams, and A. L. Robinson (2013), Secondary Organic Aerosol Formation from Photo-Oxidation of Unburned Fuel: Experimental Results and Implications for Aerosol Formation from Combustion Emissions, *Environmental Science & Technology*, 47(22), 12886-12893.
  32. Jathar, S. H., T. D. Gordon, C. J. Hennigan, H. O. T. Pye, G. Pouliot, P. J. Adams, N. M. Donahue, and A. L. Robinson (2014), Unspeciated organic emissions from combustion sources and their influence on the secondary organic aerosol budget in the United States, *Proceedings of the National Academy of Sciences of the United States of America*, 111(29), 10473-10478.
  33. Jung, J. G., P. J. Adams, and S. N. Pandis (2006), Simulating the size distribution and chemical composition of ultrafine particles during nucleation events, *Atmospheric Environment*, 40(13), 2248-2259.
  34. Jung, J. G., S. N. Pandis, and P. J. Adams (2008), Evaluation of nucleation theories in a sulfur-rich environment, *Aerosol Science and Technology*, 42(7), 495-504.
  35. Jung, J. G., C. Fountoukis, P. J. Adams, and S. N. Pandis (2010), Simulation of in situ ultrafine particle formation in the eastern United States using PMCAMx-UF, *Journal of Geophysical Research-Atmospheres*, 115.
  36. Lee, Y. H., and P. J. Adams (2010), Evaluation of aerosol distributions in the GISS-TOMAS global aerosol microphysics model with remote sensing observations, *Atmospheric Chemistry and Physics*, 10(5), 2129-2144.
  37. Lee, Y. H., and P. J. Adams (2012), A Fast and Efficient Version of the Two-Moment Aerosol Sectional (TOMAS) Global Aerosol Microphysics Model, *Aerosol Science and Technology*, 46(6), 678-689.
  38. Lee, Y. H., K. Chen, and P. J. Adams (2009), Development of a global model of mineral dust aerosol microphysics, *Atmospheric Chemistry and Physics*, 9(7), 2441-2458.
  39. Lee, Y. H., J. R. Pierce, and P. J. Adams (2013), Representation of nucleation mode microphysics in a global aerosol model with sectional microphysics, *Geoscientific Model Development*, 6(4), 1221-1232.
  40. Lee, Y. H., P. J. Adams, and D. T. Shindell (2015), Evaluation of the global aerosol microphysical ModelE2-TOMAS model against satellite and ground-based observations, *Geoscientific Model Development*, 8(3), 631-667.
  41. Leibensperger, E. M., L. J. Mickley, D. J. Jacob, W. T. Chen, J. H. Seinfeld, A. Nenes, P. J. Adams, D. G. Streets, N. Kumar, and D. Rind (2012a), Climatic effects of 1950-2050 changes in US anthropogenic aerosols - Part 1: Aerosol trends and radiative forcing, *Atmospheric Chemistry and Physics*, 12(7), 3333-3348.
  42. Leibensperger, E. M., L. J. Mickley, D. J. Jacob, W. T. Chen, J. H. Seinfeld, A. Nenes, P. J. Adams, D. G. Streets, N. Kumar, and D. Rind (2012b), Climatic effects of 1950-2050 changes in US anthropogenic aerosols - Part 2: Climate response, *Atmospheric Chemistry and Physics*, 12(7), 3349-3362.
  43. Liao, H., J. H. Seinfeld, P. J. Adams, and L. J. Mickley (2004), Global radiative forcing of coupled tropospheric ozone and aerosols in a unified general circulation model, *Journal of Geophysical Research-Atmospheres*, 109(D16).
  44. Liao, H., P. J. Adams, S. H. Chung, J. H. Seinfeld, L. J. Mickley, and D. J. Jacob (2003), Interactions between tropospheric chemistry and aerosols in a unified general circulation model, *Journal of Geophysical Research-Atmospheres*, 108(D1).
  45. Mann, G. W., et al. (2014), Intercomparison and evaluation of global aerosol microphysical properties among AeroCom models of a range of complexity, *Atmospheric Chemistry and Physics*, 14(9), 4679-4713.

46. McQuilling, A. M., and P. J. Adams (2015), Semi-empirical process-based models for ammonia emissions from beef, swine, and poultry operations in the United States, *Atmospheric Environment*, 120, 127-136.
47. Megaritis, A. G., B. N. Murphy, P. N. Racherla, P. J. Adams, and S. N. Pandis (2014), Impact of climate change on mercury concentrations and deposition in the eastern United States, *Science of the Total Environment*, 487, 299-312.
48. Morgan, M. G., P. J. Adams, and D. W. Keith (2006), Elicitation of expert judgments of aerosol forcing, *Climatic Change*, 75(1-2), 195-214.
49. Pierce, J. R., and P. J. Adams (2006), Global evaluation of CCN formation by direct emission of sea salt and growth of ultrafine sea salt, *Journal of Geophysical Research-Atmospheres*, 111(D6).
50. Pierce, J. R., and P. J. Adams (2007), Efficiency of cloud condensation nuclei formation from ultrafine particles, *Atmospheric Chemistry and Physics*, 7, 1367-1379.
51. Pierce, J. R., and P. J. Adams (2009a), A Computationally Efficient Aerosol Nucleation/Condensation Method: Pseudo-Steady-State Sulfuric Acid, *Aerosol Science and Technology*, 43(3), 216-226.
52. Pierce, J. R., and P. J. Adams (2009b), Can cosmic rays affect cloud condensation nuclei by altering new particle formation rates?, *Geophysical Research Letters*, 36.
53. Pierce, J. R., and P. J. Adams (2009c), Uncertainty in global CCN concentrations from uncertain aerosol nucleation and primary emission rates, *Atmospheric Chemistry and Physics*, 9(4), 1339-1356.
54. Pierce, J. R., K. Chen, and P. J. Adams (2007), Contribution of primary carbonaceous aerosol to cloud condensation nuclei: processes and uncertainties evaluated with a global aerosol microphysics model, *Atmospheric Chemistry and Physics*, 7(20), 5447-5466.
55. Pierce, J. R., G. Theodoritsi, P. J. Adams, and S. N. Pandis (2009), Parameterization of the effect of sub-grid scale aerosol dynamics on aerosol number emission rates, *Journal of Aerosol Science*, 40(5), 385-393.
56. Pierce, J. R., G. J. Engelhart, L. Hildebrandt, E. A. Weitkamp, R. K. Pathak, N. M. Donahue, A. L. Robinson, P. J. Adams, and S. N. Pandis (2008), Constraining particle evolution from wall losses, coagulation, and condensation-evaporation in smog-chamber experiments: Optimal estimation based on size distribution measurements, *Aerosol Science and Technology*, 42(12), 1001-1015.
57. Pinder, R. W., P. J. Adams, and A. B. Gilliland (2006a), Agricultural ammonia emissions, uncertainty, and applications to air quality modeling, *Abstracts of Papers of the American Chemical Society*, 232, 423-423.
58. Pinder, R. W., P. J. Adams, and S. N. Pandis (2007), Ammonia emission controls as a cost-effective strategy for reducing atmospheric particulate matter in the eastern United States, *Environmental Science & Technology*, 41(2), 380-386.
59. Pinder, R. W., N. J. Pekney, C. I. Davidson, and P. J. Adams (2004a), A process-based model of ammonia emissions from dairy cows: improved temporal and spatial resolution, *Atmospheric Environment*, 38(9), 1357-1365.
60. Pinder, R. W., R. Strader, C. I. Davidson, and P. J. Adams (2004b), A temporally and spatially resolved ammonia emission inventory for dairy cows in the United States, *Atmospheric Environment*, 38(23), 3747-3756.
61. Pinder, R. W., P. J. Adams, S. N. Pandis, and A. B. Gilliland (2006b), Temporally resolved ammonia emission inventories: Current estimates, evaluation tools, and measurement needs, *Journal of Geophysical Research-Atmospheres*, 111(D16).
62. Post, E. S., et al. (2012), Variation in Estimated Ozone-Related Health Impacts of Climate Change due to Modeling Choices and Assumptions, *Environmental Health Perspectives*, 120(11), 1559-1564.

63. Racherla, P. N., and P. J. Adams (2006), Sensitivity of global tropospheric ozone and fine particulate matter concentrations to climate change, *Journal of Geophysical Research-Atmospheres*, 111(D24).
64. Racherla, P. N., and P. J. Adams (2008), The response of surface ozone to climate change over the Eastern United States, *Atmospheric Chemistry and Physics*, 8(4), 871-885.
65. Racherla, P. N., and P. J. Adams (2009), US Ozone Air Quality under Changing Climate and Anthropogenic Emissions, *Environmental Science & Technology*, 43(3), 571-577.
66. Raes, F., R. Van Dingenen, E. Vignati, J. Wilson, J. P. Putaud, J. H. Seinfeld, and P. Adams (2000), Formation and cycling of aerosols in the global troposphere, *Atmospheric Environment*, 34(25), 4215-4240.
67. Roohani, Y. H., A. A. Roy, J. Heo, A. L. Robinson, and P. J. Adams (2017), Impact of natural gas development in the Marcellus and Utica shales on regional ozone and fine particulate matter levels, *Atmospheric Environment*, 155, 11-20.
68. Roy, A. A., P. J. Adams, and A. L. Robinson (2014), Air pollutant emissions from the development, production, and processing of Marcellus Shale natural gas, *Journal of the Air & Waste Management Association*, 64(1), 19-37.
69. Roy, A. A., K. M. Wagstrom, P. J. Adams, S. N. Pandis, and A. L. Robinson (2011), Quantification of the effects of molecular marker oxidation on source apportionment estimates for motor vehicles, *Atmospheric Environment*, 45(18), 3132-3140.
70. Saleh, R., P. J. Adams, N. M. Donahue, and A. L. Robinson (2016), The interplay between assumed morphology and the direct radiative effect of light-absorbing organic aerosol, *Geophysical Research Letters*, 43(16), 8735-8743.
71. Saleh, R., M. Marks, J. Heo, P. J. Adams, N. M. Donahue, and A. L. Robinson (2015), Contribution of brown carbon and lensing to the direct radiative effect of carbonaceous aerosols from biomass and biofuel burning emissions, *Journal of Geophysical Research-Atmospheres*, 120(19).
72. Singh, S., P. J. Adams, A. Misquitta, K. J. Lee, E. M. Lipsky, and A. L. Robinson (2014), Computational Analysis of Particle Nucleation in Dilution Tunnels: Effects of Flow Configuration and Tunnel Geometry, *Aerosol Science and Technology*, 48(6), 638-648.
73. Sotiropoulou, R. E. P., A. Nenes, P. J. Adams, and J. H. Seinfeld (2007), Cloud condensation nuclei prediction error from application of Kohler theory: Importance for the aerosol indirect effect, *Journal of Geophysical Research-Atmospheres*, 112(D12).
74. Trivitayanurak, W., and P. J. Adams (2014), Does the POA-SOA split matter for global CCN formation?, *Atmospheric Chemistry and Physics*, 14(2), 995-1010.
75. Trivitayanurak, W., P. J. Adams, D. V. Spracklen, and K. S. Carslaw (2008), Tropospheric aerosol microphysics simulation with assimilated meteorology: model description and intermodel comparison, *Atmospheric Chemistry and Physics*, 8(12), 3149-3168.
76. Tsigaridis, K., et al. (2014), The AeroCom evaluation and intercomparison of organic aerosol in global models, *Atmospheric Chemistry and Physics*, 14(19), 10845-10895.
77. Weaver, C. P., et al. (2009), A PRELIMINARY SYNTHESIS OF MODELED CLIMATE CHANGE IMPACTS ON US REGIONAL OZONE CONCENTRATIONS, *Bulletin of the American Meteorological Society*, 90(12), 1843-1863.
78. Westervelt, D. M., J. R. Pierce, and P. J. Adams (2014), Analysis of feedbacks between nucleation rate, survival probability and cloud condensation nuclei formation, *Atmospheric Chemistry and Physics*, 14(11), 5577-5597.
79. Westervelt, D. M., R. H. Moore, A. Nenes, and P. J. Adams (2012), Effect of primary organic sea spray emissions on cloud condensation nuclei concentrations, *Atmospheric Chemistry and Physics*, 12(1), 89-101.
80. Westervelt, D. M., J. R. Pierce, I. Riipinen, W. Trivitayanurak, A. Hamed, M. Kulmala, A. Laaksonen, S. Decesari, and P. J. Adams (2013), Formation and growth of nucleated

particles into cloud condensation nuclei: model-measurement comparison, *Atmospheric Chemistry and Physics*, 13(15), 7645-7663.

### **Other Publications**

Contributing Author, Intergovernmental Panel on Climate Change Third Assessment Report, Chapter 5, Aerosols: Their Direct and Indirect Effects

### **Selected Presentations**

- Florida Department of Environmental Protection (Invited Webinar), “Reduced-Complexity Models for Air Quality Impact Assessment”, October 2017.
- American Association for Aerosol Research (Tutorial at Annual Meeting), “Chemical Transport Modeling of Aerosols”, October 2017.
- US Environmental Protection Agency (Invited Webinar), “Carnegie Mellon University Ammonia Modeling and Emissions Inventory”, June 2017.
- US Environmental Protection Agency, Air-Climate-Energy Centers Meeting, Cambridge, MA (Invited), “Reduced-Complexity Models for Air Quality Impact Assessment”, June 2017.
- Carnegie Mellon University Climate and Energy Decision-Making Center (Invited), “Aerosols and Climate”, May 2017.
- Phipps Conservatory (Invited), Workshop: One Health, One Planet, “Air Quality – Decentralized”, April 2017.
- American Association for Aerosol Research (Tutorial at Annual Meeting), “Chemical Transport Modeling of Aerosols”, October 2015.
- Carnegie Mellon University Climate and Energy Decision-Making Center (Invited), “EASIUR Air Quality Social Costs”, May 2015.
- Scripps Institute of Oceanography (Invited), “Global Simulations of Tropospheric Cloud Condensation Nuclei”, April 2015.
- Chinese Academy of Sciences, Guangzhou Institute of Geochemistry (Invited), “Global Simulations of the Sources and Formation of Cloud Condensation Nuclei”, April 2015.
- Tsinghua University (Invited), “Global Simulations of Cloud Condensation Nuclei”, April 2015.
- Chinese Academy of Sciences, Institute for Atmospheric Physics (Invited), “Health and Climate Impacts of Atmospheric Aerosols: Results from Chemical Transport Modeling”, April 2015.
- Cornell University Ezra Roundtable (Invited), Cornell University, “Bringing Air Quality Modeling to Systems-Level Analysis”, March 2015.
- Indiana University of Pennsylvania (Invited), “The Chemistry and Microphysics of Cloud-Nucleating Particles”, February 2015.
- Climate and Energy Decision-Making Center (Invited), Carnegie Mellon University, “Crash Course in Air Pollution for Policy Analysts”, September 2014.
- Telluride Workshop on Organic Aerosols (Invited), “Global organic aerosols: models and observations”, July 2014.
- Allegheny County Climate and Health Workshop (Invited), “Climate Change: Ozone and PM<sub>2.5</sub>”, May 2014.
- International Aerosol Modeling Algorithms Conference (Invited), “Representing the Nucleation Mode in Chemical Transport Models”, December 2013.
- Cornell University (Invited), “Modeling atmospheric particles and climate change”, November 2013.
- American Association for Aerosol Research (Tutorial at Annual Meeting), “Chemical Transport Modeling of Aerosols”, October 2013.

University of Akron (Invited), “Global modeling of atmospheric particles, clouds, and climate change”, September 2013.

Climate and Energy Decision-making Center (Invited), “The role of black carbon in the climate system”, May 2013.

Environmental Protection Agency (Invited), “Ammonia Emissions from Livestock: a Process-Based Modeling Approach”, November 2012.

Workshop on Atmospheric Aerosol Formation and Early Growth (Invited), “What do models tell us about nucleation and CCN?”, August 2012.

Università degli Studi dell’Aquila (Invited), “Sources of Cloud Condensation Nuclei”, July 2012.

Alpine Summer School: Climate, Aerosols, and the Cryosphere (Invited), “Organic Chemistry of SOA Formation”, June 2012.

Alpine Summer School: Climate, Aerosols, and the Cryosphere (Invited), “Aerosols and the Climate System”, June 2012.

Università di Catania (Invited), “Atmospheric Chemistry Models: Applications to Climate Science and Air Quality Policy”, June 2012.

Particles and Climate Change Forum, University of Helsinki (Invited), “Climate models: can they get particles ‘right’?”, May 2012.

Joint Research Centre of the European Commission (Invited), “Closing the gaps on global organic aerosol”, November 2011.

ISAC-CNR (Invited), “An Emerging Picture of the Sources of Cloud Condensation Nuclei”, October 2011.

ISAC-CNR (Invited), “Global Organic Aerosol: New Models and Measurements”, October 2011.

Goldschmidt Conference (Invited), “Evaluating New Particle Formation, Growth, and CCN Formation in Global Models”, August 2011.

Massachusetts Institute of Technology (Invited), “Advancing the Predictive Power of Global Aerosol Models: Organic Chemistry and CCN”, May 2011.

University of Pittsburgh (Invited), “Aerosols, Clouds, and Climate”, March 2011.

American Geophysical Union Fall Meeting (Invited), “Model-Measurement Integration for Global Aerosols: Old and New Challenges”, December 2010.

UC Berkeley (Invited), “A New Model of Global Organic Aerosol Chemistry”, November 2010.

American Association for Aerosol Research (Tutorial at Annual Meeting), “Chemical Transport Modeling of Aerosols”, October 2010.

University of Maryland (Invited), “Closing the Gaps on Global Organic Aerosol”, August 2010.

Telluride Workshop on Atmospheric Chemistry (Invited), “Nucleation, CCN, and the Indirect Effect”, August 2010.

NASA Goddard Space Flight Center (Invited), “Global Modeling of Organic Aerosol and Cloud Condensation Nuclei: Finding the Right Observations”, June 2010.

NASA Goddard Space Flight Center (Invited), “Cloud Condensation Nuclei: Processes and Observations”, April 2010.

Columbia University (Invited), “Global Organic Aerosol: Chemistry, Volatility and Cloud Condensation Nuclei”, March 2010.

Washington University (Invited), “Where Do Cloud Condensation Nuclei Come From?”, November 2009.

American Association for Aerosol Research (Tutorial at Annual Meeting), “Chemical Transport Modeling of Aerosols”, October 2009.

Gordon Conference on Atmospheric Chemistry (Invited), “CCN Formation on the Global Scale: Microphysics and Chemistry”, August 2009.

American Chemical Society (Invited), “Airborne Particles, Clouds and Climate Change”, August 2009.

Goldschmidt Conference (Invited), “Air Quality in a Changing Climate”, June 2009.



Washington State University (Invited), "Ammonia Emissions Controls: A Cost-effective Strategy for Reducing PM<sub>2.5</sub> Concentrations", March 2009.

Kent State University (Invited), "Nucleation, Primary Particles, and Climate", November 2008.

Cloud Aerosol Feedbacks and Climate Annual Workshop (Invited), "Assessing the aerosol indirect effect with a global aerosol microphysical models", Toronto, March 2008.

NitroEurope Conference (Invited Keynote Speech), "Aerosol-Climate Interactions and the Nitrogen Cycle", February 2008.

Workshop on Aerosol-Climate Interactions in Tropical Regions (Invited Talk), "Impacts of Primary Emissions and Nucleation on Global CCN", February 2008.

Workshop on Aerosol-Climate Interactions in Tropical Regions (Invited Talk), "Global Aerosol Microphysics Models: Tools for Assessing Uncertainties in the Indirect Effect", February 2008.

Fourth Accent Barnsdale Expert Workshop (Invited), "Effect of Climate Change on Particulate Matter", November 2007.

National Atmospheric Deposition Program Annual Meeting (Invited Talk), "Air Quality and Climate Change", September 2007.

American Chemical Society Annual Meeting (Invited Talk), "Agricultural Ammonia Emissions, Uncertainty, and Applications to Air Quality Modeling", September 2006.

Telluride Workshop on Organic Particles in the Atmosphere (Invited Talk), "Organic Aerosols as CCN: Magnitude of Contribution and Key Uncertainties", August 2006.

Electric Power Research Institute (Invited Talk), "Ammonia: Environmental Impacts, Emissions, Inorganic PM<sub>2.5</sub>, and the Clean Air Interstate Rule", July 2006.

Santa Fe Climate Prediction Uncertainties Workshop (Invited Talk), "Aerosol-cloud interactions: What do in-situ observations tell us and how can it constrain and improve modeling of the indirect effect?", July 2006.

Climate Decision-Making Center (Invited Talk), "Effects of Airborne Particles on Climate: an Expert Elicitation", March 2006.

European Aerosol Conference (Invited Talk), "Factors Controlling the Tropospheric CCN Budget", August 2005.

National Oceanic and Atmospheric Administration (Invited Seminar), "Efficient Computational Modeling of Aerosol-Climate Interactions", May 2005.

University of New Hampshire (Invited Seminar), "Tropospheric CCN Formation", March 2005.

National Center for Atmospheric Research Workshop on Chemistry-Climate Interactions (Invited Talk), "Aerosol Formation and Chemistry: Sensitivity of CCN to Chemistry and Microphysics", February 2005.

Society of Environmental Journalists, "Airborne Particulate Matter: An Update on Recent Research", October 2004.

Forum on Aerosol Science and Technology (Invited Talk), "Making Progress Towards Understanding Aerosol-Climate Interactions", June 2004.

Georgia Institute of Technology (Invited Seminar), "Insights into Aerosol Climate Forcings from Global Microphysics Models", February 2004.

American Association for Aerosol Research PM Meeting (Invited Talk), "Aerosols and Climate", April 2003.

National Center for Atmospheric Research Workshop on Chemistry-Climate Interactions (Invited Talk), "Aerosols: What are we missing? What should we do in the future?", February 2003.

Goddard Institute for Space Studies (Invited Seminar), "Representing tropospheric aerosols in global climate models", February 2002.

Northern Aerosol Regional Climatological Model Workshop (Invited Talk), "Size-resolved aerosol microphysics in global models: sensitivity to nucleation and primary particles", March 2001.

## **Memberships and Professional Service**

*American Association for Aerosol Research* (AAAR): member, past Internet Committee chair, By-Laws Committee; *American Geophysical Union* (AGU); *American Society of Civil Engineers* (ASCE); *European Geosciences Union* (EGU); *Allegheny County Health Department Air Toxics New Guidelines Proposal Committee*, 2010-2012; *Commonwealth of Pennsylvania* Department of Environmental Protection Air Quality Technical Advisory Committee (PA DEP AQTAC), 2003-2009; *United States Environmental Protection Agency* Clean Air Scientific Advisory Committee Particulate Matter Review Panel, 2015-2018.