

Jay G. Slowik – Curriculum Vitae

Research Scientist, Laboratory of Atmospheric Chemistry
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Education

Boston College, Chestnut Hill, MA: *Ph.D. in Physical Chemistry*, Dec. 2006.
Thesis: “Morphology, Composition, and Atmospheric Processing of Soot Particles.” Advisor: Prof. Paul Davidovits.

Williams College, Williamstown, MA: *BA with Honors in Chemistry*, June 2001.
Thesis: “Effect of Sulfuric Acid on the Uptake of Sulfur Dioxide on Soot.” Advisor: Prof. Birgit Koehler.

Research Experience

Paul Scherrer Institut, Villigen, Switzerland: *Research Scientist*, Jan. 2011 – present.

- Research on organic aerosol formation, aging, and source identification using aerosol mass spectrometry and integrated techniques.
- First field deployment of an aerodynamic lens for aerosol mass spectrometric measurements of PM_{2.5} particles.
- Development of mobile smogchamber for *in situ* measurement of organic aerosol formation and aging.
- Detection of freshly nucleated particle growth due to organic condensation during the CLOUD experiment at CERN.

University of Toronto, Toronto, ON: *Research Associate, Postdoctoral Fellow*, Sept. 2006 – Dec. 2010.

- Research on the effects of ambient aerosol sources and atmospheric processing on chemical properties and cloud condensation nuclei (CCN) activity.
- Performed first application of the positive matrix factorization (PMF) statistical analysis technique to coupled particle- and gas-phase data from state-of-the-art Aerodyne aerosol mass spectrometer (AMS) and proton-transfer-reaction mass spectrometer (PTR-MS) instruments.
- Demonstrated the existence of a biogenic aerosol source from Canadian forests that is many times larger than previous biogenic aerosol measurements and in agreement with air quality model simulations.

- Conducted the first field implementation of a novel system for measuring the properties of cloud condensation nuclei.
- Operated AMS instruments as part of field campaigns in Whistler, BC (WCAS 2010, Whistler 2008), Egbert, ON, (Egbert 2007), Windsor, ON (BAQSMET 2007), and Toronto, ON (SPORT 2007, Toronto 2009).

Boston College, Chestnut Hill, MA and **Aerodyne Research, Inc.**, Billerica, MA: *Graduate Student, Research Assistant, Sept. 2001 – Aug. 2006.*

- Constructed a flow reactor system for production, sampling, processing, and analysis of soot particles.
- Operated AMS instruments as part of field campaigns in Mexico City, Mexico (MILAGRO 2005), Boston, MA (NEAQS 2002), and Petersham, MA (NEAQS 2002).
- Developed a rigorous mathematical formulation for determining particle morphology and composition from combined measurements of a Differential Mobility Analyzer (DMA) and an AMS. Applied this analysis to experiments with laboratory-generated soot aerosol and ambient particles.
- Analyzed the effects on morphology of organic coatings on soot particles to describe the formation and atmospheric processing of soot particles.
- Led laboratory inter-comparison of four recently developed techniques for measuring the black carbon content of soot aerosol particles.

Williams College, Williamstown, MA: *Undergraduate Researcher, Jun. 2000-Jun. 2001.*

- Developed method of depositing and measuring monolayer-scale coatings of sulfuric acid on a soot surface.
- Measured the inhibition by a thin coating of sulfuric acid of sulfur dioxide uptake by soot.
- This research was the subject of an undergraduate honors thesis.

Honors and Professional Service

- Peer reviewer of journal papers for *Journal of Geophysical Research*, *Atmospheric Chemistry and Physics*, *Aerosol Science and Technology*, *Atmospheric Measurement Techniques*, and *Geophysical Research Letters*.
- Peer reviewer of research proposals to the NOAA Atmospheric Chemistry Program and DOE Atmospheric Science Program.
- SNF Ambizione research fellow (2011-2013).
- Session convener at 2009 American Geophysical Union Fall Meeting (“Aging of Atmospheric Soot: Laboratory and Field Studies”).
- NASA Earth Systems Science Graduate Fellowship (Sept. 2003 – Aug. 2006).
- Participant in the Atmospheric Chemistry Colloquium for Emerging Senior Scientists (ACCESS VIII), Sept. 2005.

- Outstanding Poster Award at the Environmental Molecular Science Institute Annual Workshop, The Ohio State University, Columbus, OH, 2003 and 2004.

Publications

1. Wong, J. P. S., Lee, A. K. Y., **Slowik, J. G.**, Cziczo, D. J., Leaitch, W. R., Macdonald, A., and Abbatt, J. P. D.: Oxidation of ambient biogenic secondary organic aerosol (SOA) by hydroxyl radicals: effects on cloud condensation nuclei activity, *Geophys. Res. Lett.*, submitted.
2. Shantz, N. C., Pierce, J. R., Chang, R. Y.-W., Vlasenko, A., Riipinen, I., Sjostedt, S., **Slowik, J. G.**, Wiebe, A., Liggio, J., Abbatt, J. P. D., and Leaitch, W. R.: Cloud condensation nuclei droplet growth kinetics of ultrafine particles during anthropogenic nucleation events, *Atmos. Environ.*, submitted.
3. **Slowik, J. G.**, Cziczo, D. J., and Abbatt, J. P. D.: Analysis of cloud condensation nuclei composition and growth kinetics using a pumped counterflow virtual impactor and aerosol mass spectrometer, *Atmos. Meas. Tech.*, 4, 1677-1688, 2011.
4. **Slowik, J. G.**, Brook, J., Chang, R. Y.-W., Evans, G. J., Hayden, K., Jeong, C.-H., Li, S.-M., Liggio, J. L., Liu, P. S. K., McGuire, M., Mihele, C., Sjostedt, S., Vlasenko, A., and Abbatt, J. P. D.: Photochemical processing of organic aerosol at nearby continental sites: contrast between urban plumes and regional aerosol, *Atmos. Chem. Phys.*, 11, 2991-3006, 2011.
5. Lambe, A. T., Ahern, A. T., Williams, L. R., **Slowik, J. G.**, Wong, J. P. S., Abbatt, J. P. D., Brune, W. H., Ng, N. L., Wright, J. P., Croasdale, D. R., Worsnop, D. R., Davidovits, P., and Onasch, T. B.: Characterization of aerosol photooxidation flow reactors: heterogeneous oxidation, secondary organic aerosol formation and cloud condensation nuclei activity measurements, *Atmos. Meas. Tech.*, 4, 445-461, 2011.
6. McGuire, M. L., Jeong, C.-H., **Slowik, J. G.**, Chang, R. Y.-W., Corbin, J. C., Lu, G., Mihele, C., Rehbein, P. J. G., Sills, D. M. L., Abbatt, J. P. D., Brook, J. R., and Evans, G. J.: Elucidating determinants of aerosol composition through particle-type-based receptor modeling, *Atmos. Chem. Phys.*, 11, 8133-8155, 2011.
7. Riipinen, I., Pierce, J. R., Yli-Juuti, T., Nieminen, T., Hakkinen, S., Ehn, M., Junninen, H., Lehtipalo, K., Petaja, T., **Slowik, J.**, Chang, R., Shantz, N. C., Abbatt, J., Leaitch, W. R., Kerminen, V.-M., Worsnop, D. R., Pandis, S. N., Donahue, N. M., and Kulmala, M.: Organic condensation: a vital link connecting aerosol formation to cloud condensation nuclei (CCN) concentrations, *Atmos. Chem. Phys.*, 11, 3865-3878, 2011.
8. Sjostedt, S. J., **Slowik, J. G.**, Brook, J. R., Chang, R. Y.-W., Mihele, C., Stroud, C. A., Vlasenko, A., and Abbatt, J. P. D.: Diurnally resolved particulate and VOC measurements at a rural site: Indication of significant biogenic secondary organic aerosol formation, *Atmos. Chem. Phys.*, 11, 5745-5760, 2011.
9. Jeong, C.-H., McGuire, M. L., Godri, K. J., **Slowik, J. G.**, Rehbein, P. J. G., and Evans, G. J.: Quantification of aerosol chemical composition using continuous single particle measurements: *Atmos. Chem. Phys.*, 11, 7027-7044, 2011.
10. Markovic, M. Z., Hayden, K. L., Murphy, J. G., Makar, P. A., Ellis, R. A., Chang, R. Y.-W., **Slowik, J. G.**, Mihele, C., and Brook, J.: The effect of meteorological and chemical factors on the agreement between observations and predictions of fine aerosol composition in southwestern Ontario during BAQS-Met, *Atmos. Chem. Phys.*, 11, 3195-3210, 2011.
11. Stroud, C. A., Makar, P. A., Moran, M. D., Gong, W., Gong, S., Zhang, J., Hayden, K., Mihele, C., Brook, J. R., Abbatt, J. P. D., and **Slowik, J. G.**: Impact of model grid spacing on regional- and urban-scale air quality predictions of organic aerosol, *Atmos. Chem. Phys.*, 11, 3107-3118, 2011.
12. Cross, E. S., Onasch, T. B., Ahern, A., Wrobel, W., **Slowik, J. G.**, Olfert, J., Lack, D. A., Massoli, P., Cappa, C. D., Schwarz, J., Spackman, R., Fahey, D. W., Sedlacek, A., Trimborn, A., Jayne, J. T., Freedman, A., Williams, L. R., Ng, N. L., Mazzoleni, C., Dubey, M., Brem, B., Kok, G., Subramanian, R., Freitag, S., Clarke, A., Thornhill, D., Marr, L., Kolb, C. E., Worsnop, D. R., and Davidovits, P.: Soot Particle Studies – Instrument Inter-Comparison – Project Overview, *Aerosol Sci. Technol.*, 2010, 44, 592-611, 2010.

13. Liggio, J., Li, S.-M., Vlasenko, A., Sjostedt, S., Chang, R., Shantz, N., Abbatt, J., **Slowik, J. G.**, Bottenheim, J. W., Brickell, P. C., and Leaitch, W. R.: Primary and Secondary Organic Aerosols in Urban Air Masses Intercepted at a Rural Site, *J. Geophys. Res.-Atmospheres*, 115, D21305, 2010.
14. **Slowik, J. G.**, Vlasenko, A., Shantz, N., Leaitch, W. R., Brickell, P. C., and Abbatt, J. P. D.: Characterization of a Large Biogenic Secondary Organic Aerosol Event from Eastern Canadian Forests, *Atmos. Chem. Phys.* 10:2825-2845, 2010.
15. **Slowik, J. G.**, Vlasenko, A. McGuire, M., Evans, G. J., and Abbatt, J. P. D.: Simultaneous Factor Analysis of Organic Particle and Gas Measurements in Downtown Toronto, *Atmos. Chem. Phys.* 10:1969-1988, 2010.
16. Schwartz, R. E., Russel, L. M., Sjostedt, S. J., Vlasenko, A., **Slowik, J. G.**, Abbatt, J. P. D., Macdonald, A. M., Li, S. M., Liggio, J., Toom-Sauntry, D., and Leaitch, W. R.: Biogenic Oxidized Organic Functional Groups in Aerosol Particles from a Mountain Forest Site and their Similarities to Laboratory Chamber Products, *Atmos. Chem. Phys.*, 10:5075-5088, 2010.
17. Chang, R. Y.-W., **Slowik, J. G.**, Shantz, N. C., Vlasenko, A., Liggio, J., Sjostedt, S. J., Leaitch, W. R., and Abbatt, J. P. D.: The hygroscopicity parameter (κ) of ambient organic aerosol at a field site subject to biogenic and anthropogenic influences: Relationship to degree of aerosol oxidation, *Atmos. Chem. Phys.*, 10:5047-5064, 2010.
18. Chan, T. W., Huang, L., Leaitch, W. R., Sharma, S., Brook, J. R., **Slowik, J. G.**, Abbatt, J. P. D.: Determination of OM/OC Ratios and Specific Attenuation Coefficients in Ambient Fine PM at a Rural Site in Southern Ontario: Implications for Different Emission Sources and Particle Aging, *Atmos. Chem. Phys.* 10:2393-2411, 2010.
19. Shantz, N. C., Chang, R. Y.-W., **Slowik, J. G.**, Abbatt, J. P. D., and Leaitch, W. R.: Slower CCN growth kinetics of anthropogenic aerosol compared to biogenic aerosol observed at a rural site, *Atmos. Chem. Phys.*, 10:299-312, 2010.
20. Vlasenko, **Slowik, J. G.**, Bottenheim, J., Brickell, P., Chang, R., Macdonald, A. M., Shantz, N. C., Sjostedt, S., Tham, A., Wiebe, H. A., Leaitch, W. R., and Abbatt, J. P. D.: Measurements of VOCs by proton transfer reaction mass spectrometry at a rural Ontario site: Sources and correlation to aerosol composition, *J. Geophys. Res.*, 114:D21305, doi:10.1029/2009JD012025, 2009.
21. Chakrabarty, R. K., Moosmüller, H., Arnott, W. P., Garro, M. A., Guoxun, T., **Slowik, J. G.**, Cross, E. S., Han, J.-H., Davidovits, P., Onasch, T. B., and Worsnop, D. R.: Low Fractal Dimension Cluster-Dilute Soot Aggregates from a Premixed Flame, *Phys. Rev. Lett.*, 102:235504, 2009.
22. Godri, K. J., Evans, G. J., **Slowik, J.**, Knox, A., Abbatt, J. Brook, J., Dann, T., and Dabek-Zlotorzynska, E.: Evaluation and Application of a Semi-continuous Chemical Characterization System for Water Soluble Inorganic PM_{2.5} and Associated Precursor Gases, *Atmos. Meas. Tech.*, 2:65-80, 2009.
23. Knox, A., Yao, X., Brook, J. R., Jeong, C.-H., Godri, K. J., Sabaliauskas, K., **Slowik, J. G.**, and Evans, G. J.: Mass Absorption Cross-section of Ambient Black Carbon Aerosol in Relation to Chemical Age, *Aerosol Sci. Technol.*, 43(6):522-532, 2009.
24. George, I. J., **Slowik, J. G.**, and Abbatt, J. P. D.: Chemical Aging of Ambient Organic Aerosol from Heterogeneous Reactions with Hydroxyl Radicals, *Geophys. Res. Lett.*, 35:L13811, doi:10.1029/2008GL033884, 2008.
25. Chakrabarty, R. K., Moosmüller, H., Garro, M. A., Arnott, W. P., **Slowik, J. G.**, Cross, E. S., Han, J.-H., Davidovits, P., Onasch, T. B., Worsnop, D. R.: Morphology based particle segregation by electrostatic charge, *J. Aerosol Sci.*, 39:785-792, 2008.
26. **Slowik, J. G.**, Cross, E. S., Han, J.-H., Kolucki, J., Davidovits, P., Williams, L. R., Onasch, T. B., Jayne, J. T., Kolb, C. E., and Worsnop, D. R.: Measurements of Morphology Changes of Fractal Soot Particles using Coating and Denuding Experiments: Implications for Optical Absorption and Atmospheric Lifetime, *Aerosol Sci. Technol.*, 41:734-750, 2007.

27. **Slowik, J. G.**, Cross, E. S., Han, J.-H., Davidovits, P., Onasch, T. B., Jayne, J. T., Williams, L. R., Canagaratna, M. R., Worsnop, D. R., Chakrabarty, R. K., Moosmüller, H., Arnott, W. P., Schwarz, J. P., Gao, R.-S., Fahey, D. W., Kok, G. L., and Petzold, A.: An Inter-Comparison of Instruments Measuring Black Carbon Content of Soot Particles, *Aerosol Sci. Technol.*, 41:295-314, doi:10.1080/02786820701197078, 2007.
28. George, I. J., Vlasenko, A., **Slowik, J. G.**, Broekhuizen, K., and Abbatt, J. P. D.: Heterogeneous Oxidation of Saturated Organic Aerosols by Hydroxyl Radicals: Uptake Kinetics, Condensed-phase Products, and Particle Size Change, *Atmos. Chem. Phys.*, 7:4187-4207, 2007.
29. Cross, E. S., **Slowik, J. G.**, Davidovits, P., Allan, J. D., Worsnop, D. R., Jayne, J. T., Lewis, D. K., Canagaratna, M., and Onasch, T. B.: Laboratory and Ambient Particle Density Determination using Light Scattering in Conjunction with Aerosol Mass Spectrometry, *Aerosol Sci. Technol.*, 41:343-359, doi: 10.1080/02786820701199736, 2007.
30. Gao, R. S., Schwarz, J. P., Kelly, K. K., Fahey, D. W., Watts, L. A., Thompson, T. L., Spackman, J. R., **Slowik, J. G.**, Cross, E. S., Han, J.-H., Davidovits, P., and Worsnop, D. R.: A Novel Method for Estimating Light-Scattering Properties of Soot Aerosols using a Modified Single-Particle Soot Photometer, *Aerosol Sci. Technol.*, 41:125-135, doi: 10.1080/02786820601118398, 2007.
31. Chakrabarty, R. K., Moosmüller, H., Arnott, W. P., Garro, M. A., **Slowik, J. G.**, Cross, E. S., Han, J.-H., Davidovits, P., Onasch, T. B., and Worsnop, D. R.: Light Scattering and Absorption by Fractal-like Carbonaceous Chain Aggregates: Comparison of Theories and Experiment, *Applied Optics*, 46(28):6990-7006, 2007.
32. Schwarz, J. P., Gao, R. S., Fahey, D. W., Thomson, D. S., Watts, L. A., Wilson, J. C., Reeves, J. M., Baumgardner, D. G., Kok, G. L., Chung, S., Schulz, M., Hendricks, J., Lauer, A., Kärcher, B., **Slowik, J. G.**, Rosenlof, K. H., Thompson, T. L., Langford, A. O., Lowenstein, M., and Aikin, K. C.: Single-Particle Measurements of Mid Latitude Black Carbon and Light-Scattering Aerosols from the Boundary Layer to the Lower Stratosphere, *J. Geophys. Res. – Atmospheres*, 111:D16207, doi:10.1029/2006JD007076, 2006.
33. **Slowik, J. G.**, Stainken, K., Davidovits, P., Williams, L. R., Jayne, J. T., Kolb, C. E., Worsnop, D. R., Rudich, Y., DeCarlo, P. F., and Jimenez, J. L.: Particle Morphology and Density Characterization by Combined Mobility and Aerodynamic Diameter Measurements. Part 2: Application to Combustion-Generated Soot Aerosols as a Function of Fuel Equivalence Ratio, *Aerosol Sci. Technol.*, 38:1206-1222, DOI: 10.1080/027868290903916, 2004.
34. DeCarlo, P. F., **Slowik, J. G.**, Worsnop, D. R., Davidovits, P., and Jimenez, J. L.: Particle Morphology and Density Characterization by Combined Mobility and Aerodynamic Diameter Measurements. Part 1: Theory, *Aerosol Sci. and Technol.*, 38:1185-1205, DOI: 10.1080/027868290903907, 2004.
35. Katrib, Y., Martin, S. T., Hung, H.-M., Rudich, Y., Zhang, H., **Slowik, J. G.**, Davidovits, P., Jayne, J. T., and Worsnop, D. R., Products and Mechanisms of Ozone Reactions with Oleic Acid for Aerosol Particles Having Core-Shell Morphologies, *J. Phys. Chem. A*, 108:6686-6695, 2004.

Platform Presentations and Invited Seminars

1. A New PM_{2.5} Aerodynamic Lens for Aerosol Mass Spectrometry: Intercomparison and First Field Deployment, *American Association of Aerosol Research Annual Meeting*, Orlando, FL, Oct. 2011.
2. Factor Analysis of Coupled Aerosol and VOC Mass Spectra in Regions of Biogenic Influence, *American Association of Aerosol Research Annual Meeting*, Orlando, FL, Oct. 2011.
3. Real-Time, Controlled OH-Initiated Oxidation of Biogenic Secondary Organic Aerosol, *European Aerosol Conference*, Manchester, UK, Sept. 2011.
4. Factor Analysis of Coupled Aerosol and VOC Mass Spectra in Regions of Biogenic Influence, *European Geophysical Union Annual Meeting*, Vienna, Austria, May 2010.
5. Quantification and Characterization of Biogenic Secondary Organic Aerosol using Aerosol Mass Spectrometry, *Invited Seminar at Paul Scherrer Institut*, Villigen, Switzerland, April 2010.

6. Quantification and Characterization of Biogenic Secondary Organic Aerosol using Aerosol Mass Spectrometry, *Invited Seminar at University of Toronto*, Toronto, ON, Canada, March 2010.
7. Influence of Photochemical Processing on Aerosol Composition in Southwestern Ontario, *American Geophysical Union Fall Meeting*, San Francisco, CA, Dec. 2008.
8. Comparison of Urban and Biogenic Influences on Aerosol Composition and CCN Activity at a Semirural Site in Southern Ontario, *Invited Seminar at Environment Canada*, Toronto, ON, Canada, Feb. 2008.
9. Comparison of Urban and Biogenic Influences on Aerosol Composition at a Semirural Site in Southern Ontario, *American Geophysical Union Fall Meeting*, San Francisco, CA, Dec. 2007.
10. Analysis of Cloud Condensation Nuclei using a Pumped Counterflow Virtual Impactor and Aerosol Mass Spectrometer, *Annual Meeting of the American Association of Aerosol Research*, Reno, NV, Sept. 2007.
11. Real-Time Characterization of Nascent and Processed Soot Particles, *Invited Seminar at University of Toronto*, Toronto, ON, Canada, Sept. 2005.
12. Inter-Comparison of Instruments Measuring Black Carbon Content of Soot Particles, *Atmospheric Chemistry Colloquium for Emerging Senior Scientists*, Yellowstone National Park, WY, Sept. 2005.
13. Morphology and Composition of Soot Aerosols, *Boston College Graduate Student Symposium*, Chestnut Hill, MA, Oct. 2003.
14. Morphology and Composition of Soot Aerosols, *CRAEMS Workshop*, Woods Hole, MA, Oct. 2003.
15. Water Uptake on Sulfuric Acid-Activated Soot, *20th Regional Meeting on Kinetics and Dynamics*, Albany, NY, Jan. 2002.

Poster Presentations

1. Summertime Anthropogenic and Biogenic Influences on Particle Composition at a Remote Forested Site in Western Canada, *American Geophysical Union Fall Meeting*, San Francisco, CA, Dec. 2009.
2. Simultaneous Factor Analysis of Particle and Gas Measurements in Downtown Toronto, *Annual Meeting of the American Association of Aerosol Research*, Reno, NV, Sept. 2007.
3. Carbonaceous Aerosol Processing in the Mexico City Metropolitan Area, *MILAGRO Science Meeting*, Boulder, CO, Oct. 2006.
4. Inter-Comparison of Instruments Measuring Black Carbon Content of Soot Particles, *American Association of Aerosol Research Annual Conference*, Austin, TX, Oct. 2005.
5. Inter-Comparison of Instruments Measuring Black Carbon Content of Soot Particles, *Gordon Research Conference in Atmospheric Chemistry*, Yellowstone National Park, WY, Sept. 2005.
6. Effect of Organic Species Condensation on Soot Particle Morphology, *American Meteorological Society Annual Meeting*, San Diego, CA, Jan. 2005.
7. Effect of Fuel to Oxygen Ratio on Physical and Chemical Properties of Soot Particles, *American Association of Aerosol Research Annual Conference*, Atlanta, GA, Oct. 2004.
8. Effect of Fuel to Oxygen Ratio on Physical and Chemical Properties of Combustion-Generated Soot Particles, *Environmental Molecular Science Institute Annual Workshop*, Columbus, OH, Jun. 2004.
9. Morphology and Composition of Soot Aerosols, *American Association of Aerosol Research Annual Conference*, Anaheim, CA, Oct. 2003.
10. Morphology and Composition of Soot Aerosols, *Environmental Molecular Science Institute Annual Workshop*, Columbus, OH, Jun. 2003.
11. Water Uptake by H₂SO₄-activated Soot Aerosols, *American Chemical Society National Meeting*, Boston, MA, Aug. 2002.
12. Effect of Sulfuric Acid on the Uptake of Sulfur Dioxide on Soot, *American Geophysical Union Spring Meeting*, Boston, MA, May 2001.