

# Xiaoliang Wang

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Research Professor, Division of Atmospheric Sciences, Desert Research Institute, Reno, Nevada  
Graduate Faculty, Atmospheric Sciences, University of Nevada, Reno, Nevada  
Nevada System of Higher Education

## **Education**

University of Minnesota, Twin Cities, MN	Mechanical Engineering	Ph.D.	2006
University of Minnesota, Twin Cities, MN	Mechanical Engineering	M.S.	2002
Tsinghua University, Beijing, China	Thermal Engineering	B.E.	2000
Tsinghua University, Beijing, China	Environmental Engineering	B.E.	2000

## **Background**

Dr. Wang's overarching research theme is to understand air pollutant emissions, transformations, and impacts. Specifically, his research interests include physical and chemical characterization of aerosols, pollution source emission measurement, and aerosol instrument development.

Dr. Wang has developed several widely used aerosol instruments. He is a co-inventor of nanoparticle aerodynamic lenses for efficiently delivering particles into aerosol mass spectrometers and the TSI DustTrak DRX Aerosol Monitor for measuring size-segregated aerosol mass concentrations in real time. He led the design of the DRI Portable Emissions Measurement System (PEMS) that has been used for characterizing gases and particles from vehicle exhaust, stack emissions, biomass burning, and biomass-derived syngas. Dr. Wang also led the design of the DRI Model 2015 Multiwavelength Thermal/Optical Carbon Analyzer that has been commercialized and used worldwide.

Dr. Wang has been studying real-world emissions from pollution sources with the goal of improving air quality management. His projects include researching dust emissions in underground coal mines, tailpipe and non-tailpipe (i.e., brake and tire wear, as well as road dust) emissions from vehicle traffic, toxic gas and particle emissions from the open burning of household solid waste in South Africa, smoke emissions from burning lithium-ion batteries and spacecraft-relevant materials, and mining fleet/industrial stack/fugitive dust emissions in the oil sands region of Canada. Recently, he participated in several projects to study the impact of visibility, air quality, and atmospheric deposition of particles generated from wildfires and prescribed burns in the Lake Tahoe Basin.

Dr. Wang is an active participant in several scientific organizations. He conducts peer reviews for scientific publications and funding agencies. He served as co-chair and chair of the Instrumentation Working Group of the American Association of Aerosol Research (AAAR) annual conferences and chair of the Young Investigators Committee of the AAAR.

Dr. Wang has been granted three patents and published three book chapters and 90+ peer-reviewed journal articles. He is the recipient of the 2020 AAAR Benjamin Y. H. Liu Award that recognizes outstanding contributions to aerosol instrumentation and experimental techniques. He received the 2021 DRI Science Medal and the 2024 Nevada System of Higher Education (NSHE) Regents' Mid-Career Researcher Award for his outstanding scientific contributions.

## **Professional Experience**

2024 – Present	Director, Atmospheric Sciences Graduate Program, University of Nevada, Reno, Reno, NV
2016 – Present	Research Professor, Division of Atmospheric Sciences, Desert Research Institute, Reno, NV
2009 – Present	Graduate Faculty, Atmospheric Sciences, University of Nevada, Reno, NV
2013 – 2016	Associate Research Professor, Division of Atmospheric Sciences, Desert Research Institute, Reno, NV
2009 – 2013	Assistant Research Professor, Division of Atmospheric Sciences, Desert Research Institute, Reno, NV
2007 – 2009	Senior Staff Development Engineer, TSI Inc., St Paul, MN
2005 – 2007	Senior Development Engineer, TSI Inc., St Paul, MN
2005 Summer	Visiting Scientist, Process and Aerosol Measurement Technology Lab, University of Duisburg-Essen, Germany
2004 Summer	Mechanical Engineer (internship), TSI Inc., St Paul, MN
2002 – 2006	Research Assistant, Particle Technology Lab and High Temperature and Plasma Technology Lab, University of Minnesota, Minneapolis, MN
2000 – 2002	Research Assistant, Particle Technology Lab, University of Minnesota, Minneapolis, MN

## **Honors and Awards**

- Nevada System of Higher Education (NSHE) Regents' Mid-Career Researcher Award, 2024
- DRI Science Medal, 2021
- Benjamin Y.H. Liu Award, American Association for Aerosol Research, 2020
- Outstanding Reviewer Award, *Aerosol Science and Technology*, 2019, 2020, 2022, 2023
- Best Paper of 2011 Award, *Frontiers of Environmental Science and Engineering*, 2011
- TSI High Performance Award, 2007, 2008
- TSI Change Marker Award, 2007
- Best Paper Award, *Journal of Thermal Spray Technology*, 2007
- Best Paper Award, International Thermal Spray Conference, 2006

## **Professional Activities and Services**

- Deputy Director, Environmental Analysis Facility, Desert Research Institute (2019–Present)
- Faculty Senator, Desert Research Institute (2024–Present)
- Member, American Association for Aerosol Research (AAAR; 2001–Present)
- Member, Air and Waste Management Association (A&WMA; 2009–Present)
- Member, the Society for Mining, Metallurgy & Exploration (SME; 2023–Present)
- Member, Fundamental Instrument Unit Working Group for the National Ecological Observatory Network (NEON) (2011–Present)
- Reviewer for journals (2003–Present)
- Member, Editorial Board of the “Aerosols” section of the journal *Atmosphere* (2020–Present)

- Member, Editorial Advisory Board of *Aerosol Science and Technology* (2019–present)
- Member, European Science Foundation (ESF) College of Expert Reviewers (2018–2021)
- Technical Advisory Committee for Research Division, California Air Resources Board (2018–2022)
- Member, Technical Advisory Group for the Multiple Air Toxics Exposure Study (MATES VI), California South Coast Air Quality Management District (2023–Present)
- Judge, Nevada State Science Olympiad (2016)
- Judge, Western Nevada Regional Science & Engineering Fair (2013–2016)
- Chair, Young Investigators Committee of AAAR (2011–2012)
- Member, Young Investigators Committee of AAAR (2010–2012)
- Chair, Instrumentation Working Group, American Association for Aerosol Research Annual Conference, 2007
- Co-chair, Instrumentation Working Group, International Aerosol Conference, 2006

### **Patents**

- 1) Wang, X.L., Agarwal, J.K., Chancellor, G.J., et al. Size Segregated Aerosol Mass Concentration Measurement with Inlet Conditioners and Multiple Detectors. US Patent 8,047,055. November 1, 2011.
- 2) Wang, X.L., Agarwal, J.K., Chancellor, G.J., and Evenstad, J. Size segregated aerosol mass concentration measurement device. US Patent 7,932,490. April 26, 2011.
- 3) Wang, X.L., McMurry, P.H., and Kruis, E. Aerodynamic focusing of nanoparticle or cluster beams. US Patent 7,476,851. January 13, 2009.

### **Journal Articles (total 97; Google Scholar h-index 38 and i10-index 75)**

- 1) Claassen, M., Bingham, B., Chow, J.C., Watson, J.G., Wang, Y., Wang, X.L. (2024). "Characterization of Lithium-ion Battery Fire Emissions—Part 1: Chemical Composition of Fine Particles (PM<sub>2.5</sub>)."  
*Batteries* 10 (9):301.
- 2) Claassen, M., Bingham, B., Chow, J.C., Watson, J.G., Wang, Y., Wang, X.L. (2024). "Characterization of Lithium-ion Battery Fire Emissions—Part 2: Particle Size Distributions and Emission Factors."  
*Batteries* 10 (10):366. <https://doi.org/10.3390/batteries10100366>
- 3) Elahifard, M., Wang, X., Chow, Judith C., Watson, John G. (2024). "Functionalization of Filter Media for Improved Crystalline Silica Analysis Using Raman Spectroscopy."  
*Journal of Raman Spectroscopy*. <https://doi.org/10.1002/jrs.6726>
- 4) Kafil, V., Sreenan, B., Hadj-Nacer, M., Wang, Y., Yoon, J., Greiner, M., Chu, P., Wang, X.L., Fadali, M.S., Zhu, X. (2024). "Review of noble metal and metal-oxide-semiconductor based chemiresistive hydrogen sensors."  
*Sensors and Actuators A: Physical* 373:115440.
- 5) Osho, B., Elahifard, M., Wang, X.L., Abbasi, B., Chow, J.C., Watson, J.G., Arnott, W.P., Reed, W.R., Parks, D. (2024). "Evaluation of PVC and Teflon Filters for Direct-On-Filter Crystalline Silica Quantification by FTIR."  
*Journal of Occupational and Environmental Hygiene*. 21 (8):539-550.
- 6) Arnott, W., Kocsis, C., Wang, X.L., Osho, B., Nascimento, P., Taylor, S., Bingham, B., Murphy, C., Sandink, M. (2023). "Real-time measurements of respirable crystalline silica, kaolinite, coal, and calcite," *Underground Ventilation*. CRC Press, pp. 256-263.
- 7) Chen, L.-W.A., Wang, X., Lopez, B., Wu, G., Ho, S.S.H., Chow, J.C., Watson, J.G., Yao, Q., Yoon, S., Jung, H. (2023). "Contributions of non-tailpipe emissions to near-road PM<sub>2.5</sub> and PM<sub>10</sub>: A chemical mass balance study."  
*Environmental Pollution* 122283.

- 8) Lopez, B., Wang, X., Chen, L.-W.A., Ma, T., Mendez-Jimenez, D., Cobb, L.C., Frederickson, C., Fang, T., Hwang, B., Shiraiwa, M., Park, M., Park, K., Yao, Q., Yoon, S., Jung, H. (2023). "Metal contents and size distributions of brake and tire wear particles dispersed in the near-road environment." *Science of the Total Environment* 883:163561.
- 9) Wang, X., Gillies, J.A., Kohl, S., Furtak-Cole, E., Tupper, K.A., Cardiel, D.A. (2023). "Quantifying the Source Attribution of PM<sub>10</sub> Measured Downwind of the Oceano Dunes State Vehicular Recreation Area." *Atmosphere* 14 (4):718.
- 10) Wang, X., Gronstal, S., Lopez, B., Jung, H., Antony Chen, L.W., Wu, G., Ho, S.S.H., Chow, J.C., Watson, J.G., Yao, Q., Yoon, S. (2023). "Evidence of non-tailpipe emission contributions to PM<sub>2.5</sub> and PM<sub>10</sub> near southern California highways." *Environmental Pollution* 317:120691.
- 11) Wang, X.L., Firouzkouhi, H., Chow, J.C., Watson, J.G., Ho, S.S.H., Carter, W., De Vos, A.S.M. (2023). "Characterization of gas and particle emissions from open burning of household solid waste from South Africa." *Atmospheric Chemistry and Physics* 23:8921–8937.
- 12) Wang, X., Firouzkouhi, H., Chow, J.C., Watson, J.G., Ho, S.S.H., Carter, W., De Vos, A.S.M. (2023). "Chemically Speciated Air Pollutant Emissions from Open Burning of Household Solid Waste from South Africa." *Atmospheric Chemistry and Physics* 23 (24):15375–15393.
- 13) Chow, J.C., Watson, J.G., Wang, X., Abbasi, B., Reed, W.R., Parks, D. (2022). "Review of Filters for Air Sampling and Chemical Analysis in Mining Workplaces." *Minerals* 12 (10):1314.
- 14) Nascimento, P., Taylor, S.J., Arnott, W.P., Kocsis, K.C., Wang, X.L., Firouzkouhi, H. (2022). "Development of a Real-Time Respirable Coal Dust and Silica Dust Monitoring Instrument Based on Photoacoustic Spectroscopy." *Mining, Metallurgy & Exploration* Published Online <https://doi.org/10.1007/s42461-022-00653-6>.
- 15) Wang, X.L., Chen, L.-W.A., Lu, M., Ho, K.-F., Lee, S.-C., Ho, S.S.H., Chow, J.C., Watson, J.G. (2022). "Apportionment of Vehicle Fleet Emissions by Linear Regression, Positive Matrix Factorization, and Emission Modeling." *Atmosphere* 13 (7):1066.
- 16) Yuan, M., Wang, Q., Zhao, Z., Zhang, Y., Lin, Y., Wang, X.L., Chow, J.C., Watson, J.G., Tian, R., Liu, H., Tian, J., Cao, J. (2022). "Seasonal variation of optical properties and source apportionment of black and brown carbon in Xi'an, China." *Atmospheric Pollution Research* 13 (6):101448.
- 17) Abbasi, B., Wang, X.L., Chow, J.C., Watson, J.G., Peik, B., Nasiri, V., Riemenschmitter, K.B., Elahifard, M. (2021). "Review of Respirable Coal Mine Dust Characterization for Mass Concentration, Size Distribution and Chemical Composition." *Minerals* 11 (4): 426:1-37.
- 18) Chen, L.-W.A., Chow, J.C., Wang, X., Cao, J., Mao, J., Watson, J.G. (2021). "Brownness of Organic Aerosol over the United States: Evidence for Seasonal Biomass Burning and Photobleaching Effects." *Environ. Sci. Technol.* 55 (13):8561-8572.
- 19) Chow, J.C., Chen, L.W.A., Wang, X.L., Green, M.C., Watson, J.G. (2021). "Improved estimation of PM<sub>2.5</sub> brown carbon contributions to filter light attenuation." *Particuology* 56:1-9.
- 20) Hwang, B., Fang, T., Pham, R., Wei, J., Gronstal, S., Lopez, B., Frederickson, C., Galeazzo, T., Wang, X., Jung, H., Shiraiwa, M. (2021). "Environmentally Persistent Free Radicals, Reactive Oxygen Species Generation, and Oxidative Potential of Highway PM<sub>2.5</sub>." *ACS Earth and Space Chemistry* 5 (8):1865-1875.

- 21) Lin, Y., Pham, L., Wang, X.L., Bahreini, R., Jung, H.S. (2021). "Evaluation of Fast Mobility Particle Sizer (FMPS) for Ambient Aerosol Measurement." *Aerosol Air Qual. Res.* 21 (4):200525.
- 22) Nava, V., Das, K., Amin, V., Gronstal, S., Wang, X.L., Chow, J.C., Watson, J.G., Yang, Y. (2021). "Quantification of carboxyl-functionalized multiwall carbon nanotubes in plant tissues with programmed thermal analysis." *J. Environ. Qual.* 50 (1):278-285.
- 23) Wang, X.L., Antony Chen, L.-W., Ho, K.-F., Chan, C.S., Zhang, Z., Lee, S.-C., Chow, J.C., Watson, J.G. (2021). "Comparison of Vehicle Emissions by EMFAC-HK Model and Tunnel Measurement in Hong Kong." *Atmos. Environ.* 256:118452.
- 24) Watson, J.G., Cao, J., Wang, X., Chow, J.C. (2021). "PM2.5 pollution in China's Guanzhong Basin and the USA's San Joaquin Valley mega-regions." *Faraday Discuss.* 226 (0):255-289.
- 25) Cao, J.J., Wang, Q.Y., Li, L., Zhang, Y., Tan, J., Chen, L.-W.A., Ho, S.S.H., Wang, X.L., Chow, J.C., Watson, J.G. (2020). "Evaluation of the oxidation flow reactor for particulate matter emission limit certification." *Atmos. Environ.*:224, 117086.
- 26) Fujitani, Y., Sato, K., Tanabe, K., Takahashi, K., Hoshi, J., Wang, X.L., Chow, J.C., Watson, J.G. (2020). "Volatility Distribution of Organic Compounds in Sewage Incineration Emissions." *Environ. Sci. Technol.* 54 (22):14235-14245.
- 27) Guo, Q., Zhu, Z., Cheng, Z., Xu, S., Wang, X.L., Duan, Y. (2020). "Correction of Light Scattering-based Total Suspended Particulate Measurements through Machine Learning." *Atmosphere* 11 (2):139.
- 28) June, N.A., Wang, X., Chen, L.-W.A., Chow, J.C., Watson, J.G., Wang, X.L., Henderson, B.H., Zheng, Y., Mao, J. (2020). "Spatial and Temporal Variability of Brown Carbon in the United States: Implications for Direct Radiative Effects." *Geophys. Res. Lett.* 47 (23):e2020GL090332.
- 29) Niu, X., Chuang, H.-C., Wang, X.L., Ho, S.S.H., Li, L., Qu, L., Chow, J.C., Watson, J.G., Sun, J., Lee, S., Cao, J., Ho, K.F. (2020). "Cytotoxicity of PM2.5 vehicular emissions in the Shing Mun Tunnel, Hong Kong." *Environ. Pollut.* 263:114386.
- 30) Peng, C., Tian, M., Wang, X.L., Yang, F., Shi, G., Huang, R.-J., Yao, X., Wang, Q., Zhai, C., Zhang, S., Qian, R., Cao, J., Chen, Y. (2020). "Light absorption of brown carbon in PM2.5 in the Three Gorges Reservoir region, southwestern China: Implications of biomass burning and secondary formation." *Atmos. Environ.* 229:117409.
- 31) Shen, J., Zhao, Q., Cheng, Z., Huo, J., Zhu, W., Zhang, Y., Duan, Y., Wang, X.L., Antony Chen, L.W., Fu, Q. (2020). "Evolution of source contributions during heavy fine particulate matter (PM2.5) pollution episodes in eastern China through online measurements." *Atmos. Environ.* 232:117569.
- 32) Wang, X.L., Hoekman, S.K., Han, Y., Chow, J.C., Watson, J.G., Wu, X., Wu, Y., Schuetzle, D., Schuetzle, R. (2020). "Potential emission reductions by converting agricultural residue biomass to synthetic fuels for vehicles and domestic cooking in China." *Particuology* 49:40-47.
- 33) Wang, X.L., Zhou, H., Arnott, W.P., Meyer, M.E., Taylor, S., Firouzkouhi, H., Moosmüller, H., Chow, J.C., Watson, J.G. (2020). "Evaluation of Gas and Particle Sensors for Detecting Spacecraft-Relevant Fire Emissions" *Fire Saf. J.* 113(102977):1-12.
- 34) Zhang, J., Lance, S., Wang, X., Wang, J., Schwab, J.J. (2020). "Estimation of aerosol liquid water from optical scattering instruments using ambient and dried sample streams." *Atmos. Environ.* 239:117787.

- 35) Chan, T.W., Huang, L., Banwait, K., Zhang, W., Ernst, D., Wang, X.L., Watson, J.G., Chow, J.C., Green, M., Czimczik, C.I., Santos, G.M., Sharma, S., Jones, K. (2019). “Inter-comparison of the elemental and organic carbon mass measurements from three North American national long-term monitoring networks.” *Atmospheric Measurement Techniques* 12, 4543–4560.
- 36) Chow, J.C., Cao, J.J., Chen, L.-W.A., Wang, X.L., Wang, Q.Y., Tian, J., Ho, S.S.H., Watts, A.C., Carlson, T.N., Kohl, S.D., Watson, J.G. (2019). “Changes in PM<sub>2.5</sub> peat combustion source profiles with atmospheric aging in an oxidation flow reactor.” *Atmos. Meas. Tech.* 12:5475-5501.
- 37) Chow, J.C., Wang, X.L., Green, M.C., Watson, J.G. (2019). “Obtaining more information from existing filter samples in PM speciation networks.” *EM* 23 (May):15-19.
- 38) Wang, X.L., Zhou, H., Arnott, W.P., Meyer, M.E., Taylor, S., Firouzkouhi, H., Moosmuller, H., Chow, J.C., Watson, J.G. (2019). “Characterization of smoke for spacecraft safety.” *J. Aerosol Sci.* 136:36-47.
- 39) Watson, J.G., Cao, J.J., Chen, L.-W.A., Wang, Q.Y., Tian, J., Wang, X.L., Gronstal, S.B., Ho, S.S.H., Watts, A.C., Chow, J.C. (2019). “Gaseous, PM<sub>2.5</sub> mass, and speciated emission factors from laboratory chamber peat combustion.” *Atmos. Chem. Phys.* 19 (22):14173-14193.
- 40) Zhao, Z.Z., Cao, J.J., Chow, J.C., Watson, J.G., Chen, L.-W.A., Wang, X.L., Wang, Q.Y., Tian, J., Shen, Z.X., Zhu, C.S., Liu, S.X., Tao, J., Ye, Z.L., Zhang, T., Zhou, J.M., Tian, R.X. (2019). “Multi-wavelength light absorption of black and brown carbon at a high-altitude site on the Southeastern margin of the Tibetan Plateau, China.” *Atmos. Environ.* 212:54-64.
- 41) Cheng, Z., Wang, S., Qiao, L., Wang, H., Zhou, M., Fu, X., Lou, S., Luo, L., Jiang, J., Chen, C., Wang, X.L., Hao, J. (2018). “Insights into extinction evolution during extreme low visibility events: Case study of Shanghai, China.” *Science of The Total Environment* 618:793-803.
- 42) Chow, J.C., Riggio, G.M., Wang, X.L., Chen, L.W.A., Watson, J.G. (2018). “Measuring the Organic Carbon to Organic Matter Multiplier with Thermal/Optical Carbon-Quadrupole Mass Spectrometer Analyses.” *Aerosol Science and Engineering* 2 (4):165-172.
- 43) Chow, J.C., Watson, J.G., Green, M.C., Wang, X.L., Chen, L.-W.A., Trimble, D.L., Cropper, P.M., Kohl, S.D., Gronstal, S.B. (2018). “Separation of brown carbon from black carbon for IMPROVE and CSN PM<sub>2.5</sub> samples.” *Journal of the Air & Waste Management Association* 68, 494-510.
- 44) Cui, L., Wang, X.L., Ho, K.F., Gao, Y., Liu, C., Ho, S.S., Li, H., Wang, X., Jiang, B., Huang, Y., Chow, J.C., Watson, J.G., Chen, L.-W.A. (2018). “Decrease of VOC emissions from vehicular emissions in Hong Kong from 2003 to 2015: results from a tunnel study.” *Atmospheric Environment* 177:64-74.
- 45) Das, K.K., Bancroft, L., Wang, X.L., Chow, J.C., Xing, B., Yang, Y. (2018). “Digestion Coupled with Programmed Thermal Analysis for Quantification of Multiwall Carbon Nanotubes in Plant Tissues.” *Environmental Science & Technology Letters* 5 (7):442-447.
- 46) Harner, T., Rauert, C., Muir, D., Schuster, J.K., Hsu, Y.-M., Zhang, L., Marson, G., Watson, J.G., Ahad, J., Cho, S., Jariyasopit, N., Kirk, J., Korosi, J., Landis, M.S., Martin, J.W., Zhang, Y., Fernie, K., Wentworth, G.R., Wnorowski, A., Dabek, E., Charland, J.-P., Pauli, B., Wania, F., Galarneau, E., Cheng, I., Makar, P., Whaley, C., Chow, J.C., Wang, X.L. (2018). “Air synthesis review: polycyclic aromatic compounds in the oil sands region.” *Environmental Reviews* 26 (4):430-468.

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- 48) Wang, X.L., Ho, K.F., Chow, J.C., Kohl, S.D., Chan, C.S., Cui, L., Lee, S.C., Chen, L.-W.A., Ho, S.S., Cheng, Y., Watson, J.G. (2018). "Hong Kong Vehicle Emission Changes from 2003 to 2015 in the Shing Mun Tunnel." *Aerosol Science and Technology* 52 (10):1085-1098.
- 49) Cheng, Z., Ma, X., He, Y., Jiang, J., Wang, X.L., Wang, Y., Sheng, L., Hu, J., Yan, N. (2017). "Mass extinction efficiency and extinction hygroscopicity of ambient PM<sub>2.5</sub> in urban China." *Environ. Res.* 156:239-246.
- 50) Ni, H., Tian, J., Wang, X.L., Wang, Q., Han, Y., Cao, J., Long, X., Chen, L.W.A., Chow, J.C., Watson, J.G., Huang, R.-J., Dusek, U. (2017). "PM<sub>2.5</sub> emissions and source profiles from open burning of crop residues." *Atmos. Environ.* 169:229-237.
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- 52) Tian, J., Ni, H., Cao, J., Han, Y., Wang, Q., Wang, X., Chen, L.W.A., Chow, J.C., Watson, J.G., Wei, C., Sun, J., Zhang, T., Huang, R. (2017). "Characteristics of carbonaceous particles from residential coal combustion and agricultural biomass burning in China." *Atmospheric Pollution Research* 8 (3):521-527.
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- 56) Hsu, Y.-M., Wang, X.L., Chow, J.C., Watson, J.G., Percy, K.E. (2016). "Collocated comparisons of continuous and filter-based PM<sub>2.5</sub> measurements at Fort McMurray, Alberta, Canada." *Journal of the Air & Waste Management Association* 66 (3):329-339.
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## **Book Chapters**

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- 2) Wang, X.L., Watson, J.G., Chow, J.C., Kohl, S.D., Chen, L.-W.A., Sodeman, D.A., Legge, A.H., Percy, K.E. (2012). Measurement of real-world stack emissions with a dilution sampling system. In *Alberta Oil Sands: Energy, Industry, and the Environment*, Percy, K. E., Ed.; Elsevier Press: Amsterdam, The Netherlands, 171-192.
- 3) Watson, J.G., Chow, J.C., Wang, X.L., Kohl, S.D., Chen, L.-W.A., Etyemezian, V. (2012). Overview of real-world emission characterization methods. In *Alberta Oil Sands: Energy, Industry, and the Environment*, Percy, K. E., Ed.; Elsevier Press: Amsterdam, The Netherlands, 145-170.

## **Peer-Reviewed Conference Papers**

- 1) Wang, X.L., Chow, J.C., Watson, J.G., Meyer, M.E., Ruff, G.A., Easton, J., Berger, G.M., Mudgett, P.D. (2020). "Spacecraft Smoke Detector Characterization with Reference and Smoke Aerosols." 50th International Conference on Environmental Systems, July 12-16, 2020.

## **Selected Conference Presentations**

- 1) Wang, X., Chow, J.C., Watson, J.G., Abbasi, B., Elahifard, M., Osho, B.O. (2023). "Characterization of Respirable Coal Mine Dust Size Distribution, Chemical Composition, and Source Contributions." 2023 SME Annual Conference & EXPO: Denver, CO, February 26 - March 1, 2023.
- 2) Wang, X.L., Bair, S., Griffin, H., Hadj Nacer, M., Bingham, B., Arnott, W.P., Chow, J.C., Watson, J.G. (2023). "A Review of Aerodynamic Lenses Development, Challenges, and Needs." 41st AAAR Annual Conference: Portland, OR, October 2-6, 2023.
- 3) Watson, J.G., Wang, X.L., Chow, J.C. (2023). "History of Ambient Aerosol Sampling for Environmental Health Assessments." 41st AAAR Annual Conference: Portland, OR, October 2-6, 2023
- 4) Wang, X.L., Gronstal, S., Lopez, B., Jung, H., Chen, L.-W.A., Ho, S.S.H., Chow, J.C., Watson, J.G., Frederickson, C., Mendez-Jimenez, D., Ma, T., Cobb, L., Yao, Q., Yoon, S. (2022). "Contributions of Non-tailpipe Emissions to PM<sub>2.5</sub> and PM<sub>10</sub> near Highways." 2022 National Ambient Air Monitoring Conference: Pittsburgh, PA, August 22-25, 2022.
- 5) Wang, X.L., Firouzkouhi, H., Claassen, M., Chow, J.C., Watson, J.G., Fourie, G., Mamadi, M. (2021). "Characterization of Gas and Particle Emissions from Solid Waste Open Burning." 39th AAAR Annual Conference: Online, October 18-22, 2021.
- 6) Wang, X.L., Chow, J.C., Watson, J.G., Meyer, M.E., Ruff, G.A., Urban, D.L., Easton, J., Berger, G.M., Mudgett, P.D. (2020). "Laboratory-Generated Aerosols as Transfer Standards to Characterize Smoke Detector Performance." 38th AAAR Annual Conference: Online, October 5-9, 2020.
- 7) Wang, X.L., Zhou, H., Arnott, W.P., Meyer, M.E., Taylor, S., Firouzkouhi, H., Moosmüller, H., Chow, J.C., Watson, J.G. (2019). "Characterization of Smoke for Spacecraft Fire Safety." 37th AAAR Annual Conference: Portland, OR, October 14-18, 2019.

- 8) Wang, X., Chow, J. C., Daub, B. J., Gronstal, S. B., Chen, L.-W.A., Green, M. C., Watson, J. G., 2018: Estimation of Brown Carbon in PM<sub>2.5</sub> Samples from Long-Term Networks, 10th International Aerosol Conference: St. Louis, MO, September 2-7, 2018
- 9) Wang, X., Chow, J. C., Watson, J. G., Chen, L.-W.A., Ho, K. F., Lee, Shuncheng, Cui, L., 2018: Characterization of Vehicle Emission Changes in Hong Kong from 2003 to 2015 via Tunnel Studies, AGU/CAS Joint Conference on Atmospheric PM<sub>2.5</sub> in China: Change, Impact, Mitigation and Global Perspective: Xi'an, China, October 16-20, 2018
- 10) Wang, X.L., Khlystov, A. Y., Chow, J. C., Watson, J. G., Zielinska, B. K., Chen, L.-W.A., Ho, K. F., Lee, F.S.C., 2017: On-road Vehicle Emission Characterization from Tunnel Studies, 2017 Health Effects Institute Annual Conference: Alexandria, VA, April 30, 2017.
- 11) Wang, X.L., Riggio, G. M., Yang, X., Yatavelli, L., Chen, L.-W.A., Chow, J. C., Watson, J. G., 2016: Quantitative Off-line Particulate Matter Composition Analysis with Thermal Desorption Mass Spectrometry, 35th Annual Conference of the American Association for Aerosol Research: Portland, OR, October 17-21, 2016.
- 12) Wang, X.L., Sumlin, B., Mayorga, S., Gronstahl, S., Chen, L.-W.A., Chow, J.C., Watson, J.G. (2015). Design and Characterization of a Multiwavelength Thermal/Optical Carbon Analyzer. AAAR 34th Annual Conference: Minneapolis, MN, 10/13/2015.
- 13) Wang, X.L., Chow, J.C., Kohl, S.D., Yatavelli, L.N.R., Percy, K.E., Legge, A.H., Watson, J.G. (2015). Windblown Dust Characterization in the Canadian Oil Sands Region. AAAR 34th Annual Conference: Minneapolis, MN, 10/13/2015.
- 14) Wang, X.L., Watson, J.G., Chow, J.C., Kohl, S.D., Percy, K.E., Legge, A.H. (2015). Emission and Chemical Characterization of Fugitive Dust in the Athabasca Oil Sands Region. Joint Industry-AEMERA Workshop on Fugitive Emissions: Calgary, AB, Canada, 06/02/2015.
- 15) Wang, X.L., Khlystov, A., Chow, J.C., Watson, J.G., Zielinska, B., Chen, L.-W.A., Ho, K.F., Lee, S.C. (2015). Real-world Vehicle Emission Characterization for the Shing Mun Tunnel in Hong Kong and Ft. McHenry Tunnel in the U.S. Health Effects Institute 2015 Annual Conference: Philadelphia, PA, 5/3/2015.
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- 17) Wang, X.L., Chow, J.C., Watson, J.G., Grose, M.A., Caldow, R., Osmondson, B.L., Swanson, J., Kittelson, D.B., Li, Y., Xue, J., Jung, H. (2014). Engine Exhaust Particle Sizer (EEPS) Improvement for Engine Emission Measurement. 18th ETH Conference on Combustion Generated Nanoparticles: Zurich, Switzerland, 6/22/2014.
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- 22) Wang, X.L., Watson, J.G., Chow, J.C., Kohl, S.D. (2012). Characterization of Stationary Source Emissions in the Athabasca Oil Sands Region. Presented in the WBEA TEEM Investigators/Members Workshop, Calgary, Alberta, Canada, 28 November 2012.
- 23) Wang, X.L., Kohl, S.D., Chow, J.C., Watson, J.G. (2012). Real-world Emission Characterization in the Canadian Oil Sands Region. Presented in the AAAR 31th Annual Conference, Minneapolis, MN, 8 October 2012.
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- 25) Wang, X.L., Kohl, S.D., Chow, J.C., Watson, J.G., Gronstal, S. (2010). On-board emission measurements from the world's largest mining trucks. Presented in the AAAR 29th Annual Conference, Portland, OR, 25 October 2010.
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- 28) Wang, X.L., Sreenath, A., Agarwal, J.K. (2009). Performance Characterization of a DustTrak DRX. Presented in the 28th AAAR Annual Conference, Minneapolis, MN, 26 October 2009.
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- 32) Wang, X.L., Caldow, R., Sem, G.J., Sakurai, H., Hama, N. (2007). Evaluation of TSI 3068B Aerosol Electrometer and 3790 Engine Exhaust CPC. Presented in 26th AAAR Annual Conference, Reno, NV, 24 September 2007.
- 33) Wang, X.L., McMurry, P.H. (2006). Aerodynamic focusing of heavy ions and nanoparticles. Presented in 54th ASMS Conference on Mass Spectrometry, Seattle, WA, 28 May 2006.
- 34) Wang, X.L., Kruis, F.E., McMurry, P.H. (2005). Designing Aerodynamic Lenses for Nanoparticles. Presented in 24th AAAR Annual Conference, Austin, TX, 17 October 2005.

## **Technical Reports**

- 1) Abbasi, B., Wang, X., Chow, J.C., Watson, J.G., Osho, B., Elahifard, M., (2023). "Characterization of Respirable Coal Mine Dust Size Distribution, Chemical Composition, and Source Contributions." National Institute of Occupational Health and Safety (NIOSH). University of Nevada, Reno, NV (UNR) and Desert Research Institute, Reno, NV (DRI).
- 2) Elahifard, M., Osho, B., Wang, X., Chow, J.C., Watson, J.G., Abbasi, B., (2023). "A Preliminary Study of Respirable Crystalline Silica Direct-on-Filter Analysis Using Raman Spectroscopy - A Milestone Report." National Institute of Occupational Health and Safety (NIOSH). Desert Research Institute and University of Nevada, Reno, Reno, NV.
- 3) Jung, H., Wu, G., Chen, L.-W.A., Wang, X.L., Zhang, K.M., Lopez, B., (2022). "Real-world tire and brake wear emissions." California Air Resources Board, Sacramento, CA.
- 4) Wang, X.L., Chow, J.C., Watson, J.G., (2022). "Emissions of Chemically Speciated Air Pollutants from Solid Waste Open Combustion." Sasol South Africa Ltd. Desert Research Institute, Reno, NV.
- 5) Wang, X.L., Gillies, J.A., Kohl, S.D., Nikolich, G., (2022). "Chemical Speciation and Source Attribution of PM10 Samples Collected in 2021 at the CDF Monitoring Site." California Department of Parks and Recreation. Desert Research Institute, Reno, NV.
- 6) Watson, J.G., Chow, J.C., Kohl, S.D., Gronstal, S.B., Claassen, M., Wang, X.L., (2022). "Identifying sources of excessive elemental concentrations in stormwater runoff at the LADWP Haynes and Harbor generating stations." Electric Power Research Institute. Desert Research Institute, Reno, NV.
- 7) Fortenberry, C., Wang, X.L., Cleary, T., Easton, J., Berger, G., Meyer, M., (2021). "Research Questions and Challenges for Improved Fire Detection - A topical white paper submitted to the National Academies of Science, Engineering and Medicine (NASEM) for the NASA Biological and Physical Sciences Decadal Survey, 2022-2032." NASA Glenn Research Center. Cleveland, OH.
- 8) Wang, X.L., Firouzkouhi, H., Claassen, M., Chow, J.C., Watson, J.G. (2020). "Emission Factors for Criteria Pollutants from Solid Waste Material Combustion." Mamadi & Company. Desert Research Institute,, Reno, NV.
- 9) Wang, X.L., Chow, J.C., Watson, J.G. (2020). "Spacecraft Smoke Detector Characterization with Reference and Smoke Aerosols." NASA Glenn Research Center. Desert Research Institute,, Reno, NV.
- 10) Wang, X.L., Firouzkouhi, H., Claassen, M., Bingham, B., Gronstal, S., Kohl, S., Rhode, D., Son, Y., Chow, J.C., Watson, J.G., Kumar, N. (2020). "Virus Transport and Mitigation in Offices and Classrooms." Nevada Governor's Office of Economic Development. Desert Research Institute,, Reno, NV.
- 11) Wang, X.L., Firouzkouhi, H., Claassen, M., Bingham, B., Gronstal, S., Kohl, S., Rhode, D., Son, Y., Moosmüller, H., Chow, J.C., Watson, J.G., Kumar, N. (2020). "Virus Transport and Mitigation in Public Transit Buses." Nevada Governor's Office of Economic Development. Desert Research Institute,, Reno, NV.
- 12) Wang, X.L., Watson, J.G., Chow, J.C. (2019). "Dilution Measurement of Stack Emissions from an Incineration Plant." National Institute for Environmental Studies (Japan). Desert Research Institute, Reno, Nevada
- 13) Wang, X.L., Khlystov, A., Ho, K.F., Campbell, D., Chow, J.C., Kohl, S.D., Watson, J.G., Lee, S.C., Chen, L.-W.A., Lu, M., Ho, S.S.H. (2019). "Real-World Vehicle Emissions

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### **Courses Taught**

- ATMS 743 (University of Nevada, Reno): Cloud and Aerosol Physics (2016–Present)
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