

Biographical Sketch: Thomas W. Kirchstetter

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(a) Professional Preparation

Alexander Hollaender Distinguished Postdoctoral Fellow, LBNL, 1998 – 2000

Ph.D. Environmental Engineering, University of California at Berkeley, 1998

M.S. Environmental Engineering, University of California at Berkeley, 1994

B.S. Atmospheric Science and Mathematics, State University of New York at Albany, 1991

(b) Appointments

Lawrence Berkeley National Laboratory, Energy Analysis & Environmental Impacts Division

Senior Scientist and Scientific Division Director, 2017 – present

Primary steward of research, people, and safety of a scientific division of approximately 150 research and support staff • Lead world class research • Professional service to the laboratory

Department Head, Sustainable Energy and Environmental Systems, 2015 – 2020

Group Leader, Sustainable Energy Systems, 2015 – 2017

Staff Scientist, 2000 – 2018

University of California Berkeley, Department of Civil & Environmental Engineering

Adjunct Professor, 2018 – present

Teach environmental engineering courses • Lead world class research • Principle advisor of graduate student thesis research • PhD student exam committee service

Associate Adjunct Professor, 2011 – 2018

Lecturer, 2005 – 2011

Research interests: Air pollution science & technology: Pollutant emissions and controls with a focus on the transportation sector • Airborne transmission of coronavirus • Emerging low-cost air pollution sensor development and applications • Community air monitoring networks • Characterization and environmental impacts of carbonaceous aerosols • Environmental impacts of municipal solid waste-to-energy • System level energy impacts of emerging mobility technologies

Course instruction:

Air Quality Engineering: Air pollution and climate change; sources and controls; atmospheric transport, deposition, and chemical transformations; atmospheric aerosol dynamics and control techniques (co-taught in Spring 2017, 2016)

Water and Air Quality Laboratory: Contaminant transport and transformation, reactor models, water treatment, and air quality (Fall 2019, 2018, 2017; Spring 2016, 2015, 2014)

Environmental Engineering: Contaminant transport and transformation, reactor models, water treatment, and air quality (Fall 2012; Spring 2011; Spring 2008)

Environmental Engineering and Science: Population growth, energy consumption, air pollution, climate change, and water treatment (Spring 2005)

(c) Selected Other Professional Service and Synergistic Activities

- Co-founder and Chair of Oppenheimer Leadership Network, 2020 – present
- Inclusion, Diversity, Equity, and Accountability (IDEA) Division Director
Accountability Committee Member, LBNL, 2019
- Member, SMART Mobility Steering Committee, Vehicle Technologies Office, DOE, 2018 – 2020
- Editor, Aerosol Science and Technology Journal, 2013 – 2018
- Organizer, International Conference on Carbonaceous Particles in the Atmosphere, 2000 – 2018
- Contributor, EPA's Integrated Science Assessment for particulate matter welfare effects – 2016
- Editor, Journal of Atmospheric Chemistry and Physics, 2006 – 2013
- Member, Distinguished Lecture Series Committee, Lawrence Berkeley National Lab, 2011 – 2013

(d) Selected Honors

- R&D 100 Award Winner, Cool Roof Time Machine, 2017
- Outstanding Mentor Award, DOE, Office of Science Undergraduate Research Program, 2005
- Alexander Hollaender Distinguished Postdoctoral Fellowship, Department of Energy, 1998
- Golden West Section Graduate Scholarship, Air & Waste Management Association, 1994
- Science and Engineering Research Semester Award, Department of Energy, 1992

(e) Mentoring

Current and Former Postdoctoral associates:

Dr. Chelsea Preble, Postdoctoral Associate, CEE, Aug 2017 – present

Dr. Odelle Hadley, E.O. Lawrence Postdoctoral Fellow, LBNL, Jan 2009 – Dec 2011

Dr. Joshua Apte, ITRI-Rosenfeld Postdoctoral Fellow, LBNL, Jun 2013 – Dec 2014

Current and Former PhD. students:

Rebecca Sugrue, NSF graduate research fellow, CEE, Aug 2017 – present

Julien Caubel, NSF graduate research fellow, ME, completed PhD Dec 2018

Chelsea Preble, NSF graduate research fellow, CEE, completed PhD May 2017

Ph.D. qualifying and preliminary exam committees:

Emily Barnes (UCB, 2019) Regan Patterson (UCB, 2017, 2019), Rebecca Wernis (UCB, 2016), Ellen Gray (UCB, 2016), Ivy Tao (UCB, 2013), Brian McDonald (UCB, 2011), Yanju Chen (U. Illinois, 2011), Tim Dallmann (UCB, 2011), Gavin McMeeking (Col. State, 2008)

Undergraduate students mentored via CE199, HI94, ESPM HI75L, or research appointment:

Civil & Environmental Engineering: Priscilla Khuu, Caroline Loffredo, Annie Rosen, Kelly Archer, Carter Keeling, Chloe Cheok, Sean Dasey, Chelsea Preble, Nick Tang; *Earth & Planetary Sciences:* Anna Tarplin; *Chemical Engineering:* Yannick Johnson, Brandon Yee; *Environmental Science, Policy & Management:* Shannon Chang

(f) Patents

- Patent 9,856,383, "Mixture and method for simulating soiling and weathering of surfaces" Inventors: Sleiman, M; Kirchstetter, T; Destailats, H; Levinson, R; Berdahl, P; Akbari, H, Issued January 2018
- Patent 10,495,573, "Instrument for measuring airborne particulate matter" Inventors: Caubel JJ, Cados TE, Kirchstetter, TW, Issued December 2019

(g) Peer-Reviewed Journal Publications

(Google Scholar h-index = 48, citations = 9900; Web of Science h-index = 41, citations = 6200)

81. Nordahl, S; Devkota, J; Amirebrahimi, J; Smith, S; Breunig, H; Preble, C; Satchwell, A; Jin, L; Brown, N; Kirchstetter, T; Scown, C (2020) Life-Cycle Greenhouse Gas Emissions and Human Health Tradeoffs of Organic Waste Management Strategies, *Environ. Sci. Technol.*, doi:10.1021/acs.est.0c00364
80. Chambliss, S; Preble, C; Caubel, J; Cados, T; Messier, K; Alverez, R; La Franchi, B; Lunden, M; Marshall, J; Szpiro, A; Kirchstetter, T; Apte, J (2020) Comparison of Mobile and Fixed-Site Black Carbon Measurements for High-Resolution Urban Pollution Mapping, *Environ. Sci. Technol.*, doi:10.1021/acs.est.0c01409
79. Preble, CV; Harley, RA; Kirchstetter, TW (2019) Control Technology-Driven Changes to In-Use Heavy-Duty Diesel Truck Emissions of Nitrogenous Species and Related Environmental Impacts, *Environ. Sci. Technol.*, doi:10.1021/acs.est.9b04763
78. Caubel, JJ; Cados, TE; Preble, CV; Kirchstetter, TW (2019) A Distributed Network of 100 Black Carbon Sensors for 100 Days of Air Quality Monitoring in West Oakland, California, *Environ. Sci. Technol.*, doi:10.1021/acs.est.9b00282
77. Sun, T; Liu, L; Flanner, MG; Kirchstetter, TW; Jiao, C; Preble, CV; Chang, WL; Bond, TC (2019) Constraining a Historical Black Carbon Emission Inventory of the United States for 1960-2000, *J. Geophys. Res. Atmos.*, doi:10.1029/2018JD030201
76. Browne, E; Zhang, X; Franklin, J; Ridley, K; Kirchstetter, TW; Wilson, K; Cappa, C; Kroll, J (2019) Effect of heterogeneous oxidative aging on light absorption by biomass-burning organic aerosol, *Aerosol Sci. Technol.*, 53:6, 663-674, doi:10.1080/02786826.2019.1599321
75. Satchwell, AJ; Scown, CD; Smith, SJ; Amirebrahimi, J; Jin, L; Kirchstetter, TW; Brown, NJ; Preble, CV (2018) Accelerating the Deployment of Anaerobic Digestion to Meet Zero Waste Goals, *Environ. Sci. Technol.*, doi: 10.1021/acs.est.8b04481
74. Preble, CV; Cados, TE; Harley, RA; Kirchstetter, TW (2018) In-use performance and durability of particle filters on heavy-duty diesel trucks, *Environ. Sci. Technol.*, doi: 10.1021/acs.est.8b02977
73. Caubel, JJ; Cados, TE; Kirchstetter, TW (2018) A New Black Carbon Sensor for Dense Air Quality Monitoring Networks, *Sensors*, 18, 738
72. Apte, JS; Messier, KP; Gani, S; Brauer, M; Kirchstetter, TW; Lunden, MM; Marshall, JD; Portier, CJ; Vermeulen, RCH; Hamburg, SP (2017) High-resolution air pollution mapping with Google Street View cars: exploiting big data, *Environ. Sci. Technol.*, doi: 10.1021/acs.est.7b00891
71. Kirchstetter, TW; Preble, CV; Hadley, OL; Bond, TC; Apte, JS (2017) Large reductions in urban black carbon concentrations in the United States between 1965 and 2000, *Atmos. Environ.*, 151, 17-23, doi:10.1016/j.atmosenv.2016.11.001
70. Berdahl P, Chen SS, Destailats H, Kirchstetter TW, Levinson RM, Zalich MA (2016) Fluorescent cooling of objects exposed to sunlight – The ruby example. *Solar Energy Materials & Solar Cells*, doi:10.1016/j.solmat.2016.05.058
69. Sleiman, M; Chen, S; Gilbert, HE; Kirchstetter, TW; Berdahl, P, et al (2015) Soiling of building envelope surfaces and its effect on solar reflectance - Part III: Interlaboratory study of an accelerated aging method for roofing materials, *SOLMAT*, 143, 581-590, doi:10.1016/j.solmat.2015.07.031
68. Preble, CV, Dallmann, TR; Kreisberg, NM; Hering, SV; Harley, RA; Kirchstetter, TW (2015) Effects of particle filters and selective catalytic reduction on heavy-duty diesel drayage truck emissions at the Port of Oakland, *Environ. Sci. Technol.*, doi:10.1021/acs.est.5b01117

67. Tang, NW; Apte, JS; Martien, PT; Kirchstetter, TW (2015) Measurement of black carbon emissions from in-use diesel-electric passenger locomotives in California, *Atmos. Environ.*, *115*, 295-303, doi:10.1016/j.atmosenv.2015.05.001
66. Browne, EC; Franklin, JP; Canagaratna, MR; Massoli, P; Kirchstetter, TW; Worsnop, DR; Wilson, KR; Kroll, JH (2015) Changes to the Chemical Composition of Soot from Heterogeneous Oxidation Reactions, *J. Physical Chem. A*, *119*, 1154-1163, doi: 10.1021/jp511507d.
65. Canagaratna, MR; Massoli, P; Browne, EC; Franklin, JP; Wilson, KR; Onasch, TB; Kirchstetter, TW; Fortner, EC; Kolb, CE; Jayne, JT; Kroll, JH; Worsnop, DR (2015) Chemical Compositions of Black Carbon Particle Cores and Coatings via Soot Particle Aerosol Mass Spectrometry with Photoionization and Electron Ionization, *J. Physical Chem. A*, *119*, 4589-4599, doi:10.1021/jp510711u.
64. Preble, CV; Hadley, OL; Gadgil, AJ; Kirchstetter, TW (2014) Emissions and climate-relevant optical properties of pollutants emitted from a Three-Stone Fire and the Berkeley-Darfur Stove tested under laboratory conditions, *Environ. Sci. Technol.*, doi:10.1021/es5002715.
63. Dallmann, TR; Onasch, TB; Kirchstetter, TW; Worton, DR; Fortner, EC; Herndon, SC; Wood, EC; Franklin, JP; Worsnop, DR; Goldstein, AH; Harley, RA (2014) Characterization of particulate matter emissions from on-road gasoline and diesel vehicles using a soot particle aerosol mass spectrometer, *Atmos. Chem. Phys. Discuss*, doi: 10.5194/acpd-14-4007-2014.
62. Thatcher, TL; Kirchstetter, TW; Malejan, CJ; Ward, CE (2014) Infiltration of black carbon particles from residential woodsmoke into nearby homes, *Open J. Air Poll.*, *3*, doi:10.4236/ojap.2014.34011.
61. Thatcher, TL; Kirchstetter, TW; Tan, SH; Malejan, CJ; Ward, CE (2014) Near-field variability of residential woodsmoke concentrations, *Atmos. Climate Sci.*, *4*, doi: 10.4236/acs.2014.44055.
60. Worton, DR; Isaacman, G; Gentner, DR; Dallmann, TR; Chan, AWH; Ruehl, CR; Kirchstetter, TW; Wilson, KR; Harley, RA; Goldstein, AH (2014) Lubricating oil dominates primary organic aerosol emissions from motor vehicles, *Environ. Sci. Technol.*, doi:10.1021/es405375j.
59. Wang, Y; Sohn, MD; Wang, Y; Lask, KM; Kirchstetter, TW; Gadgil, AJ (2014) How many replicate tests are needed to test cookstove performance and emissions? – Three is not adequate, *Energy for Sustainable Development*, *20*, 21–29, doi:10.1016/j.esd.2014.02.002.
58. Sleiman, M; Kirchstetter, TW; Berdahl, P; Gilbert, HE; Quelen, S; Marlot, L; Preble, C; Chen, S; Montalbano, A; Rosseler, O; Akbari, H; Levinson, R; Destailhats, H (2014) Soiling of building envelope surfaces and its effect on solar reflectance - Part II: Development of an accelerated aging method for roofing materials, *SOLMAT*, *122*, 271-281, doi:10.1016/j.solmat.2013.11.028.
57. Dallmann, TR; Kirchstetter, TW; DeMartini, SJ; Harley, RA (2013) Quantifying on-road emissions from gasoline-powered motor vehicles: accounting for the presence of medium and heavy-duty diesel trucks, *Environ. Sci. Technol.*, *47*, 13873-13881, doi:10.1021/es402875u
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54. Hadley, OL; Kirchstetter, TW (2012) Black carbon snow albedo reduction, *Nature Climate Change*, *2*, 437-440, doi: 10.1038/NCLIMATE1433.

53. Dallmann, TR; DeMartini, SJ; Kirchstetter, TW; Herndon, SC; Onasch, TB; Wood, EC; Harley, RA (2012) On-Road Measurement of Gas and Particle Phase Pollutant Emission Factors for Individual Heavy-Duty Diesel Trucks, *Environ. Sci. Technol.*, 46, 8511-8518, doi:10.1021/es301936c.
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51. Kirchstetter, TW; Thatcher, TL (2012) Contribution of organic carbon to wood smoke particulate matter absorption of solar radiation, *Atmos. Chem. Phys.*, 12, 1-6, doi:10.5194/acp-12-1-2012.
49. Dallmann, TR; Harley, RA; Kirchstetter, TW (2011) Effects of diesel particle filter retrofits and accelerated fleet turnover on drayage truck emissions at the port of Oakland, *Environ. Sci. Technol.*, 45, 10773–10779.
48. Sleiman, M; Ban-Weiss, G; Gilbert, HE; Francois, D; Berdahl, P; Kirchstetter, TW; Destailats, H; Levinson, R (2011) Soiling of building envelope surfaces and its effect on solar reflectance – Part 1: Analysis of roofing product databases, *Sol. Energ. Mat. Sol. Cells*, 95, 3385-3399, doi:10.1016/j.solmat.2011.08.002.
47. Apte, JS; Kirchstetter, TW; Reich, AH; Deshpande, SJ; Kaushik, G; Chel, A; Marshall, JD; Nazaroff, WW (2011) Concentrations of fine, ultrafine, and black carbon particles in auto-rickshaws in New Delhi, India, *Atmos. Environ.*, 45, 4770-4480.
46. Soto-García, LL; Andreae, MO; Andreae, TW; Artaxo, P; Maenhaut, W; Kirchstetter, T; Novakov, T; Chow, JC; Mayol-Bracero, OL (2011) Evaluation of the carbon content of aerosols from the burning of biomass in the Brazilian Amazon using thermal, optical and thermal-optical analysis methods, *Atmos. Chem. Phys.*, 11, 4425-4444, doi:10.5194.
45. Hadley, OL; Corrigan, CE; Kirchstetter, TW; Cliff, SS; Ramanathan, V (2010) Measured black carbon deposition on the Sierra Nevada snow pack and implication for snow pack retreat, *Atmos. Chem. Phys.*, 10, 7505-7513.
44. Strawa, AW; Kirchstetter, TW; Hallar, AG; Ban-Weiss, GA; McLaughlin, JP; Harley, RA; Lunden, MM (2009) Optical and physical properties of primary on-road vehicle particle emissions and their implications for climate change, *J. Aerosol Sci.*, 41, 36-50.
43. Strawa, AW; Kirchstetter, TW; Puxbaum, (2010) Special issue for the 9th international conference on carbonaceous particles in the atmosphere, *J. Aerosol Sci.*, 41, 1-4.
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41. Ban-Weiss, GA; Lunden, MM; Kirchstetter, TW; Harley, RA (2009) Size-resolved particle number and volume emission factors for on-road gasoline and diesel motor vehicles, *J. Aerosol Sci.*, 41, 5-12.
40. Ban-Weiss, G; Lunden, MM; Kirchstetter, TW; Harley, RA (2009) Measurement of black carbon and particle number emission factors from individual heavy-duty trucks, *Environ. Sci. Technol.*, 43, 1419–1424.

39. Timko, MT; Yu, Z; Kroll, J; Jayne, JT; Worsnop, DR; Miake-Lye, RC; Onasch, TB; Liscinsky, D; Kirchstetter, TW; Destailats, H; Holder, AL; Smith, JD; Wilson, KR. (2009) Sampling artifacts from conductive silicone tubing, *Aerosol Sci Technol.*, *43*, 855-865.
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37. Kean, A; Littlejohn, D; Ban-Weiss, G; Harley, R; Kirchstetter, TW; Lunden M. (2009) Trends in on-road vehicle emissions of ammonia, *Atmos. Environ.*, *43*, 1565-1570.
36. Kirchstetter, TW; Aguiar, J; Tonse, S; Novakov, T; Fairley, D. (2008) Black carbon concentrations and diesel vehicle emission factors derived from coefficient of haze measurements in California: 1967-2003. *Atmos. Environ.*, *42*, 480-491.
35. Novakov, T; Kirchstetter, TW; Menon, S; Aguiar, J. (2008) Response of California temperature to regional anthropogenic aerosol changes, *Geophys. Res. Lett.*, *35*, L19808, doi:10.1029/2008GL034894.
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