

Biographical Sketch: Thomas W. Kirchstetter

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Environmental Energy Technologies Division • Lawrence Berkeley National Laboratory •
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(a) Professional Preparation

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

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

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

Postdoctoral Research Associate, Lawrence Berkeley National Laboratory, 1998 – 2000

(b) Current Appointments

Staff Scientist, Lawrence Berkeley National Laboratory, 2000 – present

Group Leader, Sustainable Energy Systems Group, 2015 – present

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

Adjunct Associate Professor, University of California Berkeley, 2011 – present

Department of Civil and Environmental Engineering

Research interests: Air pollution: emissions and controls with a focus on transportation, biomass combustion, and anaerobic digestion • Aerosols: composition, climate-relevant optical properties, black and brown carbon • Aerosol measurement technology: traditional and micro-electromechanical sensors, fabrication and evaluation • Waste-to-energy for greenhouse gas reduction

(c) Prior Appointments

Lecturer, University of California, Berkeley, Spring 2005, 2008, 2011

Department of Civil and Environmental Engineering

Postdoctoral Research Associate, Lawrence Berkeley National Laboratory Alexander Hollaender

Distinguished Postdoctoral Fellow, 1998 – 2000

DOE Science and Engineering Research Semester & Summer Participant, 1992 Energy Science Division, Brookhaven National Laboratory

Undergraduate Research Assistant, 1991

Atmospheric Sciences Division, State University of New York at Albany

(d) Courses Taught at UC Berkeley

CE 111L – Air and Water Quality Laboratory, Upper division, Spring 2015, Spring 2014

CE 111 – Environmental Engineering, Upper division, Spring 2008, Spring 2011, Fall 2012

CE 11 – Environmental Engineering and Science, Lower division, Spring 2005

(e) Research Supervision

Current UC Berkeley Ph.D. students:

Chelsea Preble (NSF graduate research fellow) and Nicholas Tang

Ph.D. qualifying exam committee member for:

Ivy Tao (UCB, 2013), Brian McDonald (UCB, 2011), Yanju Chen (U. Illinois, 2011), Tim Dallmann (UCB, 2011), Gavin McMeeking (Col. State, 2008)

(e) Research Supervision (continued)

Former Postdoctoral Fellows:

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

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

(f) Professional Service and Synergistic Activities

Member, Air-Microfluidics Group, 2014 – present

Editor, Aerosol Science and Technology Journal, 2013 – present

Editor, Journal of Atmospheric Chemistry and Physics, 2006 – 2013

Organizer, International Conference on Carbonaceous Particles in the Atmosphere, 2000 – present

Member, Distinguished Lecture Series Committee, Lawrence Berkeley National Lab, 2011 – 2013

Member, Bay Area AQMD's Community Air Risk Evaluation Task Force, 2008 – 2010

Panel Expert, Alameda Board of County Supervisors, Local Port Truckers' Panel Hearing, Aug 2011

Panel Reviewer, DOE Atmospheric Systems Research, Aerosol-climate proposals, Sep 2010

Reviewer, DOE SBIR Program, Low emission high efficiency biomass cookstove proposals, Mar 2012

Reviewer, Manuscripts for peer-review journals including ES&T, GRL, JGR, ACP, Recurring

(g) Honors

Outstanding Mentor Award, DOE, Office of Science Undergraduate Research Program, 2005

Research & Development Award, Lawrence Berkeley National Laboratory, 2011, 2007, 2002

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

(h) Peer-Reviewed Publications (h-index = 30; 3400 citations)

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; Destailats, 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
56. Scarnato, B; Vahidinia, S; Richard, DT; Kirchstetter, TW (2013): Effects of internal mixing and aggregate morphology on optical properties of black carbon using a discrete dipole approximation model, *Atmos. Chem. Phys.*, 13, 5089-5101, doi:10.5194/acp-13-5089-2013.
55. Chan, AWH; Isaacman, G; Wilson, KR; Worton, DR; Ruehl, CR; Nah, T; Gentner, DR; Dallmann, TR; Kirchstetter, TW; et al. (2013) Detailed chemical characterization of unresolved complex mixtures in atmospheric organics: Insights into emission sources, atmospheric processing, and secondary organic aerosol formation, *J. Geophys. Res. Atmos.*, 118, doi:10.1002/jgrd.50533.
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.
52. Baumgardner, D; Popovicheva, O; Allan, J; Bernardoni, V; Cao, J; Cavalli, F; Cozic, J; Diapouli, E; Eleftheriadis, K; Genberg, PJ; Gonzalez, C; Gysel, M; John, A; Kirchstetter, TW; et al. (2012) Soot reference materials for instrument calibration and intercomparisons: a workshop summary with recommendations, *Atmos. Meas. Tech.*, 5, 1869-1887, doi:10.5194/amt-5-1869-2012, 2012.
50. Gadgil, A. J., Fridley, D, Zheng, N, Sosler, A, Kirchstetter, T, and Phadke, A, Energy in the Developing World (2011) Book chapter in *Physics of Sustainable Energy II: Using Energy Efficiency and Producing it Renewably*, Hafemeister, D., Kammen, D., Levi, B., and Schwartz, P., Eds. Published by American Institute of Physics, AIP Conf. Proc. 1401, Melville, NY, 2011. Pp. 54-74. doi: 10.1063/1.3653845.
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.
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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.
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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.
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32. Ban-Weiss, GA; McLaughlin, JP; Harley, RA; Lunden, MM; Kirchstetter, TW; Kean, AJ; Strawa, AW; Stevenson, ED; Kendall, GR. (2008) Long-term changes in emissions of nitrogen oxides and particulate matter from on-road gasoline and diesel vehicles, *Atmos. Environ.*, *42*, 220-232.
31. Kirchstetter, T.W.; Novakov, T. (2007) Controlled generation of black carbon particles from a diffusion flame and applications in evaluating black carbon measurement methods. *Atmos. Environ.*, *41*, 1874-1888, doi:10.1016/j.atmosenv.2006.10.067.
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29. Jimenez, J; Claiborn, C; Larson, T; Gould, T; Kirchstetter, TW; Gundel, L (2007) Loading effect correction for real-time aethalometer measurements of fresh diesel soot, *J. Air Waste Manage.*, *57*, 868-873.
28. Hering, SV; Lunden, MM; Thatcher, TL; Kirchstetter, TW; Brown, NJ (2007) Using regional data and building leakage to assess indoor concentrations of particles of outdoor origin. *Aerosol Sci. Technol.*, *41*, 639-654.
27. Harley, RA; Hooper, DS; Kean, AJ; Kirchstetter, TW; et al. (2006) Effects of reformulated gasoline and motor vehicle fleet turnover on emissions and ambient concentrations of benzene, *Environ. Sci. Technol.*, *40*, 5084-5088, doi:10.1021/es0604820.
26. Novakov T, Menon S, Kirchstetter TW, Koch, D; Hansen, JE. (2005) Aerosol organic carbon to black carbon ratios: analysis of published data and implications for climate forcing, *J Geophys. Res.*, *110*, D21205.
25. Magi, B.; Hobbs P.V.; Kirchstetter, T.W.; Novakov, T.; Hegg, D.A.; Gao, S.; Redemann, J.; Schmid, B. (2005) Aerosol properties and chemical apportionment of aerosol optical depth at locations off the United States east coast in July and August 2001. *J. Atmos. Sci.*, *62*, 919-933.
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16. Hobbs, P. V., P. Sinha, R. J. Yokelson, T. J. Christian, D. R. Blake, S. Gao, T. W. Kirchstetter, T. Novakov, and P. Pilewski. (2003) Evolution of gases and particles from a savanna fire in South Africa, *J. Geophys. Res.*, 108, 10.1029/2002JD002352.
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6. Kirchstetter, TW; Singer, BC; Harley, RA; Kendall, GR; Traverse, M (1999) Impact of California reformulated gasoline on motor vehicle emissions: 1. Mass emission rates, *Environ. Sci. Technol.*, 33, 318- 328.

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