

## Biographical Sketch: Thomas W. Kirchstetter

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Energy Technologies Area • Lawrence Berkeley National Laboratory  
MS90-4026B, Berkeley, California 94720 • Phone: 510-486-7071 • Email: twkirchstetter@lbl.gov

Department of Civil and Environmental Engineering • University of California at Berkeley  
655 Davis Hall, Berkeley, California 94720 • Phone: 510-908-1237 • Email: twkirchstetter@berkeley.edu

### (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 160 researchers that connect science and technology with economics and policy by measuring and analyzing energy use and emissions to the environment and providing robust data-driven analysis that informs energy technology development and decision making in the implementation of energy technologies in the transportation, building, electricity, and manufacturing sectors

#### *Previous appointments at Berkeley Lab*

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 • Principal advisor of graduate student thesis research • PhD student exam committee service

*Previous appointments at UC Berkeley:* Associate Adjunct Professor, 2011 – 2018; Lecturer, 2005– 2011

**Research interests:** Air pollution science & technology: Pollutant emissions and controls • Climate and environmental impacts of transportation • Pollutant measurement technologies, development of low-cost sensors, and community air monitoring networks • Chemical and optical characterization of biomass burning and carbonaceous aerosols • Environmental impacts of municipal solid waste-to-energy

#### **Course instruction:**

*Water and Air Quality Laboratory:* Contaminant transport and transformation, reactor models, water treatment, and air quality (Fall 2021, 2019, 2018, 2017; Spring 2016, 2015, 2014)

*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)

*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**

- Member, SMART Mobility Steering Committee, Vehicle Technologies Office, DOE, 2018 – present
- Co-founder and Chair of Oppenheimer Leadership Network, 2020 – 2021
- Member, LBNL Diversity, Equity and Inclusion, Division Director Accountability Committee, 2019
- 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 pattern 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**

- American Chemical Society Editor's Choice, 2019
- Nominated Berkeley Lab Participant, Oppenheimer Science & Energy Leadership Program, 2019
- Top Environmental Technology Paper in Environmental Science & Technology, 2017
- 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 – April 2021
- 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:*

Rebecca Sugrue, (UCB 2021), Emily Barnes (UCB 2020, 2019), Regan Patterson (UCB 2019, 2018), Rebecca Wernis (UCB 2016), Ellen Gray (UCB 2016), Ivy Tao (UCB 2013), Brian McDonald (UCB 2011), Yanju Chen (UIUC 2011), Tim Dallmann (UCB, 2011), Gavin McMeeking (CSU 2008)

*Undergraduate student researchers mentored:*

*Civil & Environmental Engineering:* Lilou Redon-Gabel, Pietro Marconi, 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 = 49, citations = 10,300; Web of Science h-index = 43, citations = 7,000)

85. Singer, BC; Zhao, H; Preble, CV; Delp, WW; Pantelic, J; Sohn, MD; Kirchstetter, TK (2021), Measured Influence of Overhead HVAC on Exposure to Airborne Contaminants from Simulated Speaking in a Meeting and a Classroom, *Indoor Air*, doi.org/10.1111/ina.12917
84. Smith, SJ; Satchwell, AJ; Kirchstetter, TW; Scown, CD (2021) The implications of facility design and enabling policies on the economics of dry anaerobic digestion, *Waste Management*, doi.org/10.3390/s20236714
83. Sugrue, R, Preble, CV; Kirchstetter, TK (2020) Comparing the Use of High- to Low-Cost Black Carbon and Carbon Dioxide Sensors for Characterizing On-Road Diesel Truck Emissions, *Sensors*, doi.org/10.3390/s20236714
82. Preble, CV; Chen, S Hotchi, T; Sohn, M; Maddalena, R; Russell, M; Brown, NJ; Scown, C; Kirchstetter, TW (2020) Air pollutant emission rates for dry anaerobic digestion and composting of organic municipal solid waste, *Environ. Sci. Technol.*, doi.org/10.1021/acs.est.0c03953
81. Nordahl, SL; Devkota, JP; Amirebrahimi, J; Smith, SJ; Breunig, HM; Preble, CV; Satchwell, AJ; Jin, L; Brown, NJ; Kirchstetter, TW; Scown, CD (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, SE; Preble, CV; Caubel, JJ; Cados, T; Messier, KP; Alvarez, RA; La Franchi, B; Lunden, M; Marshall, JD; Szpiro, AA Kirchstetter, TW; Apte, JS (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, doi.org/10.3390/s18030738
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; 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; Destailhats, 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 9<sup>th</sup> international conference on carbonaceous particles in the atmosphere, *J. Aerosol Sci.*, *41*, 1-4.
42. GR McMeeking, SM Kreidenweis, S Baker, CM Carrico, JC Chow, JL Collett, WM Hao, AS Holden, TW Kirchstetter, WC Malm, H Moosmüller, AP Sullivan, CE Wold, (2009) Emissions of trace gases and aerosols during the open combustion of biomass in the laboratory, *J. Geophys. Res.*, *114*, D19210.
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.
38. Shehabi, A; Ganguly, S; Gundel, LA; Horvath, A; Kirchstetter, TW; Lunden, MM; Tschudi, W; Gadgil, AJ; Nazaroff, WW. (2009) Can combining economizers with improved filtration save energy and protect equipment in data centers?, *Building Environ.*, *45*, 718-726.
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.
34. Hadley, OL; Corrigan, CE; Kirchstetter, TW. (2008) Modified thermal-optical analysis using spectral absorption selectivity to distinguish black carbon from pyrolyzed organic carbon, *Environ. Sci. Technol.*, *42*, 8459–8464.
33. Lunden, MM, Kirchstetter, TW, Thatcher, TL, Hering, SV, and Brown, NJ. (2008) Factors affecting the indoor concentration of carbonaceous aerosols of outdoor origin. *Atmos. Environ.*, *42*, 5660-5671.
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.
30. Kirchstetter, TW. (2007) Evaluating past and improving present and future measurements of black carbon particles in the atmosphere. California Energy Commission, PIER Energy-Related Environmental Research. Final report CEC-500-2007-042.
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.
24. Kirchstetter, TW; Novakov, T; Hobbs, PV. (2004) Evidence that spectral light absorption by aerosols emitted from biomass burning and motor vehicles is different due to organic carbon. *J. Geophys. Res.*, 109, D21208, doi:10.1029/2004JD004999.
23. Sinha, P.; Hobbs P.V.; Yokelson, R.J.; Blake, D.R.; Gao, S; Kirchstetter, T.W. (2004) Emissions from miombo woodland and dambo grassland savanna fires, *J. Geophys. Res.*, 109, D11305.
22. Sinha, P.; Hobbs P.V.; Yokelson, R.J.; Blake, D.R.; Gao, S.; Kirchstetter, T.W. (2003) Distributions of trace gases and aerosols during the dry biomass burning season in southern Africa. *J. Geophys. Res.*, 108, 4536, doi:10.1029/2003JD003691.
21. Kirchstetter, T.W.; Novakov, T.; Hobbs P.V.; Magi, B. (2003) Airborne measurements of carbonaceous aerosols in southern Africa during the dry, biomass burning season. *J. Geophys. Res.*, 108, 10.1029/2002JD002171.
20. Novakov, T.; Ramanathan, V.; Hansen, J.; Kirchstetter, T.W.; Sinton, J.E.; Sathaye, J.A. (2003) Large historical changes of fossil-fuel black carbon aerosols. *Geophys. Res. Letters*, 30, 10.1029/2002GL016345.
19. Gao, S.; Hegg, D.A.; Hobbs, P.V.; Kirchstetter, T.W.; Magi, B.I.; Sadilek, M. (2003) Water-soluble organic components in aerosols associated with savanna fires in southern Africa: identification, evolution, and distribution. *J. Geophys. Res.*, 108, 10.1029/2002JD002324.
18. Eatough, D.J.; Eatough, N.L.; Pang, Y.; Sizemore, S.; Kirchstetter, T.W.; Novakov, T.; Hobbs, P.V. (2003) Semivolatile particulate organic material in southern Africa during SAFARI 2000, *J. Geophys. Res.*, 108, 10.1029/2002JD002296.
17. Sinha, P.; Hobbs P.V.; Yokelson, R.J.; Bertschi, I.T.; Blake, D.R.; Gao, S.; Kirchstetter, T.W.; Novakov, T. (2003) Emissions of trace gases and particles from savanna fires in southern Africa. *J. Geophys. Res.*, 108, 10.1029/2002JD002325.
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.
15. Sinha, P., P.V. Hobbs, R.J. Yokelson, T.J. Christian, T.W. Kirchstetter, R. Bruintjes. (2003) Emissions of trace gases and particles from two ships in the southern Atlantic Ocean. *Atmos. Environ.*, 37, 2139-2148.
14. Currie L.A.; Kirchstetter, T.W.; et al. (2002) A critical evaluation of interlaboratory data on total, elemental, and isotopic carbon in the carbonaceous particle reference material, NIST SRM 1649a. *J. Res. Nat. Inst. Stand. Technol.*, 107, 279-298.
13. Mayol-Bracero, O.L.; Gabriel, R.; Andreae, M.O.; Kirchstetter, T.W.; Novakov, T.; Ogren, J.; Sheridan, P.; Streets, D.G. (2002) Carbonaceous aerosols over the Indian Ocean during INDOEX: chemical characterization, optical properties and probable sources. *J. Geophys. Res.*, 107, 10.1029/2000JD000039.

12. Kirchstetter, T.W.; Corrigan, C.E.; Novakov, T. (2001) Laboratory and field investigation of the adsorption of gaseous organic compounds onto quartz filters. *Atmos. Environ.*, *35*, 1663-1671.
11. Gao, S.; Hegg, D.A.; Frick, G.; Caffrey, P.F.; Pasternack, L.; Cantrell, C.; Sullivan, W.; Ambrusko, J.; Albrechtski, T.; Kirchstetter, T.W. (2001) Experimental and modeling studies of secondary organic aerosol formation and some applications to the marine boundary layer. *J. Geophys. Res.*, *106*, 27619-27634.
10. Kirchstetter, TW; Novakov, T; Morales, R; Rosario, O (2000) Differences in the volatility of organic aerosol in unpolluted tropical and polluted continental atmospheres. *J. Geophys. Res.*, *105*, 26547- 26554.
9. Novakov, T.; Andreae, M.O.; Gabriel, R.; Kirchstetter, T.W.; Mayol-Bracero, O.L.; Ramanathan, V. (2000) Origin of carbonaceous aerosols over the tropical Indian Ocean: Biomass burning or fossil fuels? *Geophys. Res. Letters*, *27*, 4061-4064.
8. Kirchstetter, T.W.; Harley, R.A.; Hering, S.V.; Stolzenburg, M.R.; Kreisberg, N.M. (1999) On-road measurement of fine particle and nitrogen oxide emissions from light- and heavy-duty motor vehicles. *Atmos. Environ.*, 1999, *33*, 2955-2968.
7. Marr, L.C.; Kirchstetter, T.W.; Harley, R.A.; Miguel, A.H.; Hering, S.V.; Hammond, S.K. (1999) Characterization of polycyclic aromatic hydrocarbons in motor vehicle fuels and exhaust emissions. *Environ. Sci. Technol.*, *33*, 3091-3099.
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.
5. Kirchstetter, T.W.; Singer, B.C.; Harley, R.A.; Kendall, G.R.; Hesson, J.M.(1999) Impact of California reformulated gasoline on motor vehicle emissions: 2. Volatile organic compound speciation and reactivity. *Environ. Sci. Technol.*, *33*, 329-336.
4. Singer, B.C.; Kirchstetter, T.W.; Harley, R.A.; Kendall, G.R.; Hesson, J.M. (1999) A fuel-based approach to estimating motor vehicle cold start emissions. *J. Air Waste Manag. Assoc.*, *49*, 125-135.
3. Miguel, A.H.; Kirchstetter, T.W.; Harley, R.A.; Hering, S.V. (1998) On-road emissions of particulate polycyclic aromatic hydrocarbons and black carbon from gasoline and diesel vehicles. *Environ. Sci. Technol.*, *32*, 450-455.
2. Kirchstetter, T.W.; Harley, R.A.; Littlejohn, D. (1996) Measurement of nitrous acid in motor vehicle exhaust. *Environ. Sci. Technol.*, *30*, 2843-2849.
1. Kirchstetter, T.W.; Singer, B.C.; Harley, R.A.; Kendall, G.R.; Chan, W. (1996) Impact of oxygenated gasoline use on California light-duty vehicle emissions. *Environ. Sci. Technol.*, *30*, 661-670.