Ronnen Michael Levinson, Ph.D.

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OBJECTIVE

Conduct applied research to advance the technologies of energy efficiency, renewable energy generation, and energy storage, making the world a cooler place.

WORK EXPERIENCE

LAWRENCE BERKELEY NATIONAL LABORATORY (Energy R&D) Berkeley, CA
Leader, Heat Island Group 2011-present
Deputy Leader, Heat Island Group 2011
Acting Leader, Heat Island Group 2009-2011
Staff Scientist 2010-present
Research Scientist 2000-2010
Mechanical Engineering Postdoctoral Fellow 1997-2000
Graduate Student Research Assistant 1993-1997

- COOL ROOFING DEVELOPMENT AND ANALYSIS. Characterized the radiative properties of roofing pigments, developed cool nonwhite roofing technologies, and investigated roof-soiling mechanisms. Created a laboratory aging practice for roof product rating. Mapped albedos of California roofs. Successfully pressed the requirement of white roofs for nonresidential buildings and cool-colored roofs for residential buildings in the California Title 24 building energy code. Led analogous cool roof studies in China and India.
- COOL WALL DEVELOPMENT AND ANALYSIS. Advanced reflective wall technologies through materials development and testing. Assessed the energy savings and urban cooling attainable by increasing wall albedo.
- COOL PAVEMENT DEVELOPMENT AND ANALYSIS. Related pavement reflectance to composition and weathering. Created a pavement life cycle analysis tool that evaluates the energy and environmental consequences of increasing pavement albedo.
- SOLAR REFLECTANCE MEASUREMENT. Developed more accurate techniques for measuring the solar reflectance or effective solar reflectance (reflectance + fluorescence) of building, pavement, and vehicle surfaces.
- COOL BUILDING SOLUTIONS. Formed international collaborative to develop and apply passive and low-energy cooling solutions that make buildings more comfortable and safer in extreme heat.
- INTERNATIONAL ENERGY ADMINISTRATION ANNEX 80: RESILIENT COOLING OF BUILDINGS. Leading U.S. team researching technologies and policies for low-energy, low-carbon cooling of buildings, with attention to heat waves and power outages.
- OCCUPANT COMFORT SENSOR TO AVOID OVERCOOLING. Developing an occupant comfort sensor that regulates air conditioning to avoid overcooling in buildings.
- COOL CAR ANALYSIS. Characterized the fuel savings and emission reductions attainable by increasing the solar reflectance of car shells.
- SCIENCE EDUCATION. Co-created LBNL's *Cool Your School* program to teach the science of cool surfaces to middle-school students.
- SOLAR ACCESS ANALYSIS. Quantified from aerial images and surface elevation measurements the extent to which shading decreases the availability of sunlight to rooftop solar equipment.
- BUILDING ENERGY EFFICIENCY. Surveyed tools available for residential building commissioning.
- DUCT ENERGY EFFICIENCY. Developed a technology that increases the energy efficiency of ventilation ductwork by sealing duct leaks and coating duct insulation with aerosolized glue particles.
- THERMAL INSULATION PERFORMANCE. Modeled and measured ventilation-duct heat losses that result from the flow of air through fiberglass internal duct insulation.
- ENVIRONMENTAL CLIMATE STUDY. Experimentally and theoretically quantified passive cooling of cities in summer by trees and highly reflective surfaces.

FUSION ENGINEERING GROUP, UNIVERSITY OF CALIFORNIA (Energy R&D) Berkeley, CA
Graduate Student Research Assistant 1991-1993

- FUSION REACTOR SAFETY. Simulated temperature rise of a fusion reactor blanket when coolant fails to flow.

GE CORPORATE RESEARCH & DEVELOPMENT CENTER (Electronics R&D) Schenectady, NY
Intern 1987-1990 (summers)

- SHAPING CONTACT LENSES. Invented process to shape contact lenses by laser ablation.
- REPAIRING CIRCUIT BOARDS. Developed CAM tool to repair manufacturing defects in circuit boards.
- SWITCH MOTION DETECTION. Wrote software to automate laser detection of piezoelectric switch motion.

ADDITIONAL EXPERIENCE AND SKILLS

- COMPUTING. 40+ years of programming experience, including R, Mathematica, Python, C, Visual BASIC, Fortran, LISP, Excel, Assembler, Pascal, and many applications. Unix administration; website design.
- MODELING. Theoretical and numerical modeling of physical processes, e.g., heat transfer, environmental physics.
- ENTERPRISE. Wrote and published book on ballroom dancing; created sales website (*http://OutDancing.com*). Produced, publicized, DJed and emceed monthly ballroom dance event (2004 – 2011).
- COMMUNICATION. Book author; reporter and editor for daily campus newspaper. Strong writing ability.

EDUCATION

UNIVERSITY OF CALIFORNIA, BERKELEY Berkeley, CA
Ph.D., Mechanical Engineering. May 1997
Thesis: *Near-Ground Cooling Efficacies of Trees and High-Albedo Surfaces*
Fields: Heat Transfer, Numerical Mathematics, Energy & Resources
Advisors: Prof. Van P. Carey and Prof. Kent Udell, Mechanical Engineering;
Prof. John Harte, Energy & Resources Group;
Dr. Hashem Akbari, Lawrence Berkeley National Laboratory.
M.S., Mechanical Engineering. May 1992
Thesis: *An Ordinary Differential Equation Solution for the Transient Temperature Profile of a Fusion Reactor Blanket Following a Loss of Flow Accident*
Advisors: Prof. John Holdren, Energy & Resources Group; Prof. Kenneth Fowler, Nuclear Engineering; Prof. Ralph Greif, Mechanical Engineering.

CORNELL UNIVERSITY Ithaca, NY
B.S., Applied and Engineering Physics. May 1990

HONORS

2016 R&D 100 Award for Cool Roof Time Machine; 2016 Marty Hasting Award for outstanding contributions to Cool Roof Rating Council; Outstanding Research Group Award from 2016 Conference on Countermeasures to Urban Heat Islands; 2006 Pacific Gas & Electric *Flex Your Power* award for development of cool colored roofing; nominated for 2006 R&D 100 Award for cool color roofing; Nishikai award for service to Allegro Ballroom; Script Cal Society (service to University of California Sport Club Program); Cornell University Dean's List, five semesters; New York Empire State Scholarship (four-year college scholarship).

SERVICE

- Editorial boards, *Energy & Buildings* (current), *Solar Energy* (current), *Solar Energy Advances* (current), *Scientific Reports* (current), and *Advances in Building Energy Research* (through 2018).
- Board of directors and technical committee, Cool Roof Rating Council.
- Board of directors and technical committee, Global Cool Cities Alliance.
- Technical advisory group, US Green Building Council's (LEED Sustainable Sites credit), 2013 - 2017.
- Reviewer for many journals, including *Solar Energy*, *Solar Energy Materials & Solar Cells*, and *Energy & Buildings*.

PATENTS

- Sleiman M, Kirchstetter T, Destaillats H, Levinson R, Berdahl P, Akbari H. 2018. Mixture and method for simulating soiling and weathering of surfaces. United States Patent 9,856,383 B2. 2 January 2018.
- Ghahramani A, Min S, Wang A, Chen K, Levinson R. 2019. Autonomous comfort systems. 2019. Provisional patent application No. 62/898,262, filed 2019-09-10.

PUBLICATIONS

Refereed journal articles

1. Sun, K., Zhang, W., Zeng, Z., Levinson, R., Wei, M., & Hong, T. (2021). Passive cooling designs to improve heat resilience of homes in underserved and vulnerable communities. *Energy and Buildings*, *252*, 111383. https://doi.org/10.1016/j.enbuild.2021.111383
2. Zhang, C., Kazanci, O. B., Levinson, R., Heiselberg, P., Olesen, B. W., Chiesa, G., Sodagar, B., Ai, Z., Selkowitz, S., Zinzi, M., Mahdavi, A., Teufl, H., Kolokotroni, M., Salvati, A., Bozonnet, E., Chtioui, F., Salagnac, P., Rahif, R., Attia, S., … Zhang, G. (2021). Resilient cooling strategies – A critical review and qualitative assessment. *Energy and Buildings*, *251*, 111312. https://doi.org/10.1016/j.enbuild.2021.111312
3. Celniker, C., Chen, S., Meier, A., & Levinson, R. (2021). Targeting buildings for energy-saving cool-wall retrofits: A case study at the University of California, Davis. *Energy and Buildings*, *249*, 111014. https://doi.org/10.1016/j.enbuild.2021.111014
4. Miller W, Machard A, Bozonnet E, Yoon N, Qi D, Zhang C, Liu A, Sengupta A, Akander J, Hayati A, Cehlin M, Kazanci OB, Levinson R. 2021. Conceptualising a resilient cooling system: A socio-technical approach. *City and Environment Interactions*, 11, 100065. https://doi.org/10.1016/j.cacint.2021.100065
5. Attia S, Levinson R, Ndongo E, Holzer P, Berk Kazanci O, Homaei S, Zhang C, Olesen BW, Qi D, Hamdy M, & Heiselberg P. 2021. Resilient cooling of buildings to protect against heat waves and power outages: Key concepts and definition. *Energy and Buildings*, 239, 110869. https://doi.org/10.1016/j.enbuild.2021.110869
6. Narumi D, Levinson R, Shimoda Y. 2021. Effect of urban heat island and global warming countermeasures on heat release and carbon dioxide emissions from a detached house. *Atmosphere*, 12(5), 572. https://doi.org/10.3390/atmos12050572
7. Tang X, Rosseler O, Chen S, Houzé de l'Aulnoit S, Lussier MJ, Zhang J, Ban-Weiss G, Gilbert H, Levinson R, Destaillats H. 2021. Self-cleaning and de-pollution efficacies of photocatalytic architectural membranes. *Applied Catalysis B: Environmental*, 281, 119260. https://doi.org/10.1016/j.apcatb.2020.119260
8. Levinson R, Egolf M, Chen S, Berdahl P. 2020. Experimental comparison of pyranometer, reflectometer, and spectrophotometer methods for the measurement of roofing product albedo. *Solar Energy*, 206, 826-847. https://doi.org/10.1016/j.solener.2019.11.103 .
9. Guo R, Gao Y, Zhuang C, Heiselberg P, Levinson R, Zhao X, & Shi D. 2020. Optimization of cool roof and night ventilation in office buildings: A case study in Xiamen, China. *Renewable Energy*, 147, 2279–2294. https://doi.org/10.1016/j.renene.2019.10.032
10. Levinson R, Chen S, Slack J, Goudey H, Harima T, Berdahl P. 2020. Design, characterization, and fabrication of solar-retroreflective cool-wall materials. *Solar Energy Materials & Solar Cells*, 206, 110117. https://doi.org/10.1016/j.solmat.2019.110117
11. Paolini R, Terraneo G, Ferrari C, Sleiman M, Muscio A, Metrangolo P, Poli T, Destaillats H, Zinzi M, Levinson, R. 2020. Effects of soiling and weathering on the albedo of building envelope materials: Lessons learned from natural exposure in two European cities and tuning of a laboratory simulation practice. *Solar Energy Materials and Solar Cells*, 205, 110264. https://doi.org/10.1016/j.solmat.2019.110264
12. Shi D, Zhuang C, Lin C, Zhao X, Chen D, Gao Y, Levinson, R. 2019. Effects of natural soiling and weathering on cool roof energy savings for dormitory buildings in Chinese cities with hot summers. *Solar Energy Materials and Solar Cells*, 200, 110016. https://doi.org/10.1016/j.solmat.2019.110016
13. Tang X, Ughetta L, Shannon SK, Houzé de l'Aulnoit S, Chen S, Gould RAT, Russell ML, Zhang J, Ban-Weiss G, Everman RLA, Klink FKW, Levinson R, Destaillats H. 2019. De-pollution efficacy of photocatalytic roofing granules. *Building and Environment* 160, 106058. https://doi.org/10.1016/j.buildenv.2019.03.056
14. Zhang J, Li Y, Tao W, Liu J, Levinson R, Mohegh A, Ban-Weiss G. 2019. Investigating the urban air quality effects of cool walls and cool roofs in Southern California. *Environmental Science & Technology*, 53(13), 7532–7542. https://doi.org/10.1021/acs.est.9b00626
15. Rosado PJ, Levinson R. 2019. Potential benefits of cool walls on residential and commercial buildings across California and the United States: conserving energy, saving money, and reducing emission of greenhouse gases and air pollutants. *Energy & Buildings* 199, 588-607. https://doi.org/10.1016/j.enbuild.2019.02.028
16. Levinson R. 2019. Using solar availability factors to adjust cool-wall energy savings for shading and reflection by neighboring buildings. *Solar Energy* 180, 717–734. https://doi.org/10.1016/j.solener.2019.01.023

17. Shi D, Gao Y, Guo R, Levinson R, Sun Z, Li B. 2019. Life cycle assessment of white roof and sedum-tray garden roof for office buildings in China. *Sustainable Cities and Society* 46, 101390. https://doi.org/10.1016/j.scs.2018.12.018
18. Mohegh A, Levinson R, Taha H, Gilbert H, Zhang J, Li T, Tang T, Ban-Weiss G. 2018. Observational evidence of neighborhood scale reductions in air temperature associated with increases in roof albedo. *Climate* 6, 98 (19 pp). https://doi.org/10.3390/cli6040098
19. Zhang J, Mohegh A., Li Y, Levinson R, Ban-Weiss G. 2018. Systematic comparison of the influence of cool wall versus cool roof adoption on urban climate in the Los Angeles basin. *Environmental Science & Technology*. https://doi.org/10.1021/acs.est.8b00732
20. Taha H, Levinson R, Mohegh A, Gilbert H, Ban-Weiss G, Chen S. 2018. Air-temperature response to neighborhood-scale variations in albedo and canopy cover in the real world: Fine-resolution meteorological modeling and mobile temperature observations in the Los Angeles climate archipelago. *Climate* 6, 53 (25 pp). https://doi.org/10.3390/cli6020053
21. Berdahl P, Boocock SP, Chan GC-Y, Chen SS, Levinson RM, Zalich MA. 2018. High quantum yield of the Egyptian blue family of infrared phosphors ($MCuSi_4O_{10}$, M = Ca, Sr, Ba). *Journal of Applied Physics* 123, 193103 (11 pp). https://doi.org/10.1063/1.5019808
22. Millstein D, Levinson R. 2018. Preparatory meteorological modeling and theoretical analysis for a neighborhood-scale cool roof demonstration. *Urban Climate* 24, 616-632. https://doi.org/10.1016/j.uclim.2017.02.005
23. Gao Y, Shi D, Levinson R, Guo R, Lin C, Ge J. 2017. Thermal performance and energy savings of white and sedum-tray garden roof: A case study in a Chongqing office building. *Energy & Buildings* 156, 343-359. https://doi.org/10.1016/j.enbuild.2017.09.091
24. Gilbert HE, Rosado PJ, Ban-Weiss G, Harvey JT, Li H, Mandel BH, Millstein D, Mohegh A, Saboori A, Levinson RM. 2017. Energy and environmental consequences of a cool pavement campaign. *Energy & Buildings* 157, 53-77. https://doi.org/10.1016/j.enbuild.2017.03.051
25. Mohegh A, Rosado P, Jin L, Millstein D, Levinson R, Ban-Weiss G. 2017. Modeling the climate impacts of deploying solar reflective cool pavements in California cities. *Journal of Geophysical Research* 122, 6798–6817, https://doi.org/10.1002/2017JD026845
26. Levinson R, Chen S, Ferrari C, Berdahl P, Slack J. 2017. Methods and instrumentation to measure the effective solar reflectance of fluorescent cool surfaces. *Energy & Buildings* 152, 752-765. https://doi.org/10.1016/j.enbuild.2016.11.007 .
27. Rosado PJ, Ban-Weiss G, Mohegh A, Levinson RM. 2017. Influence of street setbacks on solar reflection and air cooling by reflective streets in urban canyons. *Solar Energy* 144, 144-157. https://doi.org/10.1016/j.solener.2016.12.026
28. Berdahl P, Chen SS, Destaillats H, Kirchstetter TW, Levinson RM, Zalich MA. 2016. Fluorescent cooling of objects exposed to sunlight – The ruby example. *Solar Energy Materials & Solar Cells* 157, 312-317. https://doi.org/10.1016/j.solmat.2016.05.058
29. New J, Miller WA, Huang Y(J), Levinson R. 2016. Comparison of software models for energy savings from cool roofs. *Energy & Buildings* 114, 130 – 135. https://doi.org/10.1016/j.enbuild.2015.06.020
30. Gilbert H, Mandel BH, Levinson R. 2016. Keeping California cool: Recent cool community developments. *Energy & Buildings* 114, 20-26. https://doi.org/10.1016/j.enbuild.2015.06.023
31. Cao M, Rosado P, Lin Z, Levinson R, Millstein D. 2015. Cool roofs in Guangzhou, China: outdoor air temperature reductions during heat waves and typical summer conditions. *Environmental Science & Technology* 49 (24), 14672–14679. http://dx.doi.org/10.1021/acs.est.5b04886
32. Pomerantz M, Rosado PJ, Levinson R. 2015. A simple tool for estimating city-wide annual electrical energy savings from cooler surfaces. *Urban Climate* 14, 315-325. https://doi.org/10.1016/j.uclim.2015.05.007
33. Sleiman M, Chen S, Gilbert HE, Kirchstetter TW, Berdahl P, Bibian E, Bruckman LS, Cremona D, French RH, Gordon DA, Emiliani M, Kable J, Ma L, Martarelli M, Paolini R, Prestia M, Renowden J, Revel GM, Rosseler O, Shiao M, Terraneo G, Yang T, Yu L, Zinzi M, Akbari H, Levinson R, Destaillats H. 2015. Soiling of building envelope surfaces and its effect on solar reflectance–Part III: Interlaboratory study of an accelerated aging method for roofing materials. *Solar Energy Materials & Solar Cells* 143, 581-590. https://doi.org/10.1016/j.solmat.2015.07.031
34. Ban-Weiss GA, Woods J, Levinson R. 2015. Using remote sensing to quantify albedo of roofs in seven California cities, Part 1: Methods. *Solar Energy* 115, 777-790. https://doi.org/10.1016/j.solener.2014.10.022

35. Ban-Weiss GA, Woods J, Millstein D, Levinson R. 2015. Using remote sensing to quantify albedo of roofs in seven California cities, Part 2: Results and application to climate modeling. *Solar Energy* 115, 791-805. https://doi.org/10.1016/j.solener.2014.10.041
36. Rosado PJ, Faulkner D, Sullivan DP, Levinson R. 2014. Measured temperature reductions and energy savings from a cool tile roof on a central California home, *Energy & Buildings* 80, 57-71. https://doi.org/10.1016/j.enbuild.2014.04.024
37. Gao Y, Xu J, Yang S, Tang X, Zhou Q, Ge J, Xu T, Levinson R. 2014. Cool roofs in China: Policy review, building simulations, and proof-of-concept experiments. *Energy Policy* 74, 190-214. https://doi.org/10.1016/j.enpol.2014.05.036
38. Levinson R, Chen S, Berdahl P, Rosado R, Medina LA. 2014. Reflectometer measurement of roofing aggregate albedo. *Solar Energy* 100, 159-171. https://doi.org/10.1016/j.solener.2013.11.006
39. Sleiman M, Kirchstetter TW, Berdahl P, Gilbert HE, Quelen S, Marlot L, Preble CV, Chen S, Montalbano A, Rosseler O, Akbari H, Levinson R, Destaillats H. 2014. Soiling of building envelope surfaces and its effect on solar reflectance – Part II: Development of an accelerated aging method for roofing materials. *Solar Energy Materials and Solar Cells* 122, 271–281. https://doi.org/10.1016/j.solmat.2013.11.028
40. Ban-Weiss G, Wray C, Delp W, Ly P, Akbari H, Levinson R. 2013. Electricity production and cooling energy savings from installation of building-integrated photovoltaic roof on an office building. *Energy & Buildings* 56, 210-220. https://doi.org/10.1016/j.enbuild.2012.06.032
41. Rose LS, Levinson R. 2013. Analysis of the effect of vegetation on albedo in residential areas: case studies in suburban Sacramento and Los Angeles, CA. *GIScience & Remote Sensing* 50:1, 64-77. https://doi.org/10.1080/15481603.2013.778557
42. Berdahl P, Akbari H, Levinson R, Jacobs J, Klink F, Everman R. 2012. Three-year weathering tests of asphalt shingles: Solar reflectance. *Solar Energy Materials & Solar Cells* 99, 277-281. https://doi.org/10.1016/j.solmat.2011.12.010
43. Sleiman M, Ban-Weiss G, Gilbert HE, Francois D, Berdahl P, Kirchstetter TW, Destaillats H, Levinson R. 2011. Soiling of building envelope surfaces and its effect on solar reflectance—Part I: Analysis of roofing product databases. *Solar Energy Materials & Solar Cells* 95, 3385-3399. https://doi.org/10.1016/j.solmat.2013.11.028
44. Levinson R, Pan H, Ban-Weiss G, Rosado P, Paolini R, Akbari H. 2011. Potential benefits of solar reflective car shells: Cooler cabins, fuel savings and emission reductions. *Applied Energy* 88, 4343-4357. https://doi.org/10.1016/j.apenergy.2011.05.006
45. Levinson R, Akbari H, Berdahl P. 2010. Measuring solar reflectance—Part I: defining a metric that accurately predicts solar heat gain. *Solar Energy* 84, 1717-1744. https://doi.org/10.1016/j.solener.2010.04.018
46. Levinson R, Akbari H, Berdahl P. 2010. Measuring solar reflectance—Part II: review of practical methods. *Solar Energy* 84, 1745-1759. https://doi.org/10.1016/j.solener.2010.04.017
47. Menon S, Akbari H, Mahanama S, Sednev I, Levinson R. 2010. Radiative forcing and temperature response to changes in urban albedos and associated CO_2 offsets. *Environmental Research Letters* 5, 014005 (11pp). https://doi.org/10.1088/1748-9326/5/1/014005
48. Levinson R, Akbari H, Berdahl P, Wood K, Skilton W, Petersheim J. 2010. A novel technique for the production of cool colored concrete tile and asphalt shingle roofing products. *Solar Energy Materials & Solar Cells* 94, 946–954. https://doi.org/10.1016/j.solmat.2009.12.012
49. Levinson R, Akbari H. 2010. Potential benefits of cool roofs on commercial buildings: conserving energy, saving money, and reducing emission of greenhouse gases and air pollutants. *Energy Efficiency* 3 (1), 53-109. https://doi.org/10.1007/s12053-008-9038-2
50. Levinson R, Akbari H, Pomerantz M, Gupta S. 2009. Solar access of residential rooftops in four California cities. *Solar Energy* 83, 2120–2135. https://doi.org/10.1016/j.solener.2009.07.016
51. Akbari H, Levinson R, Stern S. 2008. Procedure for measuring the solar reflectance of flat or curved roofing assemblies. *Solar Energy* 82, 648-655. https://doi.org/10.1016/j.solener.2008.01.001
52. Akbari H, Levinson R. 2008. Evolution of cool roof standards in the United States. *Advances in Building Energy Research* 2, 1-32. https://doi.org/10.3763/aber.2008.0201
53. Berdahl P, Akbari H, Levinson R, Miller WA. 2008. Weathering of roofing materials—An overview. *Construction and Building Materials* 22(4), 423-433. https://doi.org/10.1016/j.conbuildmat.2006.10.015
54. Levinson R, Berdahl P, Akbari H, Miller W, Joedicke I, Reilly J, Suzuki Y, Vondran M. 2007. Methods of creating solar-reflective nonwhite surfaces and their application to residential roofing materials. *Solar Energy Materials & Solar Cells* 91, 304-314. https://doi.org/10.1016/j.solmat.2006.06.062

55. Levinson R, Akbari H, Reilly J. 2007. Cooler tile-roofed buildings with near-infrared-reflective nonwhite coatings. *Building & Environment* 42 (7), 2591-2605. https://doi.org/10.1016/j.buildenv.2006.06.005
56. Levinson R, Berdahl P, Berhe AA, Akbari H. 2005. Effects of soiling and cleaning on the reflectance and solar heat gain of a light-colored roofing membrane. *Atmospheric Environment* 39, 7807-7824. https://doi.org/10.1016/j.atmosenv.2005.08.037
57. Levinson R, Berdahl P, Akbari H. 2005. Solar spectral optical properties of pigments, part I: Model for deriving scattering and absorption coefficients from transmittance and reflectance measurements, *Solar Energy Materials & Solar Cells* 89, 319-349. https://doi.org/10.1016/j.solmat.2004.11.012
58. Levinson R, Berdahl P, Akbari H. 2005. Solar spectral optical properties of pigments, part II: Survey of common colorants, *Solar Energy Materials & Solar Cells* 89, 351-389. https://doi.org/10.1016/j.solmat.2004.11.013
59. Levinson R, Akbari H, Konopacki S, Bretz S. 2005. Inclusion of cool roofs in nonresidential Title 24 prescriptive requirements. *Energy Policy* 33(2), 151–170. https://doi.org/10.1016/S0301-4215(03)00206-4
60. Akbari H, Levinson RM, Rainer L. 2005. Monitoring the energy-use effects of cool roofs on California commercial buildings. *Energy & Buildings* 37, 1007-1016. https://doi.org/10.1016/j.enbuild.2004.11.013
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62. Modera MP, Brzozowski O, Delp WW, Dickerhoff DJ, Fisk WJ, Levinson R, Wang D. 2002. Sealing ducts in large commercial buildings with aerosolized sealant particles, *Energy & Buildings* 34, 705–714. https://doi.org/10.1016/S0378-7788(01)00120-7
63. Carrie F, Levinson R, Xu T, Dickerhoff D, Fisk W, McWilliams J, Modera M, Wang D. 2002. Laboratory and field testing of an aerosol-based duct-sealing technology for large commercial buildings. *ASHRAE Transactions* 108(1), 316-326.
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Refereed conference papers

66. Levinson R, Ban-Weiss G., Berdahl P, Chen S, Destaillats H, Dumas N, Gilbert H, Goudey H, Houze de l'Aulnoit S, Kleissl J, Kurtz B, Li Y Long Y, Mohegh A, Nazarian N. Pizzicotti M, Rosado P, Russel M, Slack J, Tang X, Zhang J, Zhang W. 2019. Solar-reflective "cool" walls: benefits, technologies, and implementation. 5th International Conference on Countermeasures to Urban Heat Islands. Hyderabad, India, 2 – 4 Dec.
67. Levinson R, Ban-Weiss G, Chen S, Gilbert H, Goudey H, Ko J, Li Y, Mohegh A, Rodriguez A, Slack J, Taha H, Tang T, Zhang J. Monitoring the urban heat island effect and the efficacy of future countermeasures in the Los Angeles Basin. 2019. 5th International Conference on Countermeasures to Urban Heat Islands. Hyderabad, India, 2 – 4 Dec.
68. Jeong S, Millstein D, Levinson R. 2019. Modeling potential air temperature reductions yielded by cool roofs and urban irrigation in the Kansas City Metropolitan Area. 5th International Conference on Countermeasures to Urban Heat Islands. Hyderabad, India, 2 – 4 Dec.
69. Less B, Walker I, Slack J, Levinson R. 2018. Measured thermal and moisture performance of an air sealed and insulated attic with porous insulation. In proceedings of the *2018 Summer Study on Energy Efficiency in Buildings*, Pacific Grove, CA (United States), 12-17 Aug. https://aceee.org/files/proceedings/2018/#/paper/event-data/p023
70. Arumugam R, Sasank B, Rajappa T, Vinay N, Garg V, Reddy N, Levinson R. 2016. Office-like test chambers to measure cool roof energy savings in four Indian climates. In proceedings of the *2016 ACEEE Summer Study on Energy Efficiency in Buildings*, Pacific Grove, CA (United States), 21–26 Aug. http://aceee.org/files/proceedings/2016/data/papers/3_820.pdf
71. Arumugam R, Garg V, Reddy N, Rallapalli H, Levinson R, et al. 2016. Design of twin-chamber apparatus to measure cool roof savings in India. In proceedings of the *4th International Conference on Countermeasures to Urban Heat Islands*, Singapore, May 30 – June 1.

72. Gao Y, Guo R, Levinson R, Lin C, Zhuang C, Ge J, Xu J. 2016. Life-cycle cost analyses of white roof and modular garden roof retrofits on office buildings in China. In proceedings of the *4th International Conference on Countermeasures to Urban Heat Islands*, Singapore, May 30 – June 1.
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