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Joyce E. Penner
Ralph J. Cicerone Distinguished University Professor of Atmospheric Science
University of Michigan, Ann Arbor, MI
Adjunct Faculty Member, Desert Research Institute, Reno, NV

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Education

Ph.D., 1977, Harvard University, Cambridge, MA (Applied Mathematics)
M.S., 1972, Harvard University, Cambridge, MA (Applied Mathematics)
B.A., 1968–70, University of California, Santa Barbara, CA (Mathematics)
1966–68, Fresno State College, Fresno, CA (Mathematics)

Dissertation

Photochemistry and Transport Processes for Terrestrial Atmospheric H_2 and Venus Exospheric H

Additional Training

American Management Association course on project leadership, 1984
UCLA-Ojai Workshop on Leadership Training, June 1990
Training Course on the Human Element in Management, April 1993

Honors or Awards

Phi Kappa Phi, Fresno State College–1968
Phi Beta Kappa, University of California, Santa Barbara–1970
N.S.F. Scholarship, Harvard University, 1970–1971
Norbert Gerbier-Mumm International Award-1998 of the WMO for "A search for human influences on the thermal structure of the atmosphere" by Santer et al. 1996.
Fellow, American Geophysical Union, 1999.
Research Excellence Award, University of Michigan College of Engineering, 2003.
Aksel Winn-Nielson Collegiate Professor of Atmospheric Science, 2005.
Service Excellence Award, University of Michigan College of Engineering, 2007.

University of Michigan Ralph J. Cicerone Distinguished University Professor of Atmospheric Science, September 2007.
Co-author of three Intergovernmental Panel on Climate Change Assessment Reports as Report Coordinator (*Aviation and the Global Atmosphere*, 1999), as Coordinating Lead Author (*Climate Change 2001: The Scientific Basis*) and as Lead Author (*Climate Change 2007: The Physical Science Basis)* for which the IPCC shared the Nobel Peace Prize together with Al Gore in 2007.
Fellow, American Association for the Advancement of Science, 2009.
NASA Group Achievement Award, ACCRI Aircraft Cloud Effects Team, 2014.
2016 Haagen-Smit Clean Air Award in the category of Air Pollution Research.

Research Interests

Climate and climate change, aerosol and cloud interactions in climate, model development and interpretation.

Professional Employment

1972–1973
Teaching Fellow, Harvard University

1974–1977
Research Assistant in the Center for Earth and Planetary Physics
Harvard University, Cambridge, MA

1977–1996
Physicist, Lawrence Livermore National Laboratory, Livermore, CA

1987–1996
Group Leader, Lawrence Livermore National Laboratory, Livermore, CA
1993
Visiting Lecturer, University of California at Davis

1993–1995
Division Leader, Global Climate Research Division, Lawrence Livermore National Laboratory, Livermore, CA

1996-continuing
Professor, Department of Atmospheric, Oceanic, and Space Sciences
University of Michigan, Ann Arbor, Michigan

Professional Affiliations

American Geophysical Union
American Association for the Advancement of Science
American Meteorological Society

Professional Committees

President of the Atmospheric Sciences Section of the American Geophysical Union 2017-2018.

Member, Steering Committee for the Decadal Survey Earth Science and Applications from Space, January 2016-2017.

Chair, Editor in Chief Search Committee, *JGR-Atmospheres*, January 2016-September 2016.

Member, UCAR and NCAR Scientific Programs Evaluation Committee (SPEC) October 2015-2018 or 2020 (3 to 5 years)

Member, Association of Public and Land-grant Universities' Board on Oceans, Atmosphere, and Climate, 2015.

President-Elect of the Atmospheric Sciences Section of the American Geophysical Union 2015-2016.

Member, Graduate Student Qualifying Exam Committee, May 2014-2015.

Chair, International Union of Geodesy and Geophysics Union Fellow Selection Committee, 2015.

Member, CoE Nominations Committee, 2013-2016.

Member, NRC Committee on A Framework for Analyzing the Needs for Continuity of NASA-Sustained Remote Sensing Observations of the Earth from Space, Fall 2013 – Fall 2015.

Member, NRC Committee on Geoengineering Climate: Technical Evaluation and Discussion of Impacts, April 2013 – Fall 2015.

Vice Chairman, NRC Committee on Earth Science and Applications from Space, April 2012 – April 2015.

Co-Chairman, NRC Committee on Earth Science and Applications from Space, April 2015 – December 2018.

Member, Electorate Nominating Committee (ENC) of the Section on Atmospheric & Hydrospheric Sciences, American Association for the Advancement of Science, February 2012 – February 2015.

Vice President, International Association of Meteorology and Atmospheric Science, 2011 – 2019.

Member, Executive Committee, University of Michigan Graham Sustainability Institute, September 2011-August 2017.

Member, NAS Committee for the Assessment of NASA's Earth Science Program, 2011 – 2012.

Member, Max Planck Institute for Chemistry at Mainz Scientific Advisory Committee, 2010 – 2019.

Member, College of Engineering Executive Committee, September 2008 – June 2009

Member, U.S. National Committee for Geodesy and Geophysics, February 2008 – October 2015.

Member, National Academy of Science Climate Research Committee, September 2006 – August 2009

Member, UCAR University Relations Committee, October 2006 – September 2009

Member, DOE Biological and Environmental Research Advisory Committee, Mar 2006 – Dec 2013

Chair, DOE BERAC Climate Subcommittee, July 2006 – July 2008

Member, Executive Committee for the University of Michigan, Graham Environmental Sustainability Institute, May 2006 – 2008, and 2012 – 2015

Chair-Elect, Chair, and Retiring-Chair of the AAAS Section on Atmospheric and Hydrospheric Sciences (2005-2008)

Co-Chair, Scientific Coordination Committee of the Modelling and Assessment of Contributions to Climate Change group (2005-2006)

Vice Chair, NRC Panel on Climate Variability and Change for the NRC Decadal Study on Earth Sciences (2004 – 2006)

Member, Jet Propulsion Laboratory Visiting Committee (2004-2007)

Member, American Geophysical Union Publications Committee (2004 – 2008)

Member, DOE Climate Change Prediction Program Scientific Steering Group (2003 – 2006)

Member, NCAR Atmospheric Chemistry Division Advisory Committee (2003)

Member, NOAA Climate Monitoring Working Group (CMWG) (2003 – 2009)

Member, NRC Committee on Metrics for Global Change Research (2003 – 2005)

Chairman, National Science Foundation Advisory Committee for Geosciences (2002 – 2003)

Chairman, NSF Committee of Visitors for the Lower Atmospheric Research Section, Geosciences Directorate (2001)

Member, National Science Foundation Advisory Committee for Geosciences (2001)

Member, ad hoc Steering Committee to develop a National Aerosol Climate Interactions Program Plan (2001 – 2002).

Member, NASA Earth System Science Advisory Committee (2001 – 2005).

Invited Workshop participant for the development of a 10 year strategic plan for the U.S. Global Change Research Program, November 2000.

Member, American Geophysical Union Development Committee (2000 – 2002)

Member, Advisory Committee for the Goddard Institute for Space Studies Climate Modeling Program (2000 – 2004)

Member, NRC Committee to Review NASA's Earth Science Enterprise Science Plan (2000)

Member, Executive Committee, University of Michigan Institute for Environmental Science and Technology (1999-2001)

Co-Chairman , Ad Hoc Advisory Committee on Advanced Computing, University of Michigan College of Engineering (2000)

Member, University of Michigan Office of the Vice President for Research Advisory Council (2000-2002)

Member, NCAR Climate System Laboratory Review Committee (1999-2006)

Member, Space Studies Board, National Research Council (1999 – 2001)

Member, National Research Council's Committee on Research Priorities for Airborne Particulate Matter (1998-2003)

Member, UCAR Membership Committee (1997-2000)

Member, UCAR Scientific Programs Evaluation Committee (1995-1998)

Member, National Research Council's Committee on Geophysical and Environmental Data (CGED) (1995-2001)

Member, Center for Clouds, Chemistry and Climate External Advisory Panel (1994-1997)

Member, National Academy of Sciences Panel on Aerosol Forcing and Climate Change (1993–1995)

Member, UCAR Climate Modeling, Analysis, and Prediction Scientific Advisory Council (1993-1997)

Member, NASA Science User Networks Working Group (1993-1995)

Member, NASA Global Tropospheric Chemistry Ad-hoc Advisory Panel (1992–1993)

Member, AMS Committee on Atmospheric Chemistry (1992-1995)

Member, Board of Directors, American Association for Aerosol Research (1991–1993)

Member, National Academy of Sciences Atmospheric Chemistry Committee (1990–1993)

Member, California Air Resources Board Modeling Advisory Committee (1989–1992)

Professional Activities

Review Editor, Technical Summary, IPCC Working Group I Fifth Assessment Report, published 2013.

Review Editor, Chapter 7: Clouds and Aerosols, IPCC Working Group I Fifth Assessment Report, published 2013.

Associate Chair, Department of Atmospheric, Oceanic, and Space Sciences, 2011 -.

Chair American Geophysical Union Macelwane Award Committee, 2010-2012.

Member, AGU Macelwane Award Committee, 2008-2010.

Editorial advisory board, Climatic Change Letters (2009 - 2012)

Program Committee, 10th International Conference on Carbonaceous Particles in the Atmosphere, June 26 to June 29, 2011, Vienna.

Program Committee, 9th International Conference on Carbonaceous Particles in the Atmosphere, August 12-14, 2008. Berleley, CA

Briefing on the Modelling and Assessment of Contributions to Climate Change activities to the Conference of the Parties of the United Nations Climate Change Convention, Bali, December 2007.

Lead author, Understanding and Attributing Climate Change, Chapter 9 of the Intergovernmental Panel on Climate Change (IPCC) Fourth Assessment Report, 2003-2007.

Briefing on the Modelling and Assessment of Contributions to Climate Change activities to the Subsidiary Body for Scientific and Technological Advice of the United Nations, Bonn, May 2006.

Co-Chair of the Scientific Steering Committee for Modelling and Assessment of Contributions to Climate Change (2005-2006)

Program Committee, 8th International Conference on Carbonaceous Particles in the Atmosphere, September 14-16, 2004. Vienna, Austria

Program Committee, IAMAS (International Association of Meteorology and Atmospheric Science) 2001 Assembly

Program Committee, 7th International Conference on Carbonaceous Particles in the Atmosphere, Novermber 26-29, 2000 San Juan, Puerto Rico.

Program Committee, International Symposium on Aviation and the Global Atmosphere, Amsterdam, June 23rd and 24th, 1999.

Briefing on "Aviation and the Global Atmosphere" to Senate staff as requested by Senator Chafee and Senator McCain, October 26, 1999.

Briefing on "Aviation and the Global Atmosphere" to the Subsidiary Body for Scientific and Technological Advice of the United Nations, June 1999.

Director, Laboratory for Atmospheric Science and Environmental Research, University of Michigan (1999 - 2004)

Science Team Leader, NASA Aerosol Radiative Forcing Science Team (1999-2001)

Co-Chairman (with W.H. Brune) 1999 Atmospheric Chemistry Gordon Conference

Co-Chairman (with Johann Goldhammer), BIBEX Steering Committee (Biomass Burning Experiment), International Global Atmospheric Chemistry Program, International Geosphere-Biosphere Programme, 1998-2002.

Coordinating Lead Author, Aerosols, Chapter 5 of the Intergovernmental Panel on Climate Change (IPCC) Third Assessment Report, 1998-2001.

Report Coordinator (with David Lister) and editor, Aviation and the Global Atmosphere, IPCC Special Report, 1997-1999.

Reviewer and Participant, NASA Atmospheric Chemistry Program Review, May 1997.

Program Committee, Sixth International Conference on Carbonaceous Particles in the Atmosphere, September 22-25, 1997.

Reviewer and participant in U.S. EPA Particulate Matter Research Needs Workshop, September 4-6, 1996.

Member, BIBEX Steering Committee, International Geosphere-Biosphere Programme, 1995-1998.

Member, International Commission on Atmospheric Chemistry and Global Pollution, 1994-1998, 1998-2002.

Secretary, Atmospheric Sciences Section of the American Geophysical Union, 1994-1996.

Program Co-Chairman, 1994, Fifth International Conference on Carbonaceous Particles in the Atmosphere, August 22-25, 1994.

Member, Organizing Committee for the World Climate Research Program Workshop on the Transport and Scavenging of Trace Constituents by Clouds in Global Models, August 1995.

Chairman, Dept. of Energy, ARM Aerosol Working Group, 1991-1993.

Associate Editor, Journal of Climate (1993-2002).

Associate Editor, Journal of Geophysical Research-Atmospheres (1993-2002).

Program Committee, 1991, Fourth International Conference on Carbonaceous Particles in the Atmosphere, Vienna, Austria

Reviewer, 1991, NOAA Air Resources Laboratory, Dr. Bruce Hicks, Director.

Technical Program Committee, 1989, American Association for Aerosol Research Annual Meeting (organized Symposium on Global Climatic Effects of Aerosols), Reno, NV.

Program Committee, 1988, Third International Conference on Carbonaceous Particles in the Atmosphere, Berkeley, CA.

Reviewer for Journal of Geophysical Research, Nature, Science, Atmospheric Environment

Reviewer of proposals to NOAA, NASA, NSF, and DOE

Educational Activities

Visiting Lecturer: Atmospheric Chemistry 270F, a graduate level course taught at the University of California, Davis, Spring Quarter 1993.

Courses taught at University of Michigan:
Climate modeling AOSS 605: a graduate level course taught as needed.
Aerosol physics and chemistry AOSS 511: a graduate level course taught as needed.
Our Changing Atmosphere AOSS 105: an undergraduate course taught every year.
Developed new course: AOSS 410: Earth System Modeling (2004) a graduate and senior undergraduate course taught every year.
Clouds and Precipitation AOSS 411: a graduate and senior undergraduate course taught every other year.
Developed new experiential course (2009): Earth, Ocean, Atmosphere Interactions AOSS 475: a graduate and senior undergraduate course taught every other year.

Supervision of postdoctural researchers:

Dr. Catherine Liousse at Lawrence Livermore National Laboratory, 1994.
Dr. Kenneth Caldeira at Lawrence Livermore National Laboratory, 1993-1994.
Dr. Colin Price at Lawrence Livermore National Laboratory, 1993-1995
Dr. Catherine Chuang at Lawrence Livermore National Laboratory, 1989–1992
Dr. Jane Dignon at Lawrence Livermore National Laboratory, 1989–1992
Dr. David Erickson at University of California, San Diego, 1988–1990

Dr. Michael Herzog, University of Michigan, 1999 - 2001.
Dr. Xiahong Liu, University of Michigan, 2000 - 2002.
Dr. Akinori Ito, University of Michigan 2001 – 2003.
Dr. Luis Olcese, University of Michigan 2005 – 2008.
Dr. Seoung Soo Lee, University of Michigan 2007 – 2010.
Dr. Cheng Zhou, University of Michigan 2010 –2013.
Dr. Li Xu, University of Mighigan January 2012 – Mar 31, 2012.
Dr. Guangxing Lin, University of Mighigan April 2013 –.

Supervision of graduate students:

Andrew Ackerman, Ph.D. student at University of Washington, summer, 1988
Cynthia Atherton, Ph.D. student at University of California, Davis, 1987–1993
Yan Feng, University of Michigan, 1997--2004
Yang Zhang, University of Michigan, 1997-- 2003
Li Chen, University of Michigan, 1998
Christiane Jablonowski, University of Michigan, 1999 -- 2004
Haoyu Gu, University of Michigan, 2000 -- 2002
Huan Guo, University of Michigan, 2000 -- 2006
Yang Chen, University of Michigan, 2000 – 2006
Minghuai Wang, University of Michigan, 2002 – 2009
Li Xu, University of Michigan, 2004 – 2011
Yuxing Yun, University of Michigan, 2006 – 2012
Xi Chen, University of Michigan, 2006 – 2012
Erica Roesler, University of Michigan, 2006 - 2012
Guangxing Lin, University of Michigan, 2007 – 2013.

Supervision of undergraduate students:

Mark Fallis, San Jose State University—summer 1988
John Tamaresis, San Jose State University—summer 1989
Ben Graboske, University of California, Davis—summer 1990
Ben Graboske, University of California, Berkeley—summer 1991
Samuel Raisenen, University of Michigan—1997 - 1999
Elon Lang, University of Michigan, 1998-1999
Brandon Preblich, University of Michigan, 2000 - 2002

Supervision of high school teachers:

John DiBari, Livermore, high school teacher—summer 1987
Matthew Hopper, Danville, high school teacher—summer 1987
Steven Giles, Livermore, high school teacher—summer 1987

Contributor

1. Hudson, R. D. and E. I. Reed (eds.) *The Stratosphere: Present and Future,* NASA Reference Publication 1049, December 1979.
2. Hudson, R. D., Editor-in-chief, *The Stratosphere 1981: Theory and Measurement,* WMO Global Ozone Research and Monitoring Project, Report No. 11, January 1982.
3. Prather, M., R. Derwent, D. Ehhalt, P. Fraser, E. Sanhueza, and X. Zhou, Chapter 2: Other trace gases and atmospheric chemistry, in *Radiative Forcing of Climate 1994*, Intergovernmental Panel on Climate Change, Report to IPCC from the Scientific Assessment Working Group (WGI), 1994.
4. Jonas, P.R., R.J. Charlson, and H. Rodhe, Chapter 3: Aerosols, in *Radiative Forcing of Climate 1994*, Intergovernmental Panel on Climate Change, Report to IPCC from the Scientific Assessment Working Group (WGI), 1994.

5. Shine, K.P., Y. Fouquart, V. Ramaswamy, S. Solomon, and J. Srinivasan, Chapter 4: Radiative Forcing, in *Radiative Forcing of Climate 1994*, Intergovernmental Panel on Climate Change, Report to IPCC from the Scientific Assessment Working Group (WGI), 1994.
6. Santer, B.D., T.M.L. Wigley, T.P. Barnett, E. Anyamba, Chapter 8: Detection of Climate Change and Attribution of Causes, Intergovernmental Panel on Climate Change, Report to IPCC from the Scientific Assessment Working Group (WGI), 1996.
7. Schimel, D., D. Alves, I. Enting, M. Heimann, F. Joos, D. Raynaud, U. Siegenthaler, T. Wigley, M. Prather, R. Derwent, D. Ehhalt, P. Fraser, E. Sanhueza, X Zhou, P. Jonas, R.Charlson, H. Rodhe, S. Sadasivan, K.P. Shine, Y. Fouquart, V. Ramaswarmy, S. Solomon, J. Srinivasan, D. Albritton, R. Derwent, I. Isaksend, M. Lal, and D. Wuebbles, Chapter 2: Radiative Forcing of Climate Change, Intergovernmental Panel on Climate Change, Report to IPCC from the Scientific Assessment Working Group (WGI), 1996.
8. Sanhueza, E., P.J. Fraser, and R.J. Zander, Source Gases: Trends and Budgets, Scientific Assessment of Ozone Depletion: 1994, World Meteorological Organization, Global Ozone Research and Monitoring Project--Report No. 37.
9. National Research Council: 1996, A Plan for a Research Program on Aerosol Radiative Forcing and Climate Change, National Academy Press, Washington, D.C. 161 pp.
10. National Research Council: 1998: Research Priorities for Airborne Particulate Matter: Immediate Priorities and a Long-Range Research Portfolio, National Academy Press, Washington, D.C., 195 pp.
11. Aviation and the Global Atmosphere, Penner, J.E., Lister, D., Griggs, D., Docken, D., and, MacFarland, M., eds., Intergovernmental Panel on Climate Change Special Report, Cambridge University Press, 1999.
12. Penner, J.E., M. Andreae, H. Annegarn, L. Barrie, J. Feichter, D. Hegg, A. Jayaraman, R. Leaitch, D. Murphy, J. Nganga, and G. Pitari, Chapter 5: Aerosols, their Direct and Indirect Effects, in Climate Change 2001: The Scientific Basis, Ed. by J.T. Houghton, Y. Ding, D.J. Griggs, M. Noguer, P.J. van der Linden, X. Dai, K. Maskell, C.A. Johnson, Report to Intergovernmental Panel on Climate Change from the Scientific Assessment Working Group (WGI), 289-348, Cambridge University Press.
13. Hegerl, G.C., F. W. Zwiers, P. Braconnot, N.P. Gillett, Y. Luo, J.A. Marengo Orsini, N. Nicholls, J.E. Penner and P.A. Stott, 2007: Understanding and Attributing Climate Change. In: *Climate Change 2007: The Physical Science Basis. Contribution of Working Group I to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change* [Solomon, S., D. Qin, M. Manning, Z. Chen, M. Marquis, K.B. Averyt, M. Tignor and H.L. Miller (eds.)], 663-745. Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA.

Publications

Refereed Journal Articles, Book Chapters, or Committee Reports

1. McElroy, M.B., S.C. Wofsy, J.C. McConnell, and J.E. Penner, 1974: Atmospheric ozone: Possible impact of stratospheric aviation, *J. Atmos. Sci.,* **31,** 278–303.
2. Penner, J.E., M.B. McElroy, and S.C. Wofsy, 1977: Sources and sinks for atmospheric H_2: A current analysis with projections for the influence of anthropogenic activity, *Planet. Space Sci.,* **25,** 521–540.
3. Chang, J.S. and J.E. Penner, 1978: Analysis of global budgets of halocarbons, *Atmos. Environ.,* **12,** 1867–1873.
4. Penner, J.E. and J.S. Chang, 1978: Possible variations in atmospheric ozone related to the eleven-year solar cycle, *Geophys. Res. Lett.,* **5,** 817–820.
5. Penner, J.E. and J.S. Chang, 1980: The relation between atmospheric trace species variabilities and solar UV variability, *J. Geophys. Res.,* **85,** 5523–5528.
6. Penner, J.E. and F.M. Luther, 1981: Effect of temperature feedback and hydrostatic adjustment in a stratospheric model, *J. Atmos. Sci.,* **38,** 446–453. (Also UCRL-83250.)
7. Penner, J.E., 1982: Trend prediction for O_3: An analysis of model uncertainty with comparison to detection thresholds, *Atmos. Environ.,* **16,** 1109–1115.

8. Penner, J.E., L.P. Golen, and R.W. Mensing, 1982: A time series analysis of Umkehr data from Arosa, *J. Geophys. Res.,* **87,** 1331–1335.
9. Wuebbles, D.J., F.M. Luther, and J.E. Penner, 1983: Effect of coupled anthropogenic perturbations on stratospheric ozone, *J. Geophys. Res.,* **88,** 1444–1456.
10. Penner, J.E., J.J. Walton, and T. Umeda, Air quality model validation: Application to the San Francisco Bay Area and St. Louis, published in the *Proceedings of the Air Pollution Control Association,* June 19–24, 1983, Atlanta, GA., (Also UCRL-88957.)
11. Penner, J.E., Modeling the effect of biogenic hydrocarbon emissions in the San Francisco Bay Area, published in the *APCA Specialty Meeting Proceedings on the Environmental Impact of Natural Emissions,* March 7–9, 1984, Research Triangle Park, North Carolina. (Also UCRL-89170.)
12. Penner, J.E., L.C. Haselman, Jr., and L.L. Edwards, 1986: Smoke plume distribution above large scale fires: Implications for simulations of 'nuclear winter', *J. of Clim. and App. Meteor.,* **25,** 1434–1444. (Also UCRL-90915, Rev. 2.)
13. Porch, W.M., J.E. Penner and D. Gillette, 1986: Parametric study of wind generated supermicron particle effects in large fires, *Atmos. Environ.,* **20,** 919–929. (Also UCRL-92635.)
14. Penner, J.E., 1986: Uncertainties in the smoke source term for 'nuclear winter' studies, *Nature,* **324,** 222–226. (Also UCRL-94226.)
15. Penner, J.E. and W.M. Porch, 1987: Coagulation in smoke plumes after a nuclear war, *Atmos. Environ.,* **21,** 957–969. (Also UCRL-94359, Rev. 1.)
16. Porch, W.M., J.E. Penner, and D. Gillette, 1987: Reply to comments on paper, 'parametric study of wind generated supermicron particle effects in large fires', *Atmos. Environ.,* **21,** 1250–1253. (Also UCRL-92635, Rev. 3 Comments.)
17. Porch, W.M., J.E. Penner, and D. Gillette, 1987: Reply to reply by Turco et al., *Atmos. Environ.,* **21,** 2065–2067. (Also UCRL-95921.)
18. Edwards, L.L. and J.E. Penner, 1988: Potential nucleation scavenging of smoke particles over large fires: A parametric study, in *Aerosols and Climate,* Edited by P.V. Hobbs and M.P. McCormick, pp. 423-434, A. Deepak Publishing, Hampton, VA. (Also UCRL-96242, Rev. 3.)
19. Atherton, C.S. and J.E. Penner, 1988: The transformation of nitrogen oxides in the polluted troposphere, *Tellus,* **40B,** 380–392. (Also UCRL-96343, Rev. 1.)
20. Iskander, M.F., H.Y. Chen, and J.E. Penner, 1989: Scattering and absorption by elongated aerosol particles in the resonance frequency range, *Aerosol Sci. and Technol.,* **10,** 172–180. (Also UCRL-96915.)
21. Penner, J.E. and C.R. Molenkamp, 1989: Predicting the consequences of nuclear war: Precipitation scavenging of smoke, *Aerosol Sci. and Technol.,* **10,** 51–62. (Also UCRL-96916, Rev. 1.)
22. Penner, J.E., P.S. Connell, D.J. Wuebbles, and C.C. Covey, 1989: Climate change and its interactions with air chemistry: Perspectives and research needs, in *The Potential Effects of Global Climate Change on the United States,* J.B. Smith and D.A. Tirpak, (eds.), U.S. Environmental Protection Agency, Washington, D.C., EPA-230-05-89-056. (Also UCRL-21111.)
23. Wuebbles, D.J., K.E. Grant, P.S. Connell, and J.E. Penner, 1989: The role of atmospheric chemistry in climate change, *JAPCA,* **39,** 22–28. (Also UCRL-96343, Rev. 1.)
24. Iskander, M.F., H.Y. Chen, and J.E. Penner, 1989: Optical scattering and absorption by branched chains of aerosols, *Applied Optics,* **28,** 3083–3091. (Also UCRL-100161.)
25. Ghan, S.J., J.E. Penner, and K.E. Taylor, 1989: Sulfur, climate change and cloud albedos, *Nature,* **340,** 438. (Also UCRL-100023, Rev. 1.)
26. Atherton, C.S. and J.E. Penner, 1990: The effects of biogenic hydrocarbons on the transformation of nitrogen oxides in the troposphere, *J. Geophys. Res.,* **95,** 14027-14038. (Also UCRL-99755, Rev. 1.)
27. Chen, H.Y., M.F. Iskander, and J.E. Penner, 1990: Light scattering and absorption by fractal agglomerates and coagulations of smoke aerosols, *Modern Optics,* **37,** 171–181. (Also UCRL-100084.)
28. Ghan, S.J., K.E. Taylor, J.E. Penner, and D. J. Erickson, 1990: Model test of CCN-cloud albedo climate forcing, *Geophys. Res. Lett.,* **17,** 607–610. (Also UCRL-100791, Rev. 1.)

29. Penner, J.E., 1990: Cloud albedo, greenhouse effects, atmospheric chemistry and climate change, *J. of the Air and Waste Management Assoc.,* **40,** 456–461. (Also UCRL-99928, Rev. 1.)
30. Erickson III, D.J., S.J. Ghan, and J.E. Penner, 1990: Global ocean-to-atmosphere dimethyl sulfide flux, *J. Geophys. Res.* **95,** 7543–7552. (Also UCRL-102449.)
31. Kreidenweis, S., J.E. Penner, F.Yin, and J.H. Seinfeld, 1991: The effects of dimethylsulfide upon marine aerosol concentrations, *Atmos. Environ.,* **25A,** 2501–2512. (Also UCRL-102415, Rev. 1)
32. Chen, H.U., M.F. Iskander, and J.E. Penner, 1991: An empirical formula for electromagnetic absorption by fractal aerosol agglomerates, *App. Opt.,* **30,** 1547–1552. (Also UCRL-101846)
33. Penner, J.E., C.S. Atherton, J. Dignon, S.J. Ghan, J.J. Walton, and S. Hameed, 1991: Tropospheric nitrogen: A three-dimensional study of sources, distribution, and deposition, *J. of Geophys. Res.,* **96**, 959–990. (Also UCRL-102183, Rev. 2.)
34. Rogers, C.F., J.G. Hudson, J. Hallett, and J.E. Penner, 1991: Water nucleation by crude oil smoke and coagulated crude oil/wood smoke particles, *Atmos. Environ.,* **25A,** 2571–2580. (Also UCRL-JC-103164.)
35. Erickson III, D.J., J.J. Walton, S.J. Ghan, and J.E. Penner, 1991: Three-dimensional modeling of the global atmospheric sulfur cycle: A first step, *Atmos. Environ.,* **25A,** 2513–2520. (Also UCRL-JC-103973.)
36. Ghan, S.J. and J.E. Penner, 1992: Smoke, effects on climate, invited article, in *Encyclopedia of Earth System Science,* Vol. 4, ed. by W.A. Nierenberg, Academic Press Inc., San Diego, 191–198. (Also UCRL-JC-103415, Rev. 1.)
37. Iskander, M.F., H.Y. Chen, and J.E. Penner, 1991: Resonance optical absorption by fractal agglomerates of smoke aerosols, *Atmos. Environ.,* **25A,** 2563–2570. (Also UCRL-JC-103155.)
38. Penner, J.E., M.M. Bradley, C.C. Chuang, L.L. Edwards, and L.F. Radke, 1991: A numerical simulation of the aerosol-cloud interactions and atmospheric dynamics of the Hardiman Township, Ontario prescribed burn, in *Global Biomass Burning,* ed. by J. Levine, MIT press, Cambridge, MA, 420–426. (Also UCRL-JC-104051, Rev. 1.)
39. Penner, J.E., S.J. Ghan, and J.J. Walton, 1991: The role of biomass burning in the budget and cycle of carbonaceous soot aerosols and their climate impact, in *Global Biomass Burning,* ed. by J. Levine, MIT press, Cambridge, MA, 387–393. (Also UCRL-JC-104053.)
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Conference on Atmospheric Chemistry, 85th AMS annual meeting, P1.15, Jan.9-13, 2005, San Diego, California.

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124. Chen, X., E. Roesler, Y. Yung, C. Zhou, and J.E. Penner, Is aerosol size or chemistry more important in determining droplet number concentrations? Presented at the Annual ARM meeting, March 26 - 30, 2007; http://www.arm.gov/publications/proceedings/conf17/index.php?sort=author#P
125. Penner, J.E. and H. Guo, Examination of Aerosol Indirect Effects Under Contrasting Environments During the ACE-2 Experiment, Presented at the Annual ARM meeting, March 26 - 30, 2007; http://www.arm.gov/publications/proceedings/conf17/index.php?sort=author#P
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130. Schumann, U., J. E. Penner, Y. Chen, C. Zhou, and K. Graf, 2015: On dehydration effects from contrails in a coupled contrail-climate model, Proceedings of the 4th International Conference on Transport, Atmosphere, and Climate, 22-25 June 2015 in Bad Kohlgrub, Germany.

Selected Talks

Tropospheric response to a nuclear exchange, invited paper presented at the Third International Conference on Nuclear War, Erice, Sicily, August 19–23, 1983.

Chemical response of the troposphere to smoke, dust, smog and ozone depletion, invited paper presented at the AGU Fall Meeting, San Francisco, December 1983, UCRL-89813.

Review of LLNL global effects program, presented to the LLNL Scientific Advisory Committee, July 1984.

The dynamics and microphysics of large-scale fires, invited paper presented at the Third Conference on Climate Variations, American Meteorological Society, Los Angeles, CA, January 9, 1985, UCRL-91728.

Global long term effects of a nuclear exchange, symposium presented at the University of California at Los Angeles, CA., April 9, 1985.

Nuclear winter: Fact or fiction? Symposium presented at San Francisco State University, April 22, 1985.

FY85 Progress Report given for the Director's Review of the global effects program in August 1985.

Review of fuel loads in 'nuclear winter' studies, invited paper and participant at the National Academy of Sciences workshop on Nuclear Winter, Washington, D.C., January 14–15, 1986.

Progress in developing the smoke source term for 'nuclear winter' studies: Major uncertainties. presented at the Defense Sciences Board meeting in June, 1986.

Summary of nuclear winter research findings, symposium presented at Oak Ridge National Laboratory, July 1986.

Nuclear winter spinoffs, presented for the DOE/OHER Program Directors Meeting, September 1986.

Nuclear winter: Fact or fiction?, Department of Applied Sciences Colloquium, January 27, 1987.

Nuclear winter smoke: Injection, interactions, and removal, invited paper presented at the annual meeting of the American Association for the Advancement of Science, February 14–20, 1987, Chicago, IL.

Nuclear winter: Fact or fiction?, Oceanic and Atmospheric Sciences Department Colloquium, University of Michigan, Ann Arbor, MI, March 25, 1987.

The environmental consequences of nuclear war: An overview of 'nuclear winter' research, invited paper presented at the American Nuclear Society annual meeting, November 16–20, 1987, Los Angeles, CA.

The greenhouse effect and atmospheric chemistry, presented for the LLNL Summer Institute in Applied Physics, August 25, 1988.

The greenhouse effect and atmospheric chemistry, invited speaker for the Modesto Jr. College faculty, students and community, October 7, 1988.

Microphysics and nuclear winter, invited speaker for the APCA Symposium on Global Effects of Atmospheric Containments, Albuquerque, NM., October 25, 1988.

Tropospheric chemistry and climate, presented at the Director's Review of the Physics Department, December 14, 1988.

Chemistry and climate, presented at the Laboratory Science Advisory Committee review, February 28, 1989.

Uncertainties in climate models, invited talk and panel participant, annual meeting of the California Energy Research Institute, Los Angeles, CA., February 1, 1990.

Cloud albedo, greenhouse effects, atmospheric chemistry and climate change, invited talk, presented at the Air and Waste Management Association annual meeting, Anaheim, CA., June 25–30, 1989.

Long range transport of carbonaceous aerosols: A perspective based on nuclear winter studies, invited talk, presented at the European Aerosol Conference, Vienna, Austria, September 18–23, 1989.

Long range transport and the effect of NO_X on O_3 , invited seminar, presented at the University of Vienna, Vienna, Austria, September 20, 1989.

Global studies at LLNL: The nitrogen cycle, sulfur cycle and carbonaceous aerosols, invited seminar, presented at the NOAA Aeronomy Laboratory, Boulder, CO, March 7, 1990.

Uncertainties in climate models, invited talk and panel participant, Annual Meeting of the California Energy Research Institute, Los Angeles, CA , February 1, 1990.

Tropospheric chemistry: A study of sources, distributions, transport, and climatic effects, invited paper presented (by J. Dignon) at the US/PRC Cooperative Program in Atmospheric Chemistry's Workshop on Regional and Global Models of Atmospheric Chemistry, Shanghai, People's Republic of China, August 1–4, 1990.

Global tropospheric chemistry modeling, presented (by J. Dignon) at the National Academy Science's Committee on Atmospheric Chemistry's Review of the DOE Atmospheric Chemistry Program, Washington, D.C., September 25–26, 1990.

Global warming or global cooling?, seminar presented for the Environmental Engineering Fall 1990 Seminar Series at the University of California, Berkeley, September 14, 1990.

Global modeling studies at LLNL: The nitrogen cycle, sulfur cycle and soot aerosol, presented at the Atmospheric Sciences Seminar Series at the University of California, Los Angeles, March 6, 1991.

Tropospheric chemistry and climate, briefing for Leonida Petrakis, Director, DAS, Brookhaven National Laboratory, April 29, 1990.

Tropospheric chemistry studies at LLNL, briefing for Dr. David Galas, Director, DOE OHER, August 16, 1990.

The role of human activity and land use change in atmospheric chemistry and air quality, invited participant and speaker at the 1991 Global Change Institute on Global Land Use/Cover Change, Snowmass, CO, July 29–August 9, 1991.

Aerosols and climate, invited presentation for the NASA Workshop on Climate Modeling: Prospects and Needs for the Next Decade, Alexandria, VA, November 13-15, 1991.

Global model simulations of the long range transport of soot and sulfur from the Kuwait oil fires, invited presentation for the Expert Meeting on the Atmospheric Part of the Emergency Response to the Kuwait Oilfield Fires, World Meteorological Organization, Geneva, April 27–30, 1991.

Effect of biomass burning on global radiation budget, invited presentation for the 1992 Joint Spring Meeting of the AGU, CGU, and MSA, May 12-16, 1992, Montreal, Canada.

Aerosols and Climate, seminar presented at the Max Planck Institut fuer Meteorologie, Hamburg, FRG, June 17, 1992.

Aerosols and Climate, seminar presented at Laboratoire de Modelisation du Climat et de l'Environnement, Orme des Merisiers, CEN-SACLAY, 91191 Gif-sur-Yvette, France, July 16, 1992.

Global Aerosol Modeling, invited tutorial presented at the 1992 AAAR Annual Meeting, San Francisco, CA, October 12 - 16, 1992.

Global Emissions and Models of Photochemically Active Compounds, invited paper, presented at the International Global Atmospheric Biospheric Chemistry (IGAC) Scientific Conference Eilat, Israel, April 18 - 22, 1993.

Aerosols and Clouds: Model Performance and Needed Observations, invited paper, presented at the Atmospheric Chemistry Gordon Conference, New Port, Rhode Island, June 21 - June 25, 1993.

Aerosols and Climate, invited paper, presented at the at the IAMAP Scientific Conference, July 11-23, 1993, in Yokohama, Japan.

Clouds, Aerosols and Chemistry, invited paper to the NSF Workshop on the Role of Clouds, Energy and Water in Global Climate Change, Nov. 8-10, 1993, Reno, NV.

Aerosols and Climate, invited paper presented at the symposium on "Could We Engineer the Earth's Climate?", AAAS Annual Meeting, San Francisco, February, 1994.

Estimating Changes in Aerosol Forcing, invited paper presented at the 1994 Global Change Institute on Integrated Assessment of Climate Change, Snowmass, CO, July 20-29, 1994.

Aerosols and Climate Change, invited tutorial presented at the Fourth International Aerosol Conference, Los Angeles, CA, August 29 - September 2, 1994.

Forcing by Anthropogenic Aerosols, invited paper presented at the WMO experts meeting on Documenting and Detecting Long-Term Climate Cahnge: Monitoring Requirements for GCOS, January 9-11, 1995.

Aerosols and Climate Change, invited paper presented at the Global Change Symposium, Annual Meeting of the American Meteorological Society, Dallas, TX, January 15-20, 1995.

The Contribution of Aerosols from Biomass Burning to Climate Change, invited paper presented at the Chapman Conference on Biomass Burning and Global Change, Williamsburg, VA, March 13-17, 1995.

The Contribution of Anthropogenic Aerosols to Climate Change, invited paper presented at the Third International Conference on Modelling of Global Climate Change and Variability, Hamburg, September 4-8, 1995.

Aerosol Impacts on the Radiation Balance, paper presented at the 1995 JASON Review of the Atmospheric Radiation Measurements Program, July 10-12,1995.

Aerosol-Climate Interactions, invited paper presented at the 14th International Conference on Nucleation and Atmospheric Aerosols, Helsinki, Finland, 26-30 August 1996.

Anthropogenic Forcing of Climate: What is the Magnitude of Forcing and is a Signature Discernible in the Climate Record? NRC Panel on Climate Variability on Decade-to-Century Time Scales, 21-23 February 1996, Beckman Center, Irvine, CA.

Tutorial: Aircraft Effects on Aerosols, Chemistry and Climate: A New Focus, to be presented to Symposium of the Global Atmospheric Effects of Aviation, Virginia Beach Resort Hotel and Conference Center, April 15-19, 1996.

Aerosols and Climate, briefing to Agency Program Leaders and U.S. Global Change Research Program Symposium, April 25, 1996.

Uncertainty in Climate Forcing by Anthropogenic Aerosols, presented at the International Symposium on Atmospheric Chemistry and Future Global Environment, November 11-13, 1997, Nagoya, Japan.

Uncertainty in Climate Forcing by Anthropogenic Aerosols, presented at the fall meeting of the American Geophysical Union December 8-12, 1997.

Panel Participant, Atmospheric Chemistry and Climate Change, Science and Public Policy, International Symposium on Global Atmospheric Chemistry sponsored by the Commission on Atmospheric

Chemistry and Global Pollution (CACGP) and the International Global Atmospheric Chemistry Project (IGAC), Seattle, August 19-25, 1998.

Climate Change and Radiative Forcing by Anthropogenic Aerosols: A Summary of Current Understanding: PAOS/NOAA-CDC/CIRES Distinguished Lecturer Series, December 4, 1998, University of Colorado, Boulder.

Climate Change and Radiative Forcing by Anthropogenic Aerosols: Research Findings During the Last 5 Years, La Jolla International School of Science, The Institute for Advanced Physics Studies, La Jolla, CA 92038-2946, March 29-30,1999.

Climate Change and Radiative Forcing by Anthropogenic Aerosols: A Summary of Current Understanding, AMS 10th Conference on Atmospheric Radiation, Madison, Wisconsin, June 28 - July 2, 1999.

Climate Change and Radiative Forcing by Anthropogenic Aerosols: A Summary of Current Understanding, International Union of Geodosy and Geophysics, University of Birmingham, Birmingham, United Kingdom, July 19 - 30, 1999.

The Global Aerosol Climatology Project: Model Intercomparison for Sulfate, Carbon, Sea Salt and Dust. Fall Meeting of the American Geophysical Union, San Francisco, December 1999.

The Current IPCC Assessment of Climate Change, presented at the University of Michigan bi-weekly seminar series to promote Research in the Interest of the Public and the Environment, Michigan League, February 24, 2000.

Future Aerosol Composition: An Intercomparison of Model Results and Future Forcing. Western Pacific Geophysics Meeting, Tokyo, Japan, June 27-30, 2000.

Environmental science briefing to Congressional staff and others on "Aviation and the Global Atmosphere", the IPCC (Intergovernmental Panel on Climate Change) climate assessment report. Tuesday, October 26, 1999, Room G-11 of the Dirksen Senate Office Building, 12:00 Noon - 2:00 PM.

Penner, J.E. The IPCC Assessment of Aircraft and the Global Atmosphere, presented at the meeting of the IPCC (Intergovernmental Panel on Climate Change) Subsidiary Science and Technology Assessment, Berlin, June?, 1999.

The Global Aerosol Climatology Project: Building a Global Aerosol Climatology. Spring Meeting of the American Geophysical Union, Washington D.C., June 2000.

The Global Aerosol Climatology Project, presented at the NARSTO 2000 meeting: Tropospheric Aerosols: Science and Decisions in an International Community, Qerétaro, Mexico, October 23-26, 2000.

The Effects of Anthropogenic Aerosols on Climate and Temperature Structure, presented at the APEX workshop, Sapporo, Japan, February 29, 2001.

The Effects of Anthropogenic Aerosols on Climate and Temperature Structure, presented at UCLA, May 2, 2001.

A summary of the IPCC Special Report on Aviation and the Global Atmosphere, presented at the International Civil aviation Organization Colloquium on Environmental Aspects of Aviation, Montreal 9-11 April 2001.

Black carbon and other aerosols: Observations and radiative forcing, presented at the GSFC Summer Institute, June 2001.

Research needs to improve GCM assessments of the indirect aerosol effect, National Aerosol climate Interactions Program Workshop, January 8 – 10, 2002, Scripps Institute of Oceanography, San Diego.

Black carbon and other aerosols: Observations and radiative forcing, presented at the University of Arizona, February 18, 2002.

Global aerosol climatologies: Are there differences between models and the real world? Presented at the Workshop on Air Pollution as a Climate Forcing April 29 – May 3, 2002, Honolulu, Hawaii.

Aerosol-climate interaction: Improving global models and estimates of climate forcing, presented at the Aerosol-Cloud-Radiation Interaction in Boundary Layer Clouds workshop, Toulouse, France, June 24-27, 2002.

Radiative forcing uncertainties, presented at the Climate Change Impacts and Integrated Assessment Workshop of the Energy Modeling Forum, Snowmass, Colorado, July 29- August 7, 2002.

Historical aerosol emissions and climate change, presented at the Haagen-Smit Symposium, Lake Arrowhead, CA, May 6-9, 2003.

The dark side of the forcing: Black carbon, presented at the AAAS Annual Meeting Symposium on “Our Hazy Atmosphere”, February 15, 2004.

Trends in black carbon, presented for the University of Rhode Island Graduate School of Oceanography's 2003/2004 Vetlesen Distinguished lecture Series on Climate and the Marine Environment, April 8, 2004.

Model Studies of the Effects of Aircraft Soot on Cirrus, presented at Ice, Soot, and Aviation: what Impact on the Environment? Meeting at La Londe Les Maures, 10 – 14, May 2004.

Complexities in the Temperature Signal: Aerosols and Trace Gases, presented at the AAAS Symposium on Climate Change, June 15, 2004, Washington, D.C.

Effect of Black Carbon on Temperature Lapse Rates, presented at the Aspen Global Change Institute, July 2004.

Complexities in the Temperature Signal: Aerosols and Trace Gases, presented at Yale University, October, 2004.

Air Transportation: Emissions and Effects, presented to the IPIECA Climate Change Workshop, Baltimore, October 2004.

Effect of Black Carbon on Mid-Troposphere and Surface Temperature Trends, presented at MIT, November, 2004.

Uncertainties in the trends of black carbon emissions: contribution to temperature change, presented at the EPA black carbon workshop, October, 2004.

Uncertainties in model predictions of indirect aerosol effects, presented at the IGAC Specialty Conference on the Indirect Effect of Aerosols on Global Climate, 5 – 7 January, 2005, Manchester, England.

Direct effects of aerosols on climate: What do we know? presented at the IPCC Expert Meeting on Aerosols, 2-4 May, 2005, Geneva.

Aerosols and Clouds: Can we Quantify the Effect of Aerosols on Climate Change? presented at the Atmospheric Chemistry Gordon Conference, Bozeman, Montana, 4 – 9 September, 2005.

Aerosols and Clouds: Can we Quantify the Effect of Aerosols on Climate Change? Presented as a tutorial at the American Association for Aerosol Research Annual Meeting, 17 – 21, October, 2005, Austin, Texas.

Aerosols and Climate: Can we Quantify the Effect of Aerosols on Climate Change and does it matter?, Goddard Laboratory for Atmospheres Distinguished Lecture Series, July 27, 2006.

Air Transportation: Emissions and Effects, Presentation to the First Regional Symposium on Carbon Management, Dhahran, 22-24 May 2006.

Solar UV flux, DMS and Climate: Is there a connection?, Joyce E. Penner, Luis Olcese, Li Xu, and Minghuai Wang, 2007 SOLAS Open Science Meeting, Xiamen, China, March 6-9, 2007.

Aerosol-Cloud Interactions and Climate Projections, J.E. Penner, AAAS Annual Meeting, San Francisco, February 15-19, 2007.

Current Status in Understanding Climate and Climate Change Prediction, J.E. Penner, *Challenges of Climate Change in the Great Lakes Region*, University of Michigan Biological Station ,July 26-27, 2007.

What determines aerosol number concentration for cloud droplet nucleation and radiative forcing?, J.E. Penner and M. Wang, Fall AGU Meeting, San Francisco, December 10 – 14, 2007.

Aerosol Forcing of Climate, J.E. Penner, The 10th International Workshop on Next Generation Climate Models for Advanced High Performance Computing Facilities, February 28 – March 1, 2008, Oahu, Hawaii.

Effects of soot aerosols from aircraft on cirrus clouds, J.E. Penner, UTIAS-MITACS International Workshop on Aviation and Climate Change, May 29-30, 2008, Toronto, Canada.

Effects of Aerosols on Cirrus Clouds, J.E. Penner, Jet Propulsion Laboratory, July 8, 2008.

Effects of Aerosols on Cirrus Clouds, J.E. Penner, California Institute of Technology, July 9, 2008.

Effects of Aerosols from Aircraft on Cirrus Clouds, J.E. Penner, Non CO_2 Effects Workshop, July 22-24, 2008, Oxford, U.K.

Aerosols and climate: An international perspective, J.E. Penner, Something in the Air – Aerosols and Climate Change**,** 18-19 August 2008, Rydges Lakeside, Canberra, Australia.

Projecting Climate Change, J.E. Penner, International Summer School on Atmospheric and Oceanic Science, September 22 – 26, 2008, L'Aquila, Italy.

Current status in understanding climate change and climate change prediction, J.E. Penner, Invited Keynote Speaker at International Climate Change: Post-Kyoto Challenges, October 30, 2008, Washington University, St. Louis, MO.

An Overview of Aerosol-Cloud Indirect Effects Estimated From Global Models and Satellite Data, J.E. Penner and M. Wang, invited talk, Fall AGU Meeting, Dec 14 – 20, 2008, San Francisco.

Ice Nucleation in a Global Climate Model, J.E. Penner and M. Wang, invited talk, Fall AGU Meeting, Dec 14 – 20, 2008, San Francisco.

Climate Change Science: Can the skeptics ever be convinced?, DUP Lecture, February 16, 2009

Can we decrease uncertainties in estimates of the direct and indirect forcing by anthropogenic aerosols?, J.E. Penner, Invited talk, Gordon Radiation and Climate Conference, July 5 - 10, 2009, New Hampshire.

Radiative forcing and related issues, J.E. Penner, invited talk, AR5 scoping meeting,Venice, 13-17 July 2009.

Direct and indirect forcing by anthropogenic aerosols: Can we decrease uncertainties?, J.E. Penner, invited talk, International Union of Geodesy and Geophysics, MOCA 09 Joint Assembly, July 19 - 29, 2009.

Direct and indirect forcing by anthropogenic aerosols: Can we decrease uncertainties?, invited talk, Chemistry/Climate Workshop, Oslo, Norway, 10-11 September 2009.

How have "atmospheric pollutants" been treated within IPCC?, J.E. Penner, invited talk, Workshop on climate change and air pollution, Gothenburg, Sweden, October 19-21, 2009.

Using aerosol injection for geo-engineering, Invited talk, MIT Symposium on Geo-Engineering, October 30, 2009, Cambridge, MA.

What do we know about the interaction between transport-induced aerosol and clouds?, invited presentation, QUANTIFY final meeting, Munich, January 25-27, 2010.

Global Modeling of Secondary Organic Aerosol, Joyce E. Penner, Presented at the Max Planck Institute of Chemistry Summer Aerosol Course, June 2010.

Representation of cloud-aerosol-precipitation interactions in global climate models, Joyce E. Penner, invited presentation at the DOE ASR cloud-aerosol-precipitation working group, October 13, 2010.

Modelling the effects of aerosol on cirrus clouds, Invited seminar, DLR, Oberpfaffenhofen, 25 June 2010.

Uncertainties in feedbacks in the climate system, Joyce E. Penner, invited presentation, Frontiers of Nonlinear Physics, Russia, July 13-20, 2010.

Direct and indirect effect of SOA's on climate, Gordon conference on biogenic emissions, May 25, 2010, Les Diablerets, Switzerland

Production of secondary organic aerosols and effects in the atmosphere, seminar Edinburgh University, April 28, 2010.

Direct and indirect effect of organic and BC aerosols on climate, invited seminar, CNRS, Toulouse France, September 1, 2010.

Direct and indirect effect of organic aerosols on climate, J. E. Penner, Invited Seminar presented at University of Illinois, October 20, 2011.

The effect of anthropogenic soot particles on cirrus and mixed phase clouds, invited, Joyce E Penner and Yuxing Yun, Fall AGU Meeting, San Francisco, CA., Dec. 5-9, 2011.

Is it Possible to use Satellite Measurements with Models to Quantify the Indirect Forcing by Anthropogenic Aerosols? invited, Joyce E. Penner and Cheng Zhou, Meeting of the American Meteorological Association, New Orleans, January 23-25, 2012.

Effects of aircraft soot emissions on large-scale cirrus clouds, invited talk, Joyce. E. Penner, Cheng Zhou, Roy Chen, Ulrich Schumann, Kasper Graf, 3rd UTIAS International Workshop on Aviation and Climate Change, Toronto, May 2-4, 2012.

How can we improve estimates of indirect aerosol forcing? Joyce E. Penner and Cheng Zhou, invited, AEROCOM Workshop, Seattle, Sept. 10 – 13, 2012.

Observational constraints for climate forcing by biomass burning aerosols, invited, Joyce E Penner, Cheng Zhou, Michael J. Prather, Li Xu, Fall AGU Meeting, San Francisco, CA., Dec. 3-7, 2012.

Reconciling estimates for the first aerosol indirect forcing from satellites and models, invited, Joyce E. Penner, Cheng Zhou, and Seoung Soo Lee, Fall AGU Meeting, San Francisco, CA., Dec. 3-7, 2012.

Challenges linking molecular data to climate models, Joyce E. Penner, invited talk, presented at the Environmental Molecular Science Laboratory Planning meeting, Irvine, CA, January 30, 2013.

Contributed presentations (recent):

Direct and indirect forcing by anthropogenic aerosols: Can we decrease uncertainties?, J. E. Penner, L. Xu and M. Wang, International Association for Meteorology and Atmospheric Sciences, Montreal, July 2009.

Global modeling of SOA formation from different mechanisms, G. Lin, S. Sillman, and J.E. Penner, poster, Fall AGU meeting, December 14-18, 2009.

Aviation Induced Cirrus in Observations and Models, Joyce E. Penner, Kaspar Graf, Ulrich Schumann, Presented at the ACCRI Program Workshop, November 17, 2010, Washington, D.C.

The effect of organic aerosols from SOA formation on estimates of the aerosol indirect effect, J.E. Penner, S. Sillman, and G. Lin, EGU meeting, Vienna, May 3 – 7, 2010.

The 3-D AMR on a Spherical Shell for Atmospheric Models with Lagrangian Coordinates, poster, J.E. Penner, N. Andronova, Q. F. Stout, B. van Leer, J. Boyd, C. Jablonowski, K. Powell, R. C. Oehmke, J.-C. Lin, V. Zubov, D. VandenBerg, X. Chen, DOE Integrated Climate Change Modeling Science Team Meeting, March 29 – April 2, 2010.

From atmospheric chemistry to atmospheric aerosols, J.E. Penner, symposium in celebration of 70th birthday of M.B. McElroy, March 20 – 21, 2010.

Modelled radiative forcing of aerosol direct effect with nitrate aerosols: some preliminary results, Li Xu and J.E. Penner, poster, Fall AGU meeting, December 14-18, 2009.

Aerosol effects on ice formation in mixed-phase clouds, Yuxing Yun and J.E. Penner, T-ice planning workshop, Boulder Colorado, September, 24, 2009.

Aerosol effects on ice clouds: Can the traditional concept of aerosol indirect effects be applied to aerosol-cloud interactions in cirrus clouds?, poster, S.S. Lee and J.E. Penner, DOE Atmospheric System Research Program Meeting, Bethesda MD, March 15 – 18, 2010.

From Human Activities to Climate Change: Uncertainties in the Causal Chain, M. J. Prather, J. E. Penner, et al., Fall AGU Meeting, Dec. 2010.

The effects of hygroscopicity of fossil fuel BC on mixed-phase and cirrus ice clouds, Y. Yun and J. E. Penner, Fall AGU Meeting, Dec. 2010.

Global modeling of SOA formation from different mechanisms, Guangxing Lin, Sanford Sillman, and Joyce E. Penner, Fall AGU Meeting, Dec. 2010.

Global Modeling Study of Aerosol Deposition to the Ocean: Sensitivity to Mineral Dust Size Distribution at Emission, Akinori Ito, Jasper F. Kok, Yan Feng and Joyce E. Penner, IGBP meeting, 2011.

A Tracer Transport Model Test using a Finite-Volume Model with a Vertical Lagrangian Coordinate, N. Andronova, J. E. Penner, X. Chen, D. VanDenberg, Q. Stout, NCAR Workshop on Tracer Transport, March 2011.

Influence of Aviation on Large-Scale Cirrus Clouds and Anthropogenic Forcing, Joyce E. Penner, Minghaui Wang, Yuxing Yun, Li Xu and Yang Chen, presented at the International Union of Geophysics and Geosciences meeting, Melbourne, Australia, June 2011.

Quantification of indirect combustion aerosols on cirrus clouds, Olga Popovicheva, Yuxing Yun and Joyce Penner, AAC meeting, Xian, China, 2011.

Global contrail cirrus cover and radiative forcing for 2006 air traffic, U. Schumann, K. Graf, B. Mayer, H. Mannstein, P. Minnis and J. Penner, ACCRI Symposium, February, 2011

Effects of aircraft emissions on large scale clouds, J. E. Penner and C. Zhou, Federal Aviation Administration, Annual Meeting, Arlingon, VA, December 13-14, 2011.

Progress in Contrail Cirrus Modeling and Comparisons to Observations, U. Schumann, K. Graf, B. Mayer, H. Mannstein, C. Voigt, P. Minnis, J. Penner, Federal Aviation Administration, Annual Meeting, Arlingon, VA, December 13-14, 2011.

A computationally efficient finite volume hydrostatic/non-hydrostatic hybrid model with a vertical Lagrangian coordinate, Joyce E. Penner, Xi Chen, Natalia Andronova, Quentin Stout, Denny Vandenberg, DOE Climate Program Fall Meeting, September 19-22, 2011.

Differences in the transport of aerosols to the Arctic: Analysis of NCAR CAM5 & GFDL AM3 models and their prediction of snow and ice forcing and the aerosol direct and indirect effect, Cheng Zhou, Joyce E Penner, Yi Ming, Xianglei Huang, Mark G Flanner, Chaoyi Jiao, presented at the Fall AGU Meeting, San Francisco, CA., Dec. 5-9, 2011.

Modelling African aerosol using updated fossil fuel and biofuel emission inventories for 2005 and 2030, C. Liousse, J.E. Penner, E. Assamoi, presented at the Fall AGU Meeting, San Francisco, CA., Dec. 5-9, 2011.

Are the effects of hygroscopicity of soot on ice freezing important? Y. Yun and J. E. Penner, presented

at the Fall AGU Meeting, San Francisco, CA., Dec. 5-9, 2011.

Global modeling of SOA formation in the aqueous phase, Guangxing Lin, Joyce E. Penner, and Sanford Sillman, Fall AGU Meeting, San Francisco, CA., Dec. 5-9, 2011.

A computationally efficient finite volume hydrostatic/non-hydrostatic hybrid model with a vertical Lagrangian coordinate, Xi Chen, Natalia Andronova, Joyce E. Penner, Quentin Stout, Denny Vandenberg, Fall AGU Meeting, San Francisco, CA., Dec. 5-9, 2011.

Radiative forcing by aircraft: Effects of soot on large-scale clouds, Joyce E. Penner, Yibin Chen, Cheng Zhou, Yuxing Yun, Ulrich Schumann, Kaspar Graf, Olga Popovicheva, ACCRI 3rd Symposium on the Effects of Aircraft on Climate, Virginia Beach, Nov. 27-29, 2012.

The effects of marine primary biogenic organic aerosols as heterogeneous ice nuclei in mixed-phase clouds, Yuxing Yun and Joyce E Penner, Fall AGU Meeting, San Francisco, CA., Dec. 3-7, 2012.

Can observations constrain present day and pre-industrial emissions of BC aerosols from biomass burning?, Joyce E. Penner, Cheng Zhou, Cathy Liousse, Eric Assamoi, Marion Bisiaux, Ross Edwards, Joe McConnell, presented at the GEIA Workshop, Toulouse, France, June 2012.

Underlying uncertainty in future projection of marine ecosystem feedbacks to climate change, Akinori Ito, Jasper Kok, Yang Feng, and Joyce E Penner, Japan Geophysical Union, 2012.

Effect of Estimation of Dust Size Distribution at Emission on Iron Deposition, Akinori Ito, Jasper F. Kok, Yan Feng and Joyce E. Penner, SOLAS meeting, 2012.

Global modeling of SOA formation in the aqueous phase, Guangxing Lin, Sanford Sillman, and Joyce E Penner, presented at the Atmospheric Chemistry Gordon Conference, August, 2012.

Underlying uncertainty in future projection of marine ecosystem feedbacks to climate change Akinori Ito, Jasper F. Kok, Yan Feng and Joyce E. Penner, WCRP meeting, 2012.

Anthropogenic emissions enhance biogenic SOA formation and its radiative cooling effect, Guangxing Lin and Joyce E Penner, presented at the AEROCOM meeting, Seattle Washington, September, 2012.

Reconciling estimates for the first aerosol indirect forcing from satellites and models, Cheng Zhou, J. E. Penner and S. S. Lee, presented at the 93rd American Meteorological Society Annual Meeting, Austin, Texas, January 6-10, 2013.

Inclusion of an aqueous phase formation mechanism for organic aerosols in CAM, Joyce E. Penner and Guangxing Lin, Joint Climate-Chemistry and Atmospheric Working Group meeting, NCAR, Feb 11-13, 2013.

Is the indirect forcing by aircraft soot positive or negative? Cheng Zhou and Joyce E. Penner 2013 CESM workshop, Breckenridge, CO, June 19th, 2013.

Radiative forcing by aircraft: Effects of soot on large-scale clouds, Joyce. E. Penner, Cheng Zhou, Roy Chen, Yuxing Yun, Ulrich Schumann, Kasper Graf, Olga Popovicheva, IAMAS Meeting 8 – 12 July 2013, Davos, Switzerland.

Geoengineering: Technical evaluation and discussion of impacts. A summary of study sponsored by the NRC Board on Atmospheric Sciences and Climate, presented to the Standing Committee on Earth Science and Applications from Space (CESAS) October 2013 meeting.

Comparison of CAM5.3 and CSRM Over the Ocean, C. Zhou, J.E. Penner, D. Posselt, S.S. Lee, 2013 DOE ASR Fall Working Group Meeting, Washington DC, Nov 7th, 2013.

Do GCM's overestimate the warm cloud aerosol indirect effect?, Joyce Penner, DOE ASR Program Cloud-Aerosol-Precipitation Interaction Breakout Group, Nov 7, 2013.

Is the indirect forcing by aircraft soot positive or negative? C. Zhou and J.E. Penner, 2013 AGU Fall Meeting, San Francisco, CA, Dec 12th, 2013.

Radiative forcing of organic aerosol in the atmosphere and on snow: Effects of SOA and brown carbon, poster, 2013 AGU Fall Meeting, San Francisco, CA, December, 2013.

Radiative forcing associated with particulate carbon emissions resulting from the use of mercury control technology, poster, 2013 AGU Fall Meeting, San Francisco, CA, December, 2013.

Global modeling of secondary organic aerosol with an explicit scheme, Guangxing Lin, Joyce Penner, Sanford Sillman, and Ito Akinori, CESM Atmospheric Modeling Working Group and Chemistry Climate Working Group Meeting, NCAR, March 2014.

Simulations of Aerosol, Cloud, and Precipitation Effects in Comparison with ARM Data, C. Zhou, J. E. Penner, D. Posselt, S.-S. Lee, and G. Lin, Poster presented at 2014 DOE ASR Annual Meeting, Bolger Conference Center, MD, March 2014.

The CAM/IMPACT/CoCiP Coupled Climate Model: Radiative forcing by aircraft in spreading contrails and large-scale clouds, Joyce E. Penner, seminar presented at Duke University, February 2014.

The CAM/IMPACT/CoCiP Coupled Climate Model: Radiative forcing by aircraft in spreading contrails and large-scale clouds, Joyce E. Penner, seminar presented at University of Wyoming, April 14, 2014.

The CAM/IMPACT/CoCiP Coupled Climate Model: Radiative forcing by aircraft in spreading contrails and large-scale clouds, Joyce E. Penner, seminar presented at Pacific Northwest National Laboratory, August 27, 2014.

Comparison of NASA GCE-CRM and SCM-CAM5 (SCAM) with ARM data, Cheng Zhou and Joyce E. Penner, presented at DOE ASR Fall meeting, November 2014.

How important are glassy SOA ice nuclei for the formation of cirrus clouds?, Cheng Zhou, Joyce E. Penner, Guangxing Lin, Xiaohong Liu, Minghuai Wang, presented at the 2015 95th AMS annual meeting, Phoenix, AZ, January 2015.

Present-day to 21st century projections of secondary organic aerosol (SOA) from a global climate-aerosol model with an explicit SOA formation scheme, G. Lin, J. E. Penner, and C. Zhou, presented at the Fall AGU Annual Meeting, San Francisco, December 2014.

Radiative forcing of climate by aerosols, invited, presented at the International conference "Aerosol and Atmospheric Optics", October 21-24, 2014, Moscow.

Global modeling of SOA: the use of different mechanisms for aqueous phase formation, G. Lin, J.E. Penner, S. Sillman, and A. Ito, presented at the AAAR Annual conference, October 2014.

The CAM/IMPACT/CoCiP Coupled Climate Model: Radiative forcing by aircraft in spreading contrails and large-scale clouds, invited seminar, presented at the Pacific Northwest National Laboratory, August 27, 2014.

The CAM/IMPACT/CoCiP Coupled Climate Model: Radiative forcing by aircraft in spreading contrails and large-scale clouds, invited presentation, UTIAS Workshop on Aviation and Climate Change at the University of Toronto Institute for Aerospace Studies during May 27-29, 2014.

The CAM/IMPACT/CoCiP Coupled Climate Model: Radiative forcing by aircraft in spreading contrails and large-scale clouds, seminar, Scripps Institute for Oceanography, July 25, 2014.

Emission and Transport of BC to Russian Arctic from Siberian Wildfires and Seasonal Burning, O. Popovicheva, J. E. Penner, A. Makshtas, T. Uttal, presented at the PEEX workshop, Finland, February, 2015.

Secondary organic aerosol in the atmosphere: Formation and effects on radiative forcing, J. E. Penner, G. Lin, and C. Zhou, presented at NOAA Earth System Laboratory Chemical Sciences Division seminar, April 1, 2015.

Comparison of GCE-CRM and SCM-CAM5 with ARM data, J. E. Penner and C. Zhou, presented at the ASR meeting, Sheraton Tyson's Corner, VA, March 16-19, 2015.

How important are glassy SOA ice nuclei for the formation of cirrus clouds?, J. E. Penner and C. Zhou, presented at the International Union of Geodosy and Geophysics Quadrennial meeting, June 22 – July 2, 2015, Prague.

Will cirrus cloud seeding reduce warming?, Joyce E. Penner, Cheng Zhou and Guangxing Lin, presented at the International Union of Geodosy and Geophysics Quadrennial meeting, June 22 – July 2, 2015, Prague.

Emission and Transport of BC to the Russian Arctic from Siberian Wildfires, J. E. Penner, O. Popovicheva, C. Zhou, G. Lin, A. Makshtas, and T. Uttal, presented at the 11th International Conference on Carbonaceous Particles in the Atmosphere, August 10-13, 2015, Berkeley, CA.

Simulations of dehydration effects from contrails in a global model, U. Schumann, J. E. Penner, Y. Chen, Z. Chou, K. Graf, presented at the Fourth Conference on Transport, Atmosphere and Climate, Bad Kohlgrub, Germany, 22-25 June 2015.

How important are glassy SOA ice nuclei for ice formation in cirrus clouds? J. E. Penner and C. Zhou, invited presentation at the 250th American Chemical Society National Meeting Meeting, August 16-20, 2015, Boston.

What controls the low ice number concentration in the upper tropical troposphere? C. Zhou, J. E. Penner, G. Lin, X. Liu, and M. Wang, presented at the 96th Annual American Meteorological Society Meeting, January 10-14, 2016, New Orleans, Liousiana.

How Will Secondary Organic Aerosols Change in the Future?, J. E. Penner, G. Lin, and C. Zhou, presented at the Fall American Geophysical Union Meeting, December 14-18, 2015, San Francisco, CA.

How will SOA change in the future?, G. Lin, J. E. Penner, and C. Zhou, presented at the 2015 Gordon Research Conference on Atmospheric Chemistry, August 2-7, 2015, Waterville Valley, New Hampshire.

What controls the Low Ice Number Concentration in the Upper Tropical Troposphere? C. Zhou, J. E. Penner, G. Lin, X. Liu, and M. Wang, presented at the NOAA CT3LS meeting, Boulder, CO, July 23, 2015.

How can we improve estimates of indirect aerosol forcing? Invited presentation for the NRC Committee on Opportunities to Improve the Representation of Clouds and Aerosols in Climate Models with National Collection Systems meeting on June 24-25, 2015, Irvine, CA.

How Will Secondary Organic Aerosols Change in the Future?, J. E. Penner, G. Lin, and C. Zhou, presented at NCAR CESM Chemistry Working Group Meeting, Boulder, CO, February 9, 2016.

Modeling the formation of secondary organic aerosols and the consequences of climate change, Presented at Seoul University, April 12, 2016.

Why a GCM may overestimate the aerosol cloud lifetime effect: a comparison of CAM5 and CRM using ARM observations, C. Zhou and J. E. Penner, presented at the DOE ASR meeting, Washington D. C., May 2-5, 2016.

Forcing associated with contrail dehydration and soot emissions in a global climate model, J. E. Penner, Invited Presentation at the 5th UTIAS International Workshop on Aviation and Climate Change, Toronto, May 18-20, 2016.

Current status in understanding climate and climate change prediction, J. E. Penner, presented to the Ford/University of Michigan Innovation Alliance Executive Committee Meeting, June 17, 2016.

Why do GCMs overestimate the aerosol cloud lifetime effect? A comparison of CAM5 and a cloud resolving model, J. E. Penner, and C. Zhou, presented at the 2nd Kaufmann Symposium, Goddard Space Flight Center, June 21-23, 2016.

Discussion of climate change, J. E. Penner, presented at the local Ann Arbor group meeting of Science and Skeptics, June 28, 2016.

How Will Secondary Organic Aerosols Change in the Future?, J. E. Penner, G. Lin, and C. Zhou, 14th International Global Atmospheric Chemistry Science Conference, Breckinridge, CO, September 26-30, 2016.

Secondary organic aerosol in the atmosphere: Formation and future effects, J. E. Penner, Nanjing University, October 20, 2016.

Secondary organic aerosol in the atmosphere: Formation and effects on radiative forcing, J. E. Penner, Nanjing University of Information Science and Technology, October 21, 2016.

Secondary organic aerosol in the atmosphere: Formation and effects on radiative forcing, J. E. Penner, Texas A&M University, November 16, 2016.

Climate impact of solid ammonium sulfate aerosols acting as ice nuclei, C. Zhou and J. E. Penner, presented at the Fall AGU Meeting, San Francisco, CA, December 12-16, 2016.

How Will Secondary Organic Aerosol Forcing Change in the Future?, J. E. Penner, J. Zhu, C. Zhou, and G. Lin, presented at the American Meteorological Society Meeting, Seattle, WA, January 22-26, 2017.

Climate impact of anthropogenic aerosols on cirrus clouds, J. E. Penner, Invited Presentation, presented at the Fourth Santa Fe Climate Conference, February 6-10, 2017.