University of Colorado
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Curriculum Vitae
Michael D. King

Personal Information

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Education

1977	Ph.D. University of Arizona, Tucson; in Atmospheric Sciences
1973	M.S. University of Arizona; in Atmospheric Sciences
1971	B.A. Colorado College, Colorado Springs; in Physics

Professional Experience

2018–	Adjunct Professor, Department of Atmospheric Sciences, Texas A&M University, College Station
2016–2018	Faculty Fellow, Hagler Institute for Advanced Study at Texas A&M University, and Visiting Professor in the College of Geosciences, Texas A&M University, College Station. Collaborative research, advising graduate students, and giving guest lectures on remote sensing of the Earth's environment.
2009–	Team Leader, Moderate Resolution Imaging Spectroradiometer (MODIS) Science Team, NASA
2008–	Senior Research Scientist, Laboratory for Atmospheric and Space Physics, University of Colorado
2008–2013	Member, Scientific Steering Committee, College of Global Change and Earth System Science, Beijing Normal University
2004–2008	Affiliate Senior Professor, Earth Sciences and GeoInformation Sciences, School of Computational Sciences, George Mason University, Fairfax,

Virginia.

2000–2012 Adjunct Professor, Department of Atmospheric and Oceanic Science, University of Maryland, College Park

2000 Visiting Professor of Environmental Science, Colorado College

1997–2008 Goddard Senior Fellow, NASA Goddard Space Flight Center. Recommend to the Goddard Director the allocation of the Director's Discretionary Fund and monitor the progress of its various activities. Advise the Center Director on issues related to research policy and the improvement of the research and development environment.

1992–2008 Senior Project Scientist, Earth Observing System (EOS), NASA Goddard Space Flight Center. Primary day-to-day interface between the Earth science community and the Office of Earth Science in defining and representing scientific requirements and providing related scientific insight and guidance to the EOS Project. Work closely with the Associate Administrator, Director of Earth Science Research & Analysis Program, and other Earth science personnel at NASA Headquarters to ensure that scientific and related programmatic requirements are appropriately implemented by the EOS Project. Co-chair the EOS Investigators Working Group (IWG). Guide and lead the efforts of 14 Project Scientists and their deputies associated with the various EOS payloads and the EOS Data and Information System (EOSDIS). Responsibility for $130 M of funding annually (prior to 2003) to support algorithm development for all EOS instrument teams as well as all EOS calibration/validation activities.

1992 Deputy Team Leader, Moderate Resolution Imaging Spectroradiometer (MODIS) Science Team, NASA

1992–2002 Adjunct Professor of Atmospheric Science, Department of Oceanography, Dalhousie University

1986–1987 Visiting Professor, Department of Atmospheric Sciences, University of Washington (on sabbatical leave)

1983–1992 Project Scientist, Earth Radiation Budget Experiment (ERBE), NASA Goddard Space Flight Center. Chief science advisor to ERBE Project Manager; numerous presentations to NASA Administrator, Associate Administrator, Division Chiefs, Director of Goddard Space Flight Center, and press on scientific background and status of the Stratospheric Aerosol and Gas Experiment II (SAGE II) and ERBE; member of team with decision making authority over launch of the Earth Radiation Budget Satellite (ERBS) from space shuttle Challenger (Mission 41–G).

1978–1992 Physical Scientist, Laboratory for Atmospheres (formerly Laboratory for Atmospheric Sciences), NASA Goddard Space Flight Center

1972–1977 Research Assistant/Associate, Institute of Atmospheric Physics, University of Arizona

1971–1972 Teaching Assistant, Department of Physics, University of Arizona.

1970 Counselor and Instructor in Special Relativity, National Science Foundation Summer Program, Colorado College.

Special Experience

2009– Team Leader of the MODIS science team on Terra and Aqua.

1990–2009 Head of the Atmosphere Discipline Group of the MODIS science team on Terra and Aqua.

1990– Responsible for 5 science algorithms being run routinely to process MODIS satellite data globally: (i) cloud optical properties component of the MODIS cloud product, a level-2 algorithm for determining cloud optical thickness and effective particle radius of both liquid water and ice clouds, and level-3 combined atmosphere products at 1° x 1° latitude/longitude resolution, averaged over (ii) a day, (iii) eight days (half of the orbital repeat cycle of MODIS), and (iv) a month, and (v) a joint atmosphere level-2 product with the most important atmosphere properties sampled every 5-10 km to reduce the size of this data product for ease of use globally.

Television, press, and radio interviews

US, Portugal, Japan, China, Zambia, South Africa, Brazil, UK

Press conferences

US, Brazil, South Africa

Cabinet Meeting

Addressed Cabinet meeting of South Africa, presided over by the Deputy President of South Africa Jacob Zuma, on SAFARI 2000 and NASA's interest in biomass burning and the environment of South Africa

Honors and Awards

Major

2019 *William T. Pecora Award, Terra Team, U.S. Dept. of the Interior and NASA*, for 'invaluable contributions in all areas of Earth science, with scientific impacts and a legacy that make it one of the most successful missions in the long line of Earth Observing System satellites'

2015 *Elected Fellow, American Association for the Advancement of Science*, for 'distinguished contributions to the remote sensing and analysis of clouds and aerosols, and for years of distinguished scientific leadership of the multi-satellite Earth Observing System'

2015 Selected as *Faculty Fellow*, Hagler Institute for Advanced Study at Texas A&M University

2014 *Elected Fellow, Institute of Electrical and Electronics Engineers*, for 'fundamental research in remote sensing of clouds and aerosols'

2010 *Award of Excellence*, *Society for Technical Communication*, International Technical Publications Competition, for 'Our Changing Planet: The View from Space'

2010 *Best of Show Award*, *Society for Technical Communication*, Washington, DC Chapter, for 'Our Changing Planet: The View from Space'

2006 Presidential Rank Award of *Meritorious Senior Professional*

2006 *Space Systems Award, Earth Observing System (EOS) Team, American Institute of Aeronautics and Astronautics*, for 'developing the Earth Observing System, consisting of a series of earth-observing satellites, an advanced data system, and teams of scientists that represent the first global environmental monitoring system'

2006 *Elected Fellow, American Geophysical Union*, for 'seminal theoretical and experimental methods for the remote sensing of the optical properties of aerosols and clouds and understanding their roles in weather and climate, and the leadership of the definitive Earth Observing System'

2003 *Elected Member, National Academy of Engineering*, for 'advancing our understanding of the effects of aerosols and clouds on Earth's radiation and for leading programs to improve climate prediction'

2001 *William Nordberg Memorial Award for Earth Science*, the highest award of the Goddard Space Flight Center for Achievement in research in Earth systems science, 'in recognition of your exceptional scientific leadership of the NASA Earth Observing System during the last eight years, while leading outstanding experimental and theoretical research in atmospheric aerosol, clouds, and radiation'

2001 *NASA Outstanding Leadership Medal* 'in recognition of your exceptional leadership of the NASA Earth Observing System (EOS) during the last eight years while maintaining outstanding contributions to the sciences of atmospheric radiation and remote sensing'

2000 *Verner E. Suomi Award*, American Meteorological Society, for 'significant and fundamental contributions to remote sensing and radiative transfer, and for leadership in spacecraft experiments'

1997 Elected Goddard Senior Fellow

1995 Doctor of Science *honoris causa*, Colorado College

1993 *Transactions Prize Paper Award*, IEEE Geoscience and Remote Sensing Society (best paper of the year award)

1992 *NASA Exceptional Scientific Achievement Medal* 'in recognition of your outstanding contributions to the development of instrumentation, theory, and analysis of remotely sensed aircraft and satellite data to increase the understanding of the physics of the Earth's atmosphere'

1990 *Elected Fellow, American Meteorological Society*

1985 *NASA Exceptional Service Medal* 'in recognition of dedicated service and leadership as Project Scientist of the Earth Radiation Budget Satellite. His scientific skills and sound judgment contributed directly to the success of the ERBE mission'

1971 Magna cum laude, Colorado College

Secondary

2014 NASA Group Achievement Award (Studies of Emissions and Atmospheric Composition, Clouds and Climate Coupling by Regional Surveys (SEAC^{4}RS) in 2013)

2008 NASA Group Achievement Award (Tropical Composition, Cloud and Climate Coupling Experiment)

2007 NASA Group Achievement Award (Intercontinental Chemical Transport

Experiment)

2006 *People's Voice Award* for Education, Webby Award, NASA's Earth Observatory

2004 NASA Group Achievement Award (SORCE Mission Team)

2003 NASA Group Achievement Award (Aqua Mission Team)

2003 NASA Group Achievement Award (CRYSTAL-FACE Science Team)

2003 NASA Certificate of Appreciation for the creative development of technically significant software that has been accepted and approved by NASA, entitled 'MODIS Cloud Optical Properties Algorithm (MOD_PR06OD)'

2003 Elected Senior Member, Institute of Electrical and Electronics Engineers

2003 NASA Group Achievement Award (CERES Science Algorithms and Data Products Team)

2003 Goddard Space Flight Center Group Achievement Award (Outstanding Teamwork Earth Observing System (EOS) Aqua Mission Team)

2002 NASA Group Achievement Award (SAFARI 2000 International Leadership Team) 'in recognition of your outstanding dedication and leadership in the execution of the Southern African Regional Science Initiative (SAFARI 2000)'

2001 NASA Group Achievement Award (The Earth Observatory Web Page Team)

2001 NASA Group Achievement Award (Earth Observing System Terra Project)

2001 NASA Public Service Group Achievement Award (Earth Observing System (EOS) AM Program Team)

2000 NASA Group Achievement Award (Outstanding Teamwork Earth Observing System/AM (EOS/AM) Project Team)

1999 NASA Group Achievement Award (CERES Algorithm Development and Data Management Team)

1998 NASA Group Achievement Award (TRMM Team)

1997 NASA Group Achievement Award (FIRE II Science & Operations Team)

1992 NASA Group Achievement Award (FIRE Science Team)

1988 Langley Research Center Group Achievement Award

1985 NASA Group Achievement Award (ERBE Project)

1983 Goddard Space Flight Center Special Achievement Award

Professional Societies

National Academy of Engineering (Member)
American Meteorological Society (Fellow)
American Geophysical Union (Fellow)
Institute of Electrical and Electronics Engineers (Fellow)
American Association for the Advancement of Science (Fellow)

National Academies of Sciences, Engineering and Medicine (formerly NRC)

2018-2021 Member, Peer Committee, Special Fields and Interdisciplinary Engineering, National Academy of Engineering

2016–2018 co-Chair, Committee on Earth Sciences and Applications from Space

2015–2016 Member, Committee on NASA Science Mission Extensions
2013–2015 Vice Chair, Committee on a Framework for Analyzing the Needs for Continuity of NASA-Sustained Remote Sensing Observations of the Earth from Space
2012–2016 Member, Committee on Earth Sciences and Applications from Space
2011–2012 Member, Board on Atmospheric Sciences and Climate
2009–2011 Member, Climate Research Committee

Professional and Service Activities

2014 Chair, Visiting Committee, Earth Sciences Division, Sciences and Exploration Directorate, NASA Goddard Space Flight Center
2012–2015 Member of the Studies of Emissions, Atmospheric Composition, Clouds and Climate Coupling by Regional Surveys (SEAC^{4}RS) science team, National Aeronautics and Space Administration
2010–2013 Member of the Atmospheric Research Awards Committee, American Meteorological Society
2009– Team Leader of the Moderate Resolution Imaging Spectroradiometer (MODIS) science team of the Earth Observing System (EOS), National Aeronautics and Space Administration
2007–2010 Member of the Tropical Composition, Cloud and Climate Coupling (TC^4) science team, National Aeronautics and Space Administration
2005–2008 Member, Expert Team on Satellite Systems, World Meteorological Organization
2003-2010 Member of the Moderate Resolution Imaging Spectroradiometer (MODIS) science team of the Earth Observing System (EOS), National Aeronautics and Space Administration
2001–2003 Member of the Cirrus Regional Study of Tropical Anvils and Cirrus Layers (CRYSTAL) - Florida Area Cirrus Experiment (FACE) science team, National Aeronautics and Space Administration
2000–2008 Member of the International Radiation Commission, International Association of Meteorology and Atmospheric Physics, IUGG
1999–2013 Science Advisor, *Earth & Sky* Radio Series
1999–2002 Member of the Committee on Cloud Physics, American Meteorological Society
1996–1999 Member of Focus on Direct Radiative Forcing Committee of the International Global Atmospheric Chemistry (IGAC) Commission
1996 Member of the Global Imager (GLI) science team, National Space Development Agency (NASDA) of Japan
1992–1996 Member of Executive Committee of the International Commission on Clouds and Precipitation (ICCP)
1991–1993 Associate Editor, *Journal of the Atmospheric Sciences*, American Meteorological Society
1990 Lecturer, Course on "The Use of EOS for Studies of Atmospheric Physics," International School of Physics "Enrico Fermi," Italian Physical Society, Varenna, Italy
1989–2003 Member of the Moderate Resolution Imaging Spectroradiometer

(MODIS) science team of the Earth Observing System (EOS), National Aeronautics and Space Administration

1989–2003 Co-Investigator of the Clouds and the Earth's Radiant Budget Energy System (CERES) science team of EOS, National Aeronautics and Space Administration

1987 External Ph.D. Examiner, School of Physics, University of New South Wales, Kensington, Australia

1986–1992 Member of Joint Working Group on Clouds and Radiation, International Radiation Commission and International Commission on Clouds and Precipitation

1986 Session Chair and Lecturer, Short Course on "Atmospheric Radiation as it Relates to Climate," American Meteorological Society.

1986 Program Chairman, Sixth Conference on Atmospheric Radiation, American Meteorological Society

1985–2000 Member of the First ISCCP (International Satellite Cloud Climatology Project) Regional Experiment (FIRE) science experiment team, National Aeronautics and Space Administration

1985 Member of external review committee for Aerosol Research Branch, Division of Atmospheric Sciences, NASA Langley Research Center

1984–1988 Member and Chairman (1986–1988) of the Committee on Atmospheric Radiation, American Meteorological Society

1980–1992 Principal Investigator on the Earth Radiation Budget Experiment (ERBE) science team, National Aeronautics and Space Administration

Research Experience

(i) Development of radiative transfer models.

Treatment of anisotropic scattering in plane-parallel cloudy atmospheres using the doubling method and asymptotic theory for thick layers. Develop method to compute asymptotic functions and constants by direct solution of matrices arising in the discrete-ordinates method. Use of the Gauss-Seidel iterative method to solve radiative transfer problems in vertically inhomogeneous atmospheres containing aerosols and ozone, including the effects of polarization.

(ii) Development of inversion methods for remote sensing.

Selection of the Lagrange multiplier in constrained linear inversion problems. Inference of aerosol size distributions and corresponding uncertainties from spectral aerosol optical thickness measurements. Retrieval of aerosol size distribution and spectral single scattering albedo from sky radiance measurements.

(iii) Applications to ground-based remote sensing.

Inference of the total ozone content of the atmosphere from Chappuis band absorption. Determination of the spectral aerosol optical thickness of the atmosphere from direct solar transmission measurements, and the aerosol complex refractive index and surface albedo from direct-diffuse radiation measurements. Inference of the aerosol complex refractive index and size distribution from lidar measurements. Determination of the aerosol

size distributions of the El Chichón stratospheric aerosol layer prior to aircraft or balloon penetration of the aerosol layer.

(iv) Applications to satellite remote sensing.

Studies of the effect of an inhomogeneous planetary albedo on the interpretation of ERBE shortwave nonscanner measurements. Determination of the cloud optical thickness and effective particle radius from reflected solar radiation measurements (Landsat-5 Thematic Mapper and Terra and Aqua/MODIS). Determine the spatially complete spectral surface albedo of terrestrial land surfaces every 16 days (Terra and Aqua/MODIS). Characterize the spectral albedo of snow-covered land surfaces for the Northern Hemisphere (Terra and Aqua/MODIS).

(v) Applications to aircraft remote sensing.

Determination of the cloud optical thickness and effective particle radius from reflected solar radiation measurements (NASA WB-57F and ER-2 aircraft). Development and application of the diffusion domain method for inferring the spectral single scattering albedo of clouds from the angular distribution of scattered radiation deep within a cloud layer (University of Washington C-131A aircraft). Determined the bidirectional reflectance of various surfaces from airborne scanning radiometer observations. Inference of the aerosol optical thickness and size distribution of the El Chichón stratospheric aerosol layer from airborne latitudinal surveys.

(vi) Applications to climate modeling.

Parameterization of the shortwave and longwave impact of the El Chichón stratospheric aerosol layer for use by climate models. Study of the comparative accuracy of selected multiple scattering approximations commonly used in climate models and remote sensing applications.

(vii) Development of scanning radiometers for use on aircraft.

Developed the Cloud Absorption Radiometer (CAR) for inferring the spectral single scattering albedo of clouds, which was subsequently integrated and flown on the University of Washington's B-23, C-131A, and CV-580 aircraft, South African Weather Service Aerocommander 690, Sky Research J-31, and NASA P-3B. Principal investigator of the MODIS Airborne Simulator (MAS), an airborne spectrometer that has been integrated and flown on the NASA ER-2 aircraft. The primary use of this spectrometer is to aid in the development and validation of algorithms for determining cloud, aerosol and water vapor properties from the MODIS satellite sensor.

(viii) Participate in aircraft field experiments with multispectral radiometers.

Have flown on and operated the Cloud Absorption Radiometer in marine and continental stratocumulus clouds in Washington State, off the coast of California (FIRE marine stratocumulus experiment and MAST), and in the Azores (ASTEX); arctic stratus clouds over the Beaufort and Chukchi Seas off Barrow and Prudhoe Bay, Alaska; sea ice and arctic haze off Prudhoe Bay, Alaska; smoke and clouds resulting from biomass burning in Brazil, southern Africa, and Kuwait oil fire smoke; aerosol and clouds in Mexico City and environs; and agricultural regions around the Southern Great Plains ARM site [>550 research hours]. Have directed the NASA

ER-2 as flight scientist in Houston (FIRE Cirrus experiment), the Azores (ASTEX), Australia (TOGA COARE), Fiji (CEPEX), Wallops Flight Facility (SCAR-A), Ames Research Center (MAST), Fairbanks (ARMCAS and FIRE ACE), Brazil (SCAR-B), South Africa (SAFARI 2000), and southern Florida (CRYSTAL-FACE).

Current Research Projects

(i) Analysis of multispectral solar radiation data to retrieve the cloud optical thickness and effective radius of liquid water and ice clouds from MODIS data on Terra and Aqua.

(ii) Analysis of MODIS Airborne Simulator data to infer the cloud optical thickness and effective particle radius of marine stratocumulus, Arctic stratus, and cirrus clouds.

(iii) Determination of the spectral bidirectional reflectance of the ocean, sea ice, snow, tundra, savanna (cerrado, mopane, miombo), smoke, vegetation, desert (Saudi Arabia, Namib, Kalahari), and clouds between 0.5 and 2.3 μm.

Teaching Experience

1986 Atmospheric Radiation II, a graduate course in the Department of Atmospheric Sciences, University of Washington

1987 Remote Sensing of the Atmosphere, a graduate course in the Department of Atmospheric Sciences, University of Washington

2000 Remote Sensing of the Earth from Space, an undergraduate course in the Departments of Environmental Science and Physics, Colorado College

2002 Short Course on Terra, a graduate course at Goddard Space Flight Center for students from MIT, Harvard, and the University of Maryland (Baltimore County and College Park campuses)

2002 Short Course on Terra, a graduate course at the International Summer School on Atmospheric and Oceanic Sciences, L'Aquila, Italy

2007 Remote Sensing of the Atmosphere, a graduate course in the Department of Atmospheric and Oceanic Science, University of Maryland-College Park

2008 Summer Course on remote sensing and its applications in meteorology and environmental studies at the Nanjing University of Information Science and Technology, Nanjing, China

2010, 2011 Continuing Education Course on 'Our Changing Planet: The View from Space' at the University of Colorado

Students and Post-Docs Advised

1987–1990 Dr. Teruyuki Nakajima, NRC post-doctoral research associate

1995–1998 Dr. Robert Pincus, NRC post-doctoral research associate

1996–1998 Dr. Xu Liang, University of Maryland Baltimore County research assistant professor (Joint Center for Earth Systems Technology)

1996–1999 Dr. Peter Soulen, University of Maryland Baltimore County post-doctoral research associate (Joint Center for Earth Systems Technology)

1998 Ms. Suzie Young, undergraduate student, Clemson University (summer

	employment)
1998	Ms. Tamara Beitzel, undergraduate student, Colorado College (summer employment)
1999–2001	Dr. Charles Gatebe, USRA post-doctoral research associate
1999, 2000	Mr. Shane Crothers, undergraduate student, University of Ulster, Belfast, Northern Ireland (summer employment)
2001–2002	Dr. Jérôme C. Riedi, University of Maryland Baltimore County post-doctoral research associate (Goddard Earth Sciences and Technology Center)
2007-2008	Dr. Makoto Kuji, Nara Women's University, Nara, Japan

Ph.D. Committees

1987	Dr. Gabriel Viera, University of New South Wales, thesis: 'Information Analysis of Integral Equations in Remote Sensing of Atmospheric Aerosols'
2009	Dr. Qingling Zhang, Boston University, thesis: 'A Global Spatially and Temporally Complete Reflectance Anisotropy Database to Improve Surface Characterization for Environmental Monitoring'
2010	Dr. Nadia Smith, University of Johannesburg, thesis: 'Air Quality Monitoring with Polar-Orbiting Hyperspectral Infrared Sounders – A Fast Retrieval Scheme for Carbon Monoxide'
2016	Dr. Shi Song, University of Colorado, thesis 'The Spectral Signature of Cloud Spatial Structure in Shortwave Radiation'
2020	Sabrina P. Cochrane, University of Colorado, thesis 'Shortwave Spectral Optical Properties and Radiative Effects of Biomass Burning Aerosols'
2021	Hong Chen, University of Colorado, thesis '?'

Refereed Publications

Over 105 refereed journal articles, 15,200+ citations, h-index = 48 (Web of Science) or h-index = 58 (Google Scholar). Papers with over 100 citations (Thompson ISI): 31

1. King, M. D., and D. M. Byrne, 1976: A method for inferring total ozone content from the spectral variation of total optical depth obtained with a solar radiometer. *J. Atmos. Sci.*, **33**, 2242–2251.
2. King, M. D., D. M. Byrne, B. M. Herman, and J. A. Reagan, 1978: Aerosol size distributions obtained by inversion of spectral optical depth measurements. *J. Atmos. Sci.*, **35**, 2153–2167.
3. King, M. D., and B. M. Herman, 1979: Determination of the ground albedo and the index of absorption of atmospheric particulates by remote sensing. Part I: Theory. *J. Atmos. Sci.*, **36**, 163–173.
4. King, M. D., 1979: Determination of the ground albedo and the index of absorption of atmospheric particulates by remote sensing. Part II: Application. *J. Atmos. Sci.*, **36**, 1072–1083.
5. Reagan, J. A., D. M. Byrne, M. D. King, J. D. Spinhirne, and B. M. Herman, 1980: Determination of the complex refractive index and size distribution of atmospheric particulates from bistatic-monostatic lidar and solar radiometer measurements. *J. Geophys. Res.*, **85**, 1591–1599.
6. King, M. D., and R. J. Curran, 1980: The effect of a nonuniform planetary albedo on the interpretation of Earth radiation budget observations. *J. Atmos. Sci.*, **37**, 1262–1278.
7. King, M. D., D. M. Byrne, J. A. Reagan, and B. M. Herman, 1980: Spectral variation of optical depth at Tucson, Arizona between August 1975 and December 1977. *J. Appl. Meteor.*, **19**, 723–732.
8. King, M. D., 1981: A method for determining the single scattering albedo of clouds through observation of the internal scattered radiation field. *J. Atmos. Sci.*, **38**, 2031–2044.
9. King, M. D., 1982: Sensitivity of constrained linear inversions to the selection of the Lagrange multiplier. *J. Atmos. Sci.*, **39**, 1356–1369.
10. King, M. D., 1983: Number of terms required in the Fourier expansion of the reflection function for optically thick atmospheres. *J. Quant. Spectrosc. Radiat. Transfer*, **30**, 143–161.
11. King, M. D., Harshvardhan, and A. Arking, 1984: A model of the radiative properties of the El Chichón stratospheric aerosol layer. *J. Climate Appl. Meteor.*, **23**, 1121–1137.
12. Spinhirne, J. D., and M. D. King, 1985: Latitudinal variation of spectral optical thickness and columnar size distribution of the El Chichón stratospheric aerosol layer. *J. Geophys. Res.*, **90**, 10607–10619.
13. King, M. D., and Harshvardhan, 1986: Comparative accuracy of selected multiple scattering approximations. *J. Atmos. Sci.*, **43**, 784–801.
14. ERBE Science Team, 1986: First data from the Earth Radiation Budget Experiment (ERBE). *Bull. Amer. Meteor. Soc.*, **67**, 818–824.
15. King, M. D., M. G. Strange, P. Leone, and L. R. Blaine, 1986: Multiwavelength scanning radiometer for airborne measurements of scattered radiation within clouds. *J. Atmos. Oceanic Technol.*, **3**, 513–522.

16. King, M. D., 1987: Determination of the scaled optical thickness of clouds from reflected solar radiation measurements. *J. Atmos. Sci.*, **44**, 1734–1751.
17. Radke, L. F., J. A. Coakley, Jr., and M. D. King, 1989: Direct and remote sensing observations of the effects of ships on clouds. *Science*, **246**, 1146–1149.
18. King, M. D., L. F. Radke, and P. V. Hobbs, 1990: Determination of the spectral absorption of solar radiation by marine stratocumulus clouds from airborne measurements within clouds. *J. Atmos. Sci.*, **47**, 894–907.
19. Nakajima, T., and M. D. King, 1990: Determination of the optical thickness and effective particle radius of clouds from reflected solar radiation measurements. Part I: Theory. *J. Atmos. Sci.*, **47**, 1878–1893.
20. King, M. D., T. Nakajima, J. D. Spinhirne, and L. F. Radke, 1990: Cloud microphysical properties from multispectral reflectance measurements. *Long-Term Monitoring of the Earth's Radiation Budget*, B. R. Barkstrom, Ed., Proc. SPIE, **1299**, 139–153.
21. Nakajima, T., M. D. King, J. D. Spinhirne, and L. F. Radke, 1991: Determination of the optical thickness and effective particle radius of clouds from reflected solar radiation measurements. Part II: Marine stratocumulus observations. *J. Atmos. Sci.*, **48**, 728–750.
22. King, M. D., Y. J. Kaufman, W. P. Menzel, and D. Tanré, 1992: Remote sensing of cloud, aerosol, and water vapor properties from the Moderate Resolution Imaging Spectrometer (MODIS). *IEEE Trans. Geosci. Remote Sens.*, **30**, 2–27.
23. King, M. D., 1992: Directional and spectral reflectance of the Kuwait oil-fire smoke. *J. Geophys. Res.*, **97**, 14545–14549.
24. Nakajima, T., and M. D. King, 1992: Asymptotic theory for optically thick layers: Application to the discrete ordinates method. *Appl. Opt.*, **31**, 7669–7683.
25. Harshvardhan, and M. D. King, 1993: Comparative accuracy of diffuse radiative properties computed using selected multiple scattering approximations. *J. Atmos. Sci.*, **50**, 247–259.
26. King, M. D., L. F. Radke, and P. V. Hobbs, 1993: Optical properties of marine stratocumulus clouds modified by ships. *J. Geophys. Res.*, **98**, 2729–2739.
27. Price, R. D., M. D. King, J. T. Dalton, K. S. Pedelty, P. E. Ardanuy, and M. K. Hobish, 1994: Earth science data for all: EOS and the EOS Data and Information System. *Photogramm. Eng. Remote Sens.*, **60**, 277–285.
28. Platnick, S., M. D. King, G. T. Arnold, J. Cooper, L. E. Gumley, and S. C. Tsay, 1994: Status and calibration of the MODIS Airborne Simulator for Earth remote sensing applications. *European Symposium on Satellite Remote Sensing: Platforms and Systems*, Proc. SPIE, **2317**, 91–101.
29. King, M. D., D. D. Herring, and D. J. Diner, 1995: The Earth Observing System (EOS): A space-based program for assessing mankind's impact on the global environment. *Opt. Photon. News*, **6**, 34–39.
30. Gumley, L. E., and M. D. King, 1995: Remote sensing of flooding in the U.S. upper Midwest during the summer of 1993. *Bull. Amer. Meteor. Soc.*, **76**, 933–943.
31. Wielicki, B. A., R. D. Cess, M. D. King, D. A. Randall, and E. F. Harrison, 1995: Mission to Planet Earth: Role of clouds and radiation in climate. *Bull. Amer. Meteor. Soc.*, **76**, 2125–2153.
32. King, M. D., W. P. Menzel, P. S. Grant, J. S. Myers, G. T. Arnold, S. E. Platnick, L. E. Gumley, S. C. Tsay, C. C. Moeller, M. Fitzgerald, K. S. Brown, and F. G. Oster-

wisch, 1996: Airborne scanning spectrometer for remote sensing of cloud, aerosol, water vapor and surface properties. *J. Atmos. Oceanic Technol.*, **13**, 777–794.

33. Tsay, S. C., P. M. Gabriel, M. D. King, and G. L. Stephens, 1996: Spectral reflectance and atmospheric energetics in cirrus-like clouds. Part II: Applications of a Fourier-Riccati approach to radiative transfer. *J. Atmos. Sci.*, **53**, 3450–3467.
34. Arnold, G. T., M. F. Fitzgerald, P. S. Grant, S. E. Platnick, S. C. Tsay, J. S. Myers, M. D. King, R. O. Green, and L. Remer, 1996: MODIS Airborne Simulator radiometric calibration. *Conference on Earth Observing System*, Proc. SPIE, **2820**, 56–66.
35. Platnick, S., P. Abel, and M. D. King, 1996: Effect of water vapor absorption on integrating sphere output radiance and consequences for instrument calibration. *Proc. Conference on Earth Observing System*, Proc. SPIE, **2820**, 197–205.
36. Kaufman, Y. J., D. Tanré, H. R. Gordon, T. Nakajima, J. Lenoble, R. Frouin, H. Grassl, B. M. Herman, M. D. King, and P. M. Teillet, 1997: Passive remote sensing of tropospheric aerosol and atmospheric correction for the aerosol effect. *J. Geophys. Res.*, **102**, 16815–16830.
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