

EDUCATION:

1969 B.S. Indian Institute of Technology, Kharagpur
1971 M.S. Indian Institute of Science, Bangalore
1976 Ph.D. State University of New York, Stony Brook

PROFESSIONAL EXPERIENCE:

1996-2004 Head, Department of Earth and Atmospheric Sciences, Purdue University
1994-present Professor, Department of Earth and Atmospheric Sciences, Purdue University
1988-1994 Associate Professor, Department of Earth and Atmospheric Sciences, Purdue University
1978-1988 University Research Associate, Laboratory for Atmospheres, NASA/Goddard Space Flight Center
1977-1978 Resident Research Associate, Laboratory for Atmospheric Sciences, NASA/Goddard Space Flight Center.
1973-1976 Research Assistant, Department of Mechanics, S.U.N.Y.
1971-1973 Teaching Assistant, Department of Mechanics, S.U.N.Y.

HONORS AND AWARDS:

1977 National Research Council Resident Research Associate
1993 Henry G. Houghton Award, American Meteorological Society
1999 Fellow, American Meteorological Society

PROFESSIONAL ACTIVITIES:

Membership

1979- Member, American Geophysical Union (AGU)
1980- Member, American Meteorological Society (AMS)
2005- Member, Institute of Electrical & Electronics Engineers (IEEE)
1988-91 Member, Committee on Atmospheric Radiation, AMS
1998-2000 Member, AGU Heads & Chairs Executive Committee

Visiting Scientist

1981 National Center for Atmospheric Research, Boulder, CO.
1994 Max Planck Institute for Meteorology, University of Hamburg, Germany.
1994 National Centre for Medium Range Weather Forecasting, New Delhi, India.
2002 Goddard Earth Sciences and Technology Center, Greenbelt, MD

Editorial Duties

1991-93 Associate Editor, Journal of Applied Meteorology
1992-94 Associate Editor, Journal of the Atmospheric Sciences
1996-2001 Editor, Journal of Applied Meteorology

Invited Participant (since 1989)

1989 Workshop on Quantifying the Link Between Change in Radiative Balance and Atmospheric Temperature sponsored by DOE, Germantown, MD.
1990 *Workshop on Clouds, Radiation and Climate sponsored by the Department of Meteorology, University of Maryland, College Park, MD.
Planning meeting for the Atmospheric Radiation Measurement (ARM) program, Department of Energy, Argonne National Laboratory, Argonne, IL.

- *Indo-U.S. Seminar on the Parameterization of Subgrid-Scale Processes in Dynamical Models of Medium-Range Prediction and Global Climate, Pune, India.
- Contributor to the US Quadrennial Report to the XX General Assembly of the IUGG, Vienna, Austria.
- 1991 *Meeting of the Committee on Meteorological Analysis, Prediction and Research of the Board on Atmospheric Science and Climate (National Research Council), Washington, D.C.
- Workshop on critical areas in Heat Transfer, NSF Chemical and Thermal Systems Division, Chicago, IL.
- *Workshop on water vapor, clouds, radiative processes and climate; inferences from recent satellite observations, NOAA Geophysical Fluid Dynamics Laboratory, Princeton, NJ.
- *ECMWF/GEWEX Workshop on Hydrology and Surface Radiation in Atmospheric Models, European Centre for Medium Range Weather Forecasts, Reading, U.K.
- 1992 Foreign Applied Sciences Assessment Center Panel on Climate Research in the former Soviet Union, sponsored by Department of Energy, SAIC, McLean, VA.
- *Third International Cloud Modeling Workshop, WMO Workshop on Cloud Microphysics and Applications to Global Change, Toronto, Canada.
- 1994 Workshop on Ozone: Its Climate and Related Impacts, Argonne National Laboratory, Argonne, IL.
- Dahlem Conference on Aerosol Forcing of Climate, Berlin, Germany.
- *Aspen Global Change Institute workshop on Radiation Feedbacks and the Credibility of Atmospheric Models, Aspen, CO.
- 1995 Air Quality Criteria for Particulate Matter and Sulfur Oxides, U.S. EPA, Research Triangle Park, NC.
- 1996 ARM/CHAMMP/PCMDI Workshop on Improving the Representation and Diagnosis of Solar Radiative Heating in Climate Models, U.S. DOE, Sequim, WA.
- Panel Review, NASA Earth System Science Pathfinder Program, Washington, DC.
- Panel Review, NASA AM -1 Platform Instrument Algorithm Theoretical Basis Documents, Columbia, MD.
- 1997 Panel Review, NOAA/NASA Enhanced Data Sets for Analysis and Applications, Asheville, NC.
- Panel Review, NASA, Satellite Remote Sensing Measurement Accuracy, Variability, and Validation Studies, Crystal City, VA.
- 1998 *Gordon Research Conference, Solar Radiation and Climate, Plymouth, NH
- *Global Aerosol Climatology Project, Aerosol Radiative Forcing Science Team, NASA GISS, New York, NY.
- 2000 Gordon Research Conference, Solar Radiation and Climate, New London, CT
- Workshop on Monitoring Global Aerosol Forcing of Climate, GFDL, Princeton, NJ
- *Third Global Aerosol Climatology Project Science Team Meeting, Lanham-Seabrook, MD
- 2005 IGAC specialty conference on the indirect effects of aerosols on climate, Manchester, UK
- 2006 *Aerosol Workshop on Climate Prediction Uncertainties, Santa Fe, NM
- * including invited lecturer

Invited Lectures & Seminars (since 1996)

- 1996 Department of Meteorology, University of Oklahoma, Norman, OK, April 29-30.

- Marine Meteorology Division, Naval Research Laboratory, Monterey, CA, July 10.
NOAA Geophysical Fluid Dynamics Laboratory, Princeton, NJ, August 9.
- 1997 Ninth Conference on Atmospheric Radiation, Long Beach, CA, February 4.
NASA Goddard Institute for Space Studies, Columbia University, New York, NY, March 28.
- 1998 Department of Meteorology, Florida State University, Tallahassee, FL, February 27.
Marine Meteorology Division, Naval Research Laboratory, Monterey, CA, March 9.
- 2001 Department of Atmospheric Sciences, University of Illinois, Urbana-Champaign, September 5.
- 2002 Lawrence Livermore National Laboratory, Livermore, CA, May 10.
Naval Research Laboratory, Monterey, CA, May 14.
NASA Ames Research Center, Moffett Field, CA, May 16.
Brookhaven National Laboratory, Upton, NY, August 27.
Goddard Space Flight Center, Greenbelt, MD, September 25.
NOAA Geophysical Fluid Dynamics Laboratory, Princeton, NJ, September 26.
NCAR Climate and Global Dynamics Division, Boulder, CO, October 8.
Department of Atmospheric & Oceanic Sciences, U. of Wisconsin, Madison, WI, November 4.
Center for Ocean-Land-Atmosphere, Calverton, MD, November 13.
Department of Physics, Howard University, Washington, DC, November 20.
Naval Research Laboratory, Washington, DC, November 21.
- 2005 ESSIC (Earth System Science Interdisciplinary Center), University of Maryland, College Park, MD, January 31.
Optical Society of America topical meeting on Hyperspectral Imaging and Sounding of the Environment, Alexandria, VA, February 1.
Department of Atmospheric Sciences, U. of Illinois, Urban-Champaign, IL, September 28.
- 2006 Department of Environmental Sciences, Rutgers University, Newark, NJ, June 5.
NOAA Geophysical Fluid Dynamics Laboratory, Princeton, NJ, June 5.

Journal Reviewer

Journal of Applied Meteorology
Journal of the Atmospheric Sciences
Journal of Climate
Bulletin of the American Meteorological Society
Journal of Geophysical Research (Atmospheres)
Journal of the Meteorological Society of Japan
Atmospheric Research
Theoretical and Applied Climatology
Tellus
Climate Dynamics
Earth Science Reviews
Monthly Weather Review
Quarterly Journal of the Royal Meteorological Society

Proposal Reviewer

NASA Office of Space Science and Applications
NASA Mission to Planet Earth
NSF Division of Atmospheric Sciences
NSF Office of Science and Technology
Air Force Office of Scientific Research
Department of Energy Atmospheric Radiation Measurement Program

US Civilian Research & Development Foundation
 Netherlands Organization for Scientific Research NOW
 NASA Science Mission Directorate

Program Reviewer

Climate and Global Dynamics Division, National Center for Atmospheric Research

STUDENTS:

Graduate Chairman

<u>Name</u>	<u>Degree</u>	<u>Completion Date</u>
Fredrick G. Meyer (w/J. Curry)	M.S.	1990
Quattara Fatogoma	M.S.	1990
Hui Zhi	M.S.	1990
Richard Cullather	M.S.	1993
Kathryn Ginger	M.S.	1993
Steven M. Gollmer	Ph.D.	1994
Surabi Menon	M.S.	1994
John Laird	M.S.	1995
Michael Batey	M.S.	1996
Jaya Ramaprasad	Ph.D.	1998
Jill Zenner	M.S.	1999
Michael Wilson	M.S.	2000
Jui-Yuan Chiu (w/G. W. Petty)	Ph.D.	2003
Mariya Petrenko	Ph.D.	current

POST-DOCS and RESEARCH SCIENTISTS:

Robert N. Green, M.S. (Purdue)	1994-2000
Guang Guo, Ph.D. (Utah)	2000-2002
Zheng Qu, Ph.D. (Chicago)	2002-2003

REFEREED PUBLICATIONS:

Journals

- Cess, R.D., and Harshvardhan, 1974. Shear-flow stability within the atmosphere of Venus. *J. Fluid Mech.*, **66**, 267-272.
- Harshvardhan, and Cess, R.D., 1976. Stratospheric aerosols: effect upon atmospheric temperature and global climate. *Tellus*, **28**, 1-10.
- Harshvardhan, and Cess, R.D., 1978. Effect of tropospheric aerosols upon atmospheric infrared cooling rates. *J. Quant. Spectrosc. Radiat. Transfer*, **19**, 621-632.
- Harshvardhan, 1979. Perturbation of the zonal radiation balance by a stratospheric aerosol layer. *J. Atmos. Sci.*, **36**, 1274-1285.
- Konyukh, L.A., Yurevich, F.B., Cess, R.D., and Harshvardhan, 1979. Tropospheric aerosols: effect upon the surface and surface-atmosphere radiation budgets. *J. Quant. Spectrosc. Radiat. Transfer*, **22**, 483-488.
- Weinman, J.A., Harshvardhan, and Olson, W. S., 1981. Infrared radiation emerging from smoke produced by brush fires. *Appl. Opt.*, **20**, 199-206.
- Harshvardhan, Weinman, J.A., and Davies, R., 1981. Transport of infrared radiation in cuboidal clouds. *J. Atmos. Sci.*, **38**, 2500-2513.
- Harshvardhan, and Weinman J.A., 1982. Infrared radiative transfer through a regular array of cuboidal clouds. *J. Atmos. Sci.*, **39**, 431-439.
- Harshvardhan, 1982. The effect of brokenness on the cloud-climate sensitivity. *J. Atmos. Sci.*, **39**, 1853-1861.
- Weinman, J.A., and Harshvardhan, 1982. Solar reflection from a regular array of horizontally finite clouds. *Appl. Opt.*, **21**, 2940-2944.

- King, M.D., Harshvardhan, and Arking, A., 1984. A model of the radiative properties of the El Chichon stratospheric aerosol layer. *J. Climate Appl. Meteor.*, **23**, 1121-1137.
- Harshvardhan, and Thomas, R.W.L., 1984. Solar reflection from interacting and shadowing cloud elements. *J. Geophys. Res.*, **89**, 7179-7185.
- Harshvardhan, and Randall, D.A., 1985. Comments on 'The parameterization of radiation for numerical weather prediction and climate models'. *Mon. Wea. Rev.*, **113**, 1832-1833.
- King, M.D., and Harshvardhan, 1986. Comparative accuracy of selected multiple scattering approximations. *J. Atmos. Sci.*, **43**, 784-801.
- Harshvardhan, Davies, R., Randall, D.A., and Corsetti, T.G., 1987. A fast radiation parameterization for atmospheric circulations models. *J. Geophys. Res.*, **92**, 1009-1016.
- Betts, A.K., and Harshvardhan, 1987. Thermodynamic constraint on the cloud liquid water feedback in climate models. *J. Geophys. Res.*, **92**, 8483-8485.
- Fiatt, C.M.R., and Harshvardhan, 1988. The temperature dependence of cirrus extinction - implications for climate feedback. *J. Geophys. Res.*, **93**, 11051-11058.
- Harshvardhan, Randall, D.A., Corsetti, T.G., and Dazlich, D.A., 1989. Earth radiation budget and cloudiness simulations with a general circulation model. *J. Atmos. Sci.*, **46**, 1922-1942.
- Randall, D.A., Harshvardhan, Dazlich, D.A., and Corsetti, T.G., 1989. Interactions among radiation, convection, and large-scale dynamics in a general circulation model. *J. Atmos. Sci.*, **46**, 1943-1970.
- Harshvardhan, Randall, D.A., and Dazlich, D.A., 1990. Relationship between the longwave cloud radiative forcing at the surface and the top of the atmosphere. *J. Climate*, **3**, 1435-1443.
- Randall, D.A., Harshvardhan, and Dazlich, D.A., 1991. Diurnal variability of the hydrologic cycle in a general circulation model. *J. Atmos. Sci.*, **48**, 40-62.
- Ridgway, W.L., Harshvardhan, and Arking, A., 1991. Computation of atmospheric infrared cooling rates by exact and approximate methods. *J. Geophys. Res.* **96**, 8969-8984.
- Harshvardhan, 1991. Atmospheric radiation. *Rev. Geophys.*, **29**, Supplements, 56-68.
- Harshvardhan, and King, M.D., 1993. Comparative accuracy of diffuse radiative properties computed using selected multiple scattering approximations. *J. Atmos. Sci.*, **50**, 247-259.
- Zhi, H., and Harshvardhan, 1993. A hybrid technique for computing the monthly mean net longwave surface radiation over oceanic areas. *Theor. Appl. Climatol.*, **47**, 65-79.
- Harshvardhan, Wielicki, B.A., and Gieger, K.M., 1994. The interpretation of remotely sensed cloud properties from a model parameterization perspective. *J. Climate*, **7**, 1987-1998.
- Cahalan, R.F., Ridgway, W., Wiscombe, W.J., Gollmer, S., and Harshvardhan, 1994. Independent pixel and Monte Carlo estimates of stratocumulus albedo. *J. Atmos. Sci.*, **51**, 3776-3790.
- Harshvardhan, and Espinoza, R.C., Jr., 1994. Simple parameterizations of the radiative properties of cloud layers: a review. *Atmos. Res.*, **35**, 113-125.
- Gollmer, S.M., Harshvardhan, Cahalan, R.F., and Snider, J.B., 1995. Windowed and wavelet analysis of marine stratocumulus cloud inhomogeneity. *J. Atmos. Sci.*, **52**, 3013-3030.
- Espinoza, R.C., Jr., and Harshvardhan, 1996. Parameterization of solar near-infrared radiative properties of cloud layers. *J. Atmos. Sci.*, **53**, 1559-1568.
- Cullather, R.I., Harshvardhan, and Campana, K.A., 1997. Climatology of cloud and radiation fields in a numerical weather prediction model. *Theor. Appl. Climatol.*, **57**, 11-33.
- Laird, J.L., and Harshvardhan, 1997. Analysis of cumulus solar irradiance reflectance (CSIR) events. *Atmos. Res.*, **44**, 317-332.
- Harshvardhan, Ridgway, W., Ramaswamy, V., Freidenreich, S.M., and Batey, M., 1998. Spectral characteristics of solar near-infrared absorption in cloudy atmospheres. *J. Geophys. Res.*, **103**, 28, 793-799.
- Batey, M., Harshvardhan, and Green, R., 2000: Geometrically effective cloud fraction for solar radiation. *Atmos. Res.*, **55**, 115-129.

- Harshvardhan, Schwartz, S.E., Benkovitz, C.M, and Guo, G., 2002. Aerosol influence on cloud microphysics examined by satellite measurements and chemical transport modeling. *J. Atmos. Sci.*, **59**, 714-725.
- Schwartz, S.E., Harshvardhan, and Benkovitz, C.M., 2002. Influence of anthropogenic aerosol on cloud optical depth and albedo shown by satellite measurements and chemical transport modeling. *Proc. Natl. Acad. Sci.*, **99**, 1784-1789.
- Harshvardhan, Guo, G., Green, R.N., Qu, Z., and Nakajima, T.Y., 2004. Remotely sensed microphysical and thermodynamic properties of non-uniform water cloud fields. *J. Atmos. Sci.*, **61**, 2574-2587.
- Bennartz, R. and Harshvardhan, 2007. Correction to 'Global assessment of marine boundary layer cloud droplet number concentration from satellite' by R. Bennartz. *J. Geophys. Res.* **112**, D16302, doi:10.1029/2007JD008841.

Book Chapters

- Harshvardhan, Arking, A., King, M.D., and Chou, M -D, 1984. Impact of the El Chichon stratospheric aerosol layer on northern hemisphere temperatures. *Aerosols and their Climatic Effects*, H. Gerber and A. Deepak (eds.), A. Deepak Publishing, 261-273.
- Binenko, V.I, and Harshvardhan, 1991. Vliyanie aerolya na perenos radiatsiyi. *Aerolya i Klimat.*, K.Ya. Kondratyev (ed.), Leningrad Gidrometeoizdat, 427-487.
- Harshvardhan, 1992. The computation of radiative fluxes and heating rates in high resolution atmospheric numerical models. *Physical Processes in Atmospheric Models*. D.R. Sikka and S.S. Singh (eds.), Wiley Eastern Limited, New Delhi, 261-279.
- Binenko, V.I., and Harshvardhan, 1993. Aerosol effects in radiation transfer. *Aerosol Effects on Climate*, S.G. Jennings (ed.), University of Arizona Press, 190-232.
- Harshvardhan, 1993. Aerosol-Climate Interactions. *Aerosol-Cloud-Climate Interactions*, P.V. Hobbs (ed.), Academic Press, 75-95.