

LASP
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EDUCATION

University of Colorado, Ph.D., Atmospheric Science, 1996
University of Colorado, M.S., Atmospheric Science, 1993
Massachusetts Institute of Technology, S.B., Earth, Atmospheric, and Planetary Sciences,
1989

HONORS AND AWARDS

2006 Marinus Smith Teaching Award
 University of Colorado Parents Association

2005 NASA EOS Aura Mission Contribution Award

2003 Teaching Service Award
 University of Colorado at Boulder

1996 Outstanding Scientific Paper Award
 NOAA Environmental Research Laboratories

1995 Atmospheric Chemistry Colloquium for Emerging Senior Scientists

1993 Outstanding Scientific Paper Award
 NOAA Environmental Research Laboratories

1992-1995 NASA Global Change Fellowship

1985 Valedictorian of high school class numbering 341

AFFILIATIONS

1991 to present American Geophysical Union

CLASSES TAUGHT

Fall 2004, Air Chemistry and Pollution, University of Colorado, undergraduate
Fall 2005
Spring 2003 Principles of Climate, University of Colorado undergraduate
Fall 2001 General Chemistry 2, University of Colorado undergraduate

FIELD CAMPAIGNS

January 2000 SAGE III Ozone Loss Validation Experiment, Kiruna, Sweden

August-October
1992 UV-visible spectroscopy measurements of the ozone hole, McMurdo
Station, Antarctica

SERVICE

April 2004, 2005 Science Panel Moderator, CU Conference on World Affairs

1998-2008 Member, LASP Computer Support Advisory Committee

2004-present Member, LASP Beowulf Cluster Advisory Group

RESEARCH/PROFESSIONAL EXPERIENCE

Dr. Mills has been a Research Scientist at LASP, University of Colorado since 1997. His research has focused on modeling the chemistry and microphysics of the middle atmosphere, which affect the ozone layer and our climate. His recent published work suggests that high-energy cosmic rays from dense interstellar clouds caused catastrophic ozone depletion and mass extinctions in the past, during periods of magnetic reversal on Earth. His earlier work developed the semi-empirical method for evaluating ozone depletion potentials, which helped ensure that the dramatic depletions in ozone at the Earth's poles are correctly accounted for in evaluating substances controlled by the Montreal Protocol protecting the ozone layer. His work has taken him below the Antarctic Circle and above the Arctic Circle.

Dr. Mills has been interested in stratospheric aerosol since 1993, when his work helped to help explain how volcanoes make man-made chlorine more effective at destroying ozone. He then added sulfur chemistry and aerosol microphysics to the Garcia-Solomon two-dimensional dynamical-chemical model, which he used to provide the first self-consistent explanation of the polar stratospheric CN layer, and most recently propose the existence of a mesospheric sulfate aerosol layer. He has recently added sulfur isotopes to the model for a study explaining observations of mass-independent sulfur fractionation observed in Antarctic ice cores. He is currently integrating CARMA microphysics for stratospheric aerosol into the MOZART3 three-dimensional chemical transport model in support of the HIRDLS instrument. He is a contributing author to the modeling chapter of the SPARC Assessment of Stratospheric Aerosol, to be published early this year.

PUBLICATIONS

- Atmospheric Photolysis of Sulfuric Acid, H.G. Kjaergaard, J.R. Lane, A.L. Garden, D.P. Schofield, T.W. Robinson and M.J. Mills, *Advances In Quantum Chemistry*, 55, ISBN-13: 978-0-12-374335-0, Academic Press, May 2008.
- Massive global ozone loss predicted following regional nuclear conflict, M.J. Mills, O.B. Toon, R.P. Turco, D.E. Kinnison, R.R. Garcia, *Proceedings of the National Academy of Sciences*, in press, 2008.
- SPARC Assessment of Stratospheric Aerosol, Chapter 6, D. Weisenstein, S. Bekki, M. Mills, C. Timmreck, G. Pitari, *WCRP – 124 WMO/TD No. 1295 SPARC Report No. 4*, 2006.
- Mesospheric sulfate aerosol layer, M.J. Mills, O. B. Toon, G. E. Thomas, *J. Geophys. Res.*, 110, D24208, doi:10.1029/2005JD006242, 2005.
- Sulfur mass independent fractionation in the oxidizing atmosphere, A.A. Pavlov, M.J. Mills, O.B. Toon, *Geophys. Res. Lett.*, 32 (L12816), doi:10.1029/2005GL022784 2005.
- Photolysis of sulfuric acid vapor by visible light as a source of the polar stratospheric CN layer, Mills, M. J., O. B. Toon, V. Vaida, P. E. Hintze, H. G. Kjaergaard, D. P. Schofield and T. W. Robinson, *J. Geophys. Res.*, 110 (D08201), doi:10.1029/2004JD005519, 2005.

- Catastrophic ozone loss during passage of the Solar system through an interstellar cloud, A.A. Pavlov, A.K. Pavlov, M.J. Mills, V.M. Ostryakov, G.I. Vasilyev, Owen B. Toon, *Geophys. Res. Lett.*, 32 (L01815), doi:10.1029/2004GL021601, 2005.
- Upper limit for the UV absorption cross sections of H₂SO₄, J.B. Burkholder, M. Mills, S. McKeen, *Geophys. Res. Lett.*, 27 (16), 2493-2496, 2000.
- Volcanic aerosol and global atmospheric effects, M.J. Mills, *Encyclopedia of Volcanoes*, Haraldur Sigurdsson, ed., 1999.
- A 2D microphysical model of the polar stratospheric CN layer, M.J. Mills, O.B. Toon, and S. Solomon, *Geophys. Res. Lett.*, 26 (8), 1133-1136, 1999.
- Stratospheric Sulfate Aerosol: A Microphysical Model, M.J. Mills, Ph.D. Thesis, University of Colorado, 1996.
- Do Hydrofluorocarbons Destroy Stratospheric Ozone?, A.R. Ravishankara, A.A. Turnipseed, N.R. Jensen, S. Barone, M.J. Mills, C.J. Howard and S. Solomon, *Science*, 263, 71-75, 1994.
- On the relationship between stratospheric aerosols and nitrogen dioxide, M.J. Mills, A. O. Langford, T.J. O'Leary, K. Arpag, H.L. Miller, M.H. Proffitt, R.W. Sanders and S. Solomon, *Geophys. Res. Lett.*, 20, 1187-1190, 1993.
- Atmospheric lifetimes and ozone depletion potentials of methyl bromide (CH₃Br) and dibromomethane (CH₂Br₂), A. Mellouki, R.K. Talukdar, A. Schmoltnner, T. Gierczak, M.J. Mills, S. Solomon, and A.R. Ravishankara, *Geophys. Res. Lett.*, 19, 2059-2062, 1992.
- On the age of stratospheric air and ozone depletion potentials in polar regions, W.H. Pollock, L.E. Heidt, R.A. Lueb, J.F. Vedder, M.J. Mills, and S. Solomon, *J. Geophys. Res.*, 97, 12993-12999, 1992.
- On the evaluation of ozone depletion potentials, S. Solomon, M.J. Mills, L.E. Heidt, W.H. Pollock and A. F. Tuck, *J. Geophys. Res.*, 97, 825-842, 1992.