MATTHEW D. SHUPE

Research Scientist
Cooperative Institute for Research in Environmental Sciences
University of Colorado and
NOAA Earth Systems Research Laboratory
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EDUCATION:

University of Colorado, Ph.D 2007, M.S. 2006
Astrophysical, Planetary, and Atmospheric Sciences
University of Puget Sound, B.S. Summa Cum Laude 1997,
Chemistry with atmospheric sciences focus, second major Mathematics

PROFESSIONAL APPOINTMENTS:

Cooperative Institute for Research in Environmental Sciences, University of Colorado and NOAA/ERSL; research scientist II, 2008-present
Cooperative Institute for Research in Environmental Sciences, University of Colorado and NOAA/ERSL; associate scientist II/III, 2004-2008
Science and Technology Corporation and NOAA-Environmental Technology Laboratory, research scientist; 1998 – 2004
Battelle Corporation and Pacific Northwest National Laboratory, Research Assistant; June – August, 1996

RESEARCH AREAS:

Cloud microphysical, radiative, and dynamical properties and processes, cloud property retrievals and validation, assessment of cloud model parameterizations, cloud type classification, Arctic meteorology and climate.

FIELD EXPERIENCE:

Nov. 2010-Mar. 2011: Storm Peak Validation Experiment (StormVex), Colorado
Summer 2009, 2010, 2011: ICECAPS, Summit Station, Greenland
August-Sept 2008: Arctic Summer Cloud Ocean Study (ASCOS), Arctic Ocean
August 2007: SEARCH project deployment and maintenance, Eureka, Canada
May 2006: SEARCH project deployment and maintenance in Eureka, Canada
July 2005: SEARCH project deployment in Eureka, Canada
October 2004: Mixed-Phase Arctic Clouds Experiment in Barrow, Alaska
July 2002: NASA-FIRE CRYSTAL- Florida Area Cirrus Experiment (South Florida)
Jan. 2000-Feb. 2000: High Altitude Weather Characterization Experiment (Boston)
March 1999: NOAA/ETL depolarization lidar (DABUL) in Barrow, Alaska.
Nov. 1997 – Oct. 1998: Surface Heat Budget of the Arctic Program (Arctic Ocean)

SPECIAL SKILLS:

Knowledgeable of Linux, Unix, and PC computer systems.
Proficient in IDL with a working knowledge of Matlab, Unix shell scripts, Perl, C.

HONORS AND AWARDS:

University of Puget Sound

Graduated Summa Cum Laude 1997
Graduated with Honors in Mathematics 1997
Campus Leadership Award 1997
Dean's List 1992, 1994-1997
Trustee Scholarship 1992-1997 (for academic performance)
Hearst Writing Award 1996 (for a mathematical modeling paper)
Fehlandt Scholarship Award 1996 (for outstanding Chemistry Student)
Hunter Memorial Scholarship: 1994-1996 (Highest GPA in Fraternity)
Goman Scholarship 1995 - 1996 (for outstanding Mathematics student)
Chemistry Dept. Scholarship 1995 (for outstanding Chemistry student)
Merck Index Award 1995 (for outstanding Organic Chemistry student)
Murdock Research Grant 1995

Other

NOAA Outstanding Scientific Paper Award, 2010
NOAA-ETL Employee of the Month, June 2005
NASA Group Achievement Award, 2002

GRANTS FUNDED

"Using Radar, Lidar, and Radiometer Data from NSA and SHEBA to Quantify Cloud Property Effects on the Arctic Surface Heat Budget," Janet Intrieri (PI) and Matthew Shupe (Co-PI), Department of Energy, Atmospheric Radiation Measurement Program, 2002-2004, $209,400.

"An Investigation of the Microphysical, Radiative, and Dynamical Properties of Mixed-Phase Clouds," Matthew Shupe (PI) and Pavlos Kollias (Co-PI), Department of Energy, Atmospheric Radiation Measurement Program, 2005-2007, $100,800.

"Collaborative Research: IPY: Cloud properties across the Arctic Basin from surface and satellite measurements – An existing Arctic Observing network," Matthew Shupe (PI), National Science Foundation, 2007-2009, $184,340.

"Investigations of the Microphysical, Radiative, and Dynamical Properties of Mixed-Phase Clouds," Matthew Shupe (PI), Department of Energy, Atmospheric Radiation Measurement Program, 2008-2010, $338,635.

"Collaborative Research: Integrated Characterization of Energy, Clouds, Atmospheric Stat, and Precipitation at Summit (ICECAPS)," Matthew Shupe (PI), National Science Foundation, 2009-2014, $694,492.

"Collaborative Research: Colorado Airborne Multi-Phase Cloud Study (CAMPS)," Linnea Avallone (PI) and Matthew Shupe (Co-PI), National Science Foundation, 2010-2012, $504,080.

"Collaborative Research: Understanding and Modeling Key Arctic Cloud-ABL-Surface Processes and Interactions," Ola Persson (PI), Matthew Shupe (Co-PI), National Science Foundation, 2010-2013, $664,741.

"Investigations of Mixed-Phase Cloud Microphysical Radiative and Dynamical Processes," Matthew Shupe (PI), Department of Energy, Atmospheric Radiation Measurement Program, 2011-2014, $531,645.

SCIENCE COMMITTEES AND ASSOCIATIONS:

DOE ASR/ARM Science Team member, 2002 - present
DOE ARM Sunset Committee member, 2006 – 2009
DOE ARM Cloud Properties Working Group, Mixed-phase subgroup chair, 2006 – 2008
DOE ARM Cloud Properties Working Group, Steering committee, 2006 – 2008
DOE ARM Cloud Properties Working Group, Chair, 2008 – 2009
DOE ASR Cloud Life Cycle Working Group, Co-Chair, 2009 – present
DOE ARM Science and Infrastructure Steering Committee (Executive Committee), 2008 - present
DOE ARM Climate Research Facility Science Board, 2009 - present
Member American Geophysical Union
Member American Meteorological Society
AMS Polar Meteorology and Oceanography Committee, 2006 – 2011
NSF Facilities Assessment, Surface-based remote sensing subcommittee, 2007 – 2008
NSF Arctic Observing Network Science Team member, 2007 – present

SERVICE

Research Advisor – University of Colorado ATOC Program, Ph.D candidate Ben Castellani, 2011 - present
Research Advisor – NOAA Hollings Scholar Program, Gregory Seroka, 2007
Research Advisor – NOAA Hollings Scholar Program, Elizabeth Maroon, 2009
Instructor – U. of Colorado independent study, Cassandra Wheeler, 2008
NOAA-ESRL Workplace Advisory Committee, 2006-2007
NOAA-ESRL Computer Users Advisory Committee, 2007-2010
Journal reviewer: Atmospheric Research, Bulletin of the American Meteorological Society, Geophysical Research Letters, International Journal of Climatology, Journal of Applied Meteorology, Journal of Applied Meteorology and Climatology, Journal of Climate, Journal of Geophysical Research, Journal of Hydrometeorology, Quarterly Journal of the Royal Meteorology Society, Radio Science, Remote Sensing of the Environment,
Proposal reviewer: National Environmental Research Council (U.K.), National Science Foundation, Natural Sciences and Engineering Research Council of Canada, U.S. Department of Energy.

REFEREED PUBLICATIONS:

Total publications: 54
Hersh Index: 19

Shupe, M.D., T. Uttal, S.Y. Matrosov, and A.S. Frisch, 2001: Cloud water contents and hydrometeor sizes during the FIRE-Arctic Clouds Experiment. *J. Geophys. Res.*, **106**, 15,015-15,028.

Hobbs, P.V., A.L. Rangno, **M.D. Shupe**, and T. Uttal, 2001: Airborne studies of cloud structures over the Arctic Ocean and comparisons with deductions from ship-based 35 GHz radar measurements. *J. Geophys. Res.*, **106**, 15 029-15 044.

Minnis, P., D.R. Doelling, V. Chakrapani, D.A. Spangenberg, L. Nguyen, R. Palikonda, T. Uttal, R.F. Arduini, and **M.D. Shupe**, 2001: Cloud coverage during FIRE ACE derived from AVHRR data. *J. Geophys. Res*., **106**, 15,215-15,232.

Khvorostyanov, V.I., J.A. Curry, J.O. Pinto, **M.D. Shupe**, B.A. Baker, and K. Sassen, 2001: Modeling with explicit spectral water and ice microphysics of a two-layer cloud system of altostratus and cirrus observed during the FIRE Arctic Clouds Experiment. *J. Geophys. Res.*, **106**, 15,099-15,112.

Westwater, E.R., Y. Han, **M.D. Shupe**, and S.Y. Matrosov, 2001: Analysis of integrated cloud liquid and precipitable water vapor retrievals from microwave radiometers during SHEBA. *J. Geophys. Res*., **106**, 32,019-32,030.

Uttal, T., and Coauthors (including **M.D. Shupe**), 2002: Surface Heat Budget of the Arctic Ocean. *Bull. Amer. Meteor. Soc.*, 83, 255-276.

Rathke, C., J. Fischer, S. Neshyba, and **M.D. Shupe**, 2002: Improving IR cloud phase determination with 20 microns spectral observations. *Geophys. Res. Let.*, **29**, 50.1-50.4.

Frisch, A.S., **M.D. Shupe**, I. Djalalova, G. Feingold, and M. Poellot, 2002: The retrieval of stratus cloud droplet effective radius with cloud radars. *J. Atmos. Ocean. Tech.*, **19**, 835-842.

Intrieri, J.M., **M.D. Shupe**, T. Uttal, and B.J. McCarty, 2002: Annual Cycle of Arctic Cloud Geometry and Phase from Radar and lidar at SHEBA. *J. Geophys. Res*., **107** (C10), 10.1029/2000JC000423.

Intrieri, J.M., C.F. Fairall, **M.D. Shupe**, P.O.G. Persson, E.L Andreas, P. Guest, and R.M. Moritz, 2002: Annual cycle of cloud forcing over the Arctic. *J. Geophys. Res*., **107** (C10), 10.1029/2000JC000439.

Schweiger, A., R Lindsay, J. Francis, J. Key, J. Intrieri, and **M.D. Shupe**, 2002: Validation of TOVS Path-P data during SHEBA. *J. Geophys. Res*., **107**(C10), 10.1029/2000JC000453.

Rathke, C., S. Neshyba, **M.D. Shupe**, P. Rowe, and A. Rivers, 2002: Radiative and microphysical properties of Arctic stratus clouds from multiangle downwelling infrared radiances, *J. Geophys. Res.*, **107**(D23), 4703, doi: 10.1029/2001JD001545.

Loehnert, U., G. Feingold, T. Uttal, A.S. Frisch, and **M.D. Shupe**, 2003: Analysis of two independent methods to for retrieving liquid water profiles in spring and summer Arctic boundary clouds. *J. Geophys. Res.*, **108**(D7), 4219, doi:10.1029/2002JD002861.

Morrison, H., **M.D. Shupe**, and J.A. Curry, 2003: Modeling clouds observed at SHEBA using a bulk microphysics parameterization implemented into a single-column model. *J. Geophys. Res.*, **108**(D8), 4255, doi:10.1029/2002JD002229.

Matrosov, S.Y., **M.D. Shupe**, A.J. Heymsfield, and P. Zuidema, 2003: Ice cloud optical thickness and extinction estimates from radar measurements. *J. Appl. Meteor.*, **42**, 1584-1597.

Shupe, M.D. and J.M. Intrieri, 2004: Cloud radiative forcing of the Arctic surface: The influence of cloud properties, surface albedo, and solar zenith angle. *J. Climate*, **17**, 616-628.

Shupe, M.D., P. Kollias, S.Y. Matrosov, and T.L. Schneider, 2004: Deriving mixed-phase cloud properties from Doppler radar spectra. *J. Atmos. Ocean. Technol.*, **21**, 705-715.

Intrieri, J.M., and **M.D. Shupe**, 2004: Characteristics and radiative effects of diamond dust over the Western Arctic Ocean region. *J. Climate*, **17**, 2953-2960.

Zuidema, P., B. Baker, Y. Han, J. Intrieri, J. Key, P. Lawson, S. Matrosov, **M.D. Shupe**, R. Stone, and T. Uttal, 2005: An Arctic springtime mixed-phase cloudy boundary layer observed during SHEBA. *J. Atmos. Sci.*, 62, 160-176.

Sassen, K., J.R. Campbell, J. Zhu, P. Kollias, **M.D. Shupe**, and C. Williams, 2005: Lidar and triple-wavelength Doppler radar measurements of the melting layer: A revised model for dark- and brightband phenomena. *J. Appl. Meteor.*, **44**,301-312.

Morrison, H., J.A. Curry, **M.D. Shupe**, and P. Zuidema, 2005: A new double-moment microphysics parameterization, Part 2: Application to Arctic stratiform clouds. *J. Atmos. Sci.*, **62**, 1678-1693.

Morrison, H., **M.D. Shupe**, J.A. Curry, and J.O. Pinto, 2005: Possible roles of ice nucleation mode and ice nuclei depletion in the extended lifetime of arctic mixed-phase clouds. *Geophys. Res. Lett.*, **32**, L18801, doi:10.1029/2005GL023614.

Shupe, M.D., T. Uttal, and S.Y. Matrosov, 2005: Arctic cloud microphysics retrievals from surface-based remote sensors at SHEBA. *J. Appl. Meteor.*, **44**, 1544-1562.

Shupe, M.D., S.Y. Matrosov, and T. Uttal, 2006: Arctic mixed-phase cloud properties derived from surface-based sensors at SHEBA. *J. Atmos. Sci.*, **63**, 697-711.

Daniel, J.S., R.W. Portman, H.L. Miller, S. Solomon, A.L. Langford, C.E. Eubank, R. Schofield, D.D. Turner, and **M.D. Shupe**, 2006: Cloud property estimates from zenith spectral measurements of scattered sunlight between 0.9 and 1.7 um. *J. Geophys. Res.*, **111**, D16208, doi:10.1029/2005JD006641.

Matrosov, S.Y., P.D. May, and **M.D. Shupe**, 2006: Rainfall profiling using Atmospheric Radiation Measurement Program's vertically pointing 8-mm wavelength radars. *J. Atmos. Ocean. Tech.* **23**, 1478-1491.

Verlinde, J., and Coauthors (including **M.D. Shupe**), 2007: The Mixed-Phase Arctic Cloud Experiment (M-PACE). *Bull. Amer. Met. Soc.*, **88**, 205-220.

Comstock, J.M., R. d'Entremont, D. DeSlover, G.G. Mace, S.Y. Matrosov, S.A. McFarlane, P. Minnis, D. Mitchell, K. Sassen, **M.D. Shupe**, D.D. Turner, and Z. Wang, 2007: An intercomparison of microphysical retrieval algorithms for upper tropospheric ice clouds. *Bull. Amer. Met. Soc.*, **88**, 191-204.

Schofield, R., J.S. Daniel, R.W. Portmann, H.L. Miller, S. Solomon, C.S. Eubank, M.L. Melamed, A.O. Langford, and **M.D. Shupe**, 2007: Retrieval of effective radius and liquid water path from ground-based instruments: A case study at Barrow, Alaska. *J. Geophys. Res.*, 112, D21203, doi:10.1029/2007JD008737.

Shupe, M.D., 2007: A ground-based multiple remote-sensor cloud phase classifier. *Geophys. Res. Lett.*, 34, L22809, doi:10.1029/2007GL031008.

Matrosov, S.Y., **M.D. Shupe**, and I.V. Djalalova, 2008: Snowfall retrievals using millimeter-wavelength cloud radars. *J. Appl. Meteor. Clim.*, 47, 769-777.

Shupe, M.D., P. Kollias, M. Poellot, and E. Eloranta, 2008: On deriving vertical air motions from cloud radar Doppler spectra. *J. Atmos. Ocean. Techn.*, 25, 547-557.

Shupe, M.D., P. Kollias, P.O.G. Persson, and G. M. McFarquhar, 2008: Vertical motions in Arctic mixed-phase stratiform clouds. *J. Atmos. Sci.*, 65, 1304-1322.

Tjernstrom, M., J. Sedlar, and **M.D. Shupe**, 2008: How well do regional climate models reproduce radiation and clouds in the Arctic? An evaluation of ARCMIP simulations. *J. Appl. Met. Clim*., 47, 2405-2422.

Shupe, M.D., J.S. Daniel, G. De Boer, E.W. Eloranta, P. Kollias, E. Luke, C.N. Long, D. D. Turner, and J. Verlinde, 2008: A focus on mixed-phase clouds: The status of ground-based observational methods. *Bull. Amer. Meteor. Soc.*, 87, 1549-1562.

Klein, S.A., and Coauthors (including **M. D. Shupe**), 2009: Intercomparison of model simulations of mixed-phase clouds observed during the ARM Mixed-Phase Arctic Cloud Experiment. Part I: Single layer cloud. *Quart. J. Roy. Meteor. Soc*., 135, doi: 10.1002/qj.416.

Morrison, H., and Coauthors (including **M. D. Shupe**), 2009: Intercomparison of model simulations of mixed-phase clouds observed during the ARM Mixed-Phase Arctic Cloud Experiment. Part II: Multi-layered cloud. *Quart. J. Roy. Meteor. Soc*., 135, 1003-1019.

de Boer, G., E.W. Eloranta, and **M. D. Shupe**, 2009: Arctic mixed-phase stratiform cloud properties from multiple years of surface-based measurements at two high-latitude locations. *J. Atmos. Sci.*, 66, 2874-2887.

Solomon, A., H. Morrison, O. Persson, **M.D. Shupe** and J.-W. Bao, 2009: Investigation of microphysical parameterizations of snow and ice in Arctic clouds during M-PACE through model-observation comparison. *Mon. Wea. Rev*., 137, 3110-3128.

Dong, X., B. Xi, K. Crosby, C.N. Long, R.S. Stone, and **M.D. Shupe**, 2010: A 10-year climatology of Arctic cloud fraction and radiative forcing at Barrow, Alaska. *J. Geophys. Res.*, 115, D17212, doi: 10.1029/2009JD013489.

Luke, E., P. Kollias, and **M.D. Shupe**, 2010: Detection of supercooled liquid in mixed-phase clouds using radar Doppler spectra. *J. Geophys. Res.*, 115, D19201, doi:10.1029/2009JD012884.

de Boer, G., H. Morrison, **M.D. Shupe**, and R. Hildner, 2011: Evidence of liquid dependent ice nucleation in high-latitude stratiform clouds from surface remote sensors. *Geophys. Res. Lett*., 38, L01803, doi:10.1029/2010GL046016.

Mauritsen, T., J. Sedlar, M. Tjernstrom, C. Leck, M. Martin, **M. D. Shupe**, S. Sjogren, B. Sierau, O. Persson, I. Brooks, and E. Swietlicki, 2011: An Arctic CCN-limited cloud-aerosol regime. *Atmos. Chem. Phys.*, 11, 165-173.

McFarquhar, G.M., and Coauthors (including **M. D. Shupe**), 2010: Indirect and Semi-Direct Aerosol Campaign (ISDAC): The impact of Arctic aerosols on clouds. *Bull. Amer. Meteor. Soc*., 92, 183-201.

Shupe, M.D., V.P. Walden, E. Eloranta, T. Uttal, J.R. Campbell, S.M. Starkweather, and M. Shiobara, 2011: Clouds at Arctic Atmospheric Observatories, Part I: Occurrence and macrophysical properties. *J. Appl. Meteor. Clim*., 50, 626-644.

Shupe, M.D., 2011: Clouds at Arctic Atmospheric Observatories, Part II: Thermodynamic phase characteristics. *J. Appl. Meteor. Clim*., 50, 645-661.

Du, P., E. Girard, A.K. Bertram, and **M.D. Shupe**, 2011: Modeling of the cloud and radiation processes observed during SHEBA. *Atmos. Res*., 101, 911-927.

Lance, S., **M.D. Shupe**, G. Feingold, C.A. Brock, J. Cozic, J.S. Holloway, R.H. Moore, A. Nenes, J.P. Schwarz, J.R. Spackman, K.D. Froyd, D.M. Murphy, J. Brioude, O.R. Cooper, A. Stohl, and J.F. Burkhart, 2011: CCN as a modulator of ice processes in Arctic mixed-phase clouds. *Atmos. Chem. Phys*., 11, 8003-8015.

Sedlar, J., M. Tjernstrom, T. Maurtisen, **M.D. Shupe**, I.M. Brooks, P.O.G. Persson, C.E. Birch, C. Leck, A. Sirevaag, and M. Nicolaus, 2010: A transitioning Arctic surface energy budget: the impacts of solar zenith angle, surface albedo and cloud radiative forcing. *Clim. Dyn*., 37, 1643-1660.

Solomon, A., **M.D. Shupe**, P.O.G. Persson, and H. Morrison, 2011: Moisture and dynamical interactions maintaining decoupled Arctic mixed-phase stratocumulus in the presence of a humidity inversion. *Atmos. Chem. Phys.*, 11, 10127-10148.

Morrison, H., G. de Boer, G. Feingold, J. Harrington, **M.D. Shupe**, and K. Sulia, 2012: Self-organization and resilience of Arctic mixed-phase clouds. *Nature Geoscience*, doi: 10.1038/NGE01332.

Fridlind, A.M., B. van Diedenhoven, A.S. Ackerman, A. Avramov, H. Morrison, P. Zuidema, and **M.D. Shupe**, 2012: Entrainment limitations on heterogeneous ice formation: A FIRE-ACE/SHEBA case study of mixed-phase Arctic boundary-layer clouds. *J. Atmos. Sci*. in press.

Sedlar, J., **M.D. Shupe**, and M. Tjernstrom, 2012: On the relationship between thermodynamic structure, cloud top, and climate significance in the Arctic. *J. Climate*, in press.

de Boer, G., W. Chapman, J. Kay, B. Medeiros, **M.D. Shupe**, S. Vavrus, and J. Walsh, 2012: A characterization of the present-day Arctic Atmosphere in CCSM4. *J. Climate*, in press.

OTHER IMPORTANT CONTRIBUTIONS:

Atmospheric System Research Science and Program Plan, 2010, U.S. Department of Energy. Available: www.sc.doe.gov/ober/Atmospheric System Research Science Plan.pdf . Primary authors: DD Turner, **MD Shupe**, A McComiskey, A Fridlind, RL McGraw, S Schwartz, W Wiscombe, S Ghan, J. Gaffney, S Klein, R Ellingson, and A Del Genio.