DAVID L. MITCHELL

Associate Research Professor
Division of Atmospheric Sciences (DAS), Desert Research Institute (DRI)

EDUCATION:

Ph.D.	1995	Atmospheric Science	University of Nevada, Reno (Advisor: Dr. Jim Hudson)
M.Sc.	1986	Atmospheric Physics	University of Nevada, Reno (Advisor: Dr. Dennis Lamb)
B.Sc.	1981	Chemistry	California Polytechnical State University, San Luis Obispo

PROFESSIONAL EXPERIENCE:

2001-present	Associate Research Professor, Division of Atmospheric Sciences, Desert Research Institute, Reno, Nevada
1995-2001	Assistant Research Professor, DAS/DRI, Reno, Nevada
1989-1995	Atmospheric Research Scientist, Atmospheric Sciences Center, DRI, Reno, Nevada
1985-1989	Staff Cloud Chemist, DRI/ASC
1982-1985	Graduate Research Assistant, DRI/ASC
1981-1982	Research Chemist, Teledyne McCormick Selph, Hollister, California

RESEARCH INTERESTS:

Dr. Mitchell's research has focused on the following areas, in chronological order: (1) theoretical understanding and modeling of the microphysical evolution within cirrus and frontal clouds, especially with regard to particle size spectra; (2) understanding and modeling the radiative properties of ice clouds; (3) remote sensing of cloud properties; (4) understanding the onset, strength and extent of the North American monsoon; (5) modification of cirrus clouds to reduce global warming.

Accomplishments regarding (1) include the development of two models successfully predicting the evolution of ice particle size spectra. The input for one model consists of the ice water content and temperature profiles, while the other is driven by changes in water vapor super-saturation. These models are computationally efficient, utilizing analytical solutions for ice particle growth by vapor diffusion, aggregation and riming, and can be easily used to improve radar estimates of precipitation at ground level.

Regarding (2), the processes of absorption and extinction in liquid water and ice clouds have been mathematically described in terms of their size distribution and particle shape. These analytical solutions, known as the Modified Anomalous Diffraction Approximation (MADA), agree with explicit electrodynamic solutions of water droplet and ice crystal single scattering properties within 10% and 15%, respectively. These developments, along with parameterizing the asymmetry parameter for various ice crystal shapes, have led to a treatment of ice cloud optical properties that is used in (i) the Community Atmosphere Model versions 5 and 6 (e.g. CAM6) global climate model (GCM), (ii) in the Colorado State University GCM, (iv) in the Regional Atmospheric Modeling System (RAMS) at CIRES and (v) in the

Rapid Radiation Transfer Model (RRTM) and the Paleoclimate version of RRTM developed at Atmospheric and Environmental Research (AER).

Regarding (3), the MADA scheme (noted above) resolves the two main processes responsible for the absorption of thermal radiation in ice particles; Beer's law and wave resonance absorption. This led to two satellite retrieval algorithms that have been developed that estimate (1) the effective ice particle size D_e, number concentration N and ice water content in cirrus clouds and (2) the percentage of liquid water relative to the total (ice + liquid) condensate in mixed phase clouds. Method (1) is the first for estimating N, and it appears to reveal the likelihood of homogeneous ice nucleation occurrence in terms of temperature, latitude, season and surface type (e.g. land vs. ocean). Method (2) is the first for estimating the fraction of liquid water when present (which will strongly affect cloud optical properties). Knowledge of these properties and processes are useful for parameterizing clouds in GCMs.

Regarding (4), a new approach to understanding the North American monsoon (NAM) has been pursued in terms of sea surface temperatures (SSTs) in the eastern tropical Pacific and the Gulf of California (GC). Results from nine monsoon seasons show that relatively heavy rainfall in Arizona commences once the SST in the northern GC exceeds 29^{o}C. Both observational and modeling research indicates that humid air overlying the GC is trapped by an inversion that breaks when SSTs exceed 29°C. Once the marine inversion is removed, the warm SSTs humidify a deep layer of free tropospheric air that can be advected over land to often produce thunderstorms. In addition, this mechanism along with climatological and reanalysis data suggest that NAM convection is initiated in central and northwest Mexico through the poleward propagation of warm tropical surface water along the Pacific coast, and that this convection contributes to the poleward propagation of the NAM anticyclone that eventually steers mid-level moisture into the NAM region, augmenting the NAM rainfall.

Regarding (5), it is generally accepted that the mean increase in global surface temperatures (relative to pre-industrial times) should not exceed 2°C if mankind is to avoid "unacceptable" consequences from climate change. Recent research has led some scientists to conclude that exceeding this threshold may be unavoidable unless some type of climate intervention (CI) is invoked to (1) accelerate CO_2 removal from the atmosphere and (2) alter the planet's radiation balance (e.g. by reflecting more sunlight or releasing more heat to space) while simultaneously and very rapidly converting to non-carbon based energy systems. The most recent CI proposal, known as cirrus cloud thinning or CCT, requires aircraft or drones for seeding the coldest cirrus clouds at high latitudes when nighttime is longer than daytime. This may reduce their coverage and optical thickness, producing significant global cooling by releasing more thermal radiation to space. This CI method may have some advantages over the other two main methods (for radiation management CI), including the preferential cooling of the Polar Regions where climate change is most severe. Preliminary research indicates it may also reduce the frequency of extreme weather in the mid-latitudes.

PROFESSIONAL ACTIVITIES:

- Member, Atmospheric Systems Research (ASR) program science team
- Co-chair of ASR focus group on ice particle properties
- Member, Atmosphere Model Working Group (AMWG) for CAM5 development
- Member, American Meteorological Society (AMS) Committee on Planned and Inadvertent Weather Modification (2013-16)
- Committee Chairman, AMS Committee on Cloud Physics (2000-2006)
- Member, American Geophysical Union
- Member, European Geosciences Union

HONORS AND AWARDS:

- DOE-EPSCoR Traineeship Program, scholarship award
- Best Poster Award at the Fifth International Conference on Precipitation Scavenging and Atmosphere-Surface Exchange Processes, Richland, Washington, 15-19 July 1991.
- AMS Editor's Award for the Journal of Atmospheric Sciences, 2000
- Peter B. Wagner Medal of Excellence (for early career achievement by DRI scientists)
- NOWCAST section, Papers of Note, AMS Bulletin, October 2002: Relating sea surface temperatures to the North American monsoon, by Mitchell, D.L., D. Ivanova, R. Rabin, K. Redmond, and T.J. Brown

PEER REVIEWED PUBLICATIONS:

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Mitchell, D.L., 1989: Influence of rime ice and snow in the central Sierra. Reviewed proceedings, International Mountain Watershed Symposium, 8-10 June, Lake Tahoe, Nevada, 401-415.

Mitchell, D.L. and D. Lamb, 1989: Influence of riming on the chemical composition of snow in winter orographic storms. J. Geophys. Res., 94, 14,831-14,840.

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Borys, R.D., D. Del Vecchio, J.L. Jaffrezo, J. Dibb and D.L. Mitchell, 1991: Field observations, measurements and preliminary results from a study of wet deposition processes influencing snow and ice chemistry at Summit, Greenland. 5th International Conference on Precipitation Scavenging and Atmospheric-Surface Exchange Processes, July, Vol 3, Application and Appraisals, Richland, Washington, 1705-1718.

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Mitchell, D.L., A. Macke, and Y. Liu, 1996: Modeling cirrus clouds. Part II: Treatment of radiative properties. *J. Atmos. Sci.*, **53**, 2967-2988.

Baran, A.J., J.S. Foot and D.L. Mitchell, 1998: The question of ice crystal absorption: A comparison between T-matrix, Mie and anomalous diffraction theory and implications for remote sensing. *Appl. Opt*., **37**, 2207-2215.

Baran, A.J., S.J. Brown, J.S. Foot and D.L. Mitchell, 1999: Retrieval of tropical cirrus thermal optical depth, crystal size and shape using a dual-view instrument at 3.7 and 10.8 μm. *J. Atmos. Sci*., **56**, 92-110.

Kristjansson, J.E., J.M. Edwards, and D.L. Mitchell, 1999: A new parameterization scheme for the optical properties of ice crystals for use in general circulation models of the atmosphere. *Phys. Chem. Earth (B)*, **24**, 231-236.

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Mitchell, D.L., R.P. d'Entremont and R.P. Lawson, 2010: Inferring cirrus size distributions through satellite remote sensing and microphysical databases. *J. Atmos. Sci*., **67**, 1106-1125.

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Gettelman, A., X. Liu, S. J. Ghan, H. Morrison, S. Park, A. J. Conley, S. A. Klein, J. Boyle, D. L. Mitchell, and J.-L. F. Li, 2010: Global simulations of ice nucleation and ice supersaturation with an improved cloud scheme in the Community Atmosphere Model, *J. Geophys. Res*., **115**, D18216, doi:10.1029/2009JD013797.

Mitchell, D. L., R. P. Lawson and B. Baker, 2011: Understanding effective diameter and its application to terrestrial radiation in ice clouds. *Atmos. Chem. Phys*., **11**, 3417-3429.

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Mitchell, D. L., S. Mishra and R. P. Lawson, 2011: Cirrus clouds and climate engineering: New findings on ice nucleation and theoretical basis. In: *Planet Earth 2011 - Global Warming Challenges and Opportunities for Policy and Practice*, Prof. Elias Carayannis (Ed.), ISBN 978-953-307-733-8, InTech, Available from <http://www.intechopen.com/articles/show/title/cirrus-clouds-and-climate-engineering-new-findings-on-ice-nucleation-and-theoretical-basis>

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Mitchell, D. L., S. Mishra, J. Comstock, U. Lohmann, M. Kuebbeler, J. Mejia, D. Turner and P. Rasch, 2014: Relevance of the negative Twomey effect for cirrus clouds. 94th Annual Meeting of the American Meteorological Society, Atlanta, Georgia, 6 February 2014.

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Mitchell, D. L., 2015: On the ethics of climate engineering: An overlooked question? 95th AMS Annual Meeting, 20th Conference on Planned and Inadvertent Weather Modification and the Seventh Symposium on Aerosol–Cloud–Climate Interactions, joint session on "Human Alternation of Climate: Engineering, Ethics, and Politics", 5-9 Jan. 2015. Oral presentation recorded at: https://ams.confex.com/ams/95Annual/videogateway.cgi/id/29788?recordingid=29788

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Ivanova, D. and D. L. Mitchell, 2015: WRF and MM5 modeling of the 1999 North American monsoon onset and the Las Vegas flood, 95th AMS Annual Meeting: Phoenix, AZ, January 7, 2015.

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E. Erfani, D. Mitchell, and M. Avery, 2015: A partial mechanistic understanding of the North American monsoon. International Union of Geophysics and Geodesy (IUGG), 26th IUGG General Assembly, Prague, Czech Republic, June 22 – July 2, 2015.

E. Erfani, D. Mitchell and M. Avery, 2015: The role of coastal mid-latitude air-sea interactions in exporting tropical energy to N. America during summer. International Union of Geophysics and Geodesy (IUGG), 26th IUGG General Assembly, Prague, Czech Republic, June 22 – July 2, 2015.

Mitchell, D., A. Garnier and M. Avery, 2015: The seasonal dependence of climate on high latitude cirrus clouds. International Union of Geophysics and Geodesy (IUGG), 26th IUGG General Assembly, Prague, Czech Republic, June 22 – July 2, 2015.

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Mitchell, D. L., A. Garnier, and M. Avery, 2015: Cirrus cloud thinning: Do the right conditions exist, and how can it be tested with observations? Our Common Future Under Climate Change International Scientific Conference, 7-10 July 2015, Paris, France

Mitchell, D., A. Garnier, M. Avery and E. Erfani, 2015: Satellite remote sensing of the dependence of homogeneous ice nucleation on latitude and season. *AGU Fall Meeting*, San Francisco, December 14-18, 2015. (poster)

Mitchell, D., A. Garnier, M. Avery and E. Erfani, 2016: The seasonal, latitude, temperature and surface roughness dependence of homogeneous ice nucleation. 96th AMS Annual Meeting, Eighth Symposium on Aerosol–Cloud–Climate Interactions, session on "Aerosol Impacts on Cirrus Clouds", New Orleans, Louisiana, 11-15 Jan. 2016.

Mitchell, D., A. Garnier, M. Avery and E. Erfani, 2016: A novel cirrus cloud retrieval method for GCM high cloud validations. Atmosphere Model Working Group (AMWG), National Center for Atmospheric Research (NCAR), Boulder, Colorado, 8-10 February 2016.

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Mitchell, D. L., 2016: Participant in the Workshop on Low Environmental Impact Solar Radiation Management Field Experiments, Institute of Advanced Sustainability Studies, Potsdam, Germany, 7-8 September 2016.

Mitchell, D., A. Garnier, M. Avery and E. Erfani, 2016: The Dependence of Cirrus Cloud Formation Mechanism on Latitude, Season and Surface Type. International Conference on Clouds and Precipitation, Manchester, United Kingdom, 25-29 July 2016.

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Mitchell, D. L., A. Garnier, J. Mejia and M. Avery, 2017: The seasonal cycle of Arctic cirrus clouds and its possible relevance to jet steam dynamics. Poster, Fourth Santa Fe Conference on Global and Regional Climate Change, Santa Fe, New Mexico, 5-10 February 2017.

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Mitchell, D. L., A. Garnier, M. Avery and E. Erfani, 2017: The latitude and seasonal dependence of cirrus cloud occurrence frequency and formation mechanism, and their potential impact on jet steam dynamics. Poster, A-Train Symposium, Pasadena, California, 19-21 April 2017.

Mitchell, D. L., J. Mejia, A. Garnier and F. Hosseinpour, 2017: A potential regulation of jet stream behavior by changes in high latitude cirrus cloud formation and coverage. American Geophysical Union Fall Meeting, Session A54G: The Dynamics of the Large-Scale Atmospheric Circulation in Present and Future Climates: Jet Streams, Storm Tracks, Stationary Waves, and Monsoons, New Orleans, Louisiana, 11-15 December 2017.

Mitchell, D. L., J. Mejia, A. Garnier and E. Erfani, 2018: On the feasibility of cirrus cloud thinning (CCT): A surprising coincidence. 98th AMS Annual Meeting, 21st Conference on Planned and Inadvertent Weather Modification, joint session with Aerosol-Cloud-Climate Interactions on Climate Engineering and Inadvertent Weather Modification, Austin, Texas, 7-11 January 2018.

Mitchell, D. L., J. Mejia, A. Garnier and F. Hosseinpour, 2018: Comparing standard CAM5 against "CALIPSO Cirrus CAM5" and the need for a better cirrus cloud parameterization. CESM Atmosphere Model Working Group (AMWG) Meeting, National Center for Atmospheric Research, 12-14 February 2018.

Mitchell, D. L., A. Garnier and J. Pelon, 2018: The dependence of cirrus cloud formation mechanism on latitude, season and surface type. NASA CloudSat-CALIPSO Science Team Meeting, Boulder, Colorado, 23-25 April 2018.

Mitchell, D. L., J. Mejia, A. Garnier and F. Hosseinpour, 2018: Can changes in cirrus cloud ice nucleation affect the jet stream and storm track? Atmospheric Radiation Conference, American Meteorological Society, Vancouver, British Columbia, Canada, 9-13 July 2018.

Mitchell, D. L., J. Mejia, Y. Tomii and A. Garnier, 2019: On the potential role of Arctic cirrus clouds in producing anomalous mid-latitude weather and climate. CESM Atmosphere Model Working Group (AMWG) Meeting, National Center for Atmospheric Research (NCAR), Boulder, Colorado, 19-21 February 2019.

Mitchell, D. L., Y. Tomii, J. Mejia and A. Garnier, 2019: Constraining WACCM6 cirrus cloud microphysics with CALIPSO (IIR-CALIOP) effective diameter retrievals. American Geophysical Union Fall Meeting, San Francisco, 9-13 December 2019.

Tomii, Y., F. Hosseinpour, J. Mejia and D. Mitchell, 2020: An evaluation of cirrus cloud thinning through improved integration of satellite retrievals and climate modeling. American Meteorological Society Annual Meeting (100th anniversary), 12-17 January 2020.

Mitchell, D. L., J. Mejia, Y. Tomii, A. Garnier, and F. Hosseinpour, 2020: Constraining WACCM6 cirrus cloud microphysics with CALIPSO (IIR-CALIOP) effective diameter retrievals. Atmosphere Model Working Group (AMWG) winter meeting, National Center for Atmospheric Research (NCAR), Boulder Colorado, Feb. 2020.

Mitchell, D. L., J. Mejia, and A. Garnier, 2021: How realistic are explicit CCT simulations in climate models? Climate Engineering Conference 2021 (virtual), Institute for Advanced Sustainability Studies (IASS), Potsdam, Germany, October 2021.

Mitchell, D. L., J. Mejia, Y. Tomii, and A. Garnier, 2021: Does climate sensitivity depend on ice nuclei concentration? 18th International Conference on Clouds and Precipitation (ICCP) (virtual), Pune, India, July 2021.

Dmitruk, Gwendolyn, Anne Garnier and David Mitchell, 2022: Reigniting CCT: Satellite retrieval-model integration. Poster presentation, Gordon Research Conference on Climate Engineering, Sunday River, Maine, 26 June – July 1, 2022.

Mitchell, D. L., J. Mejia and A. Garnier, 2022: How realistic are explicit CCT simulations in climate models? Poster presentation, Gordon Research Conference on Climate Engineering, Sunday River, Maine, 26 June – July 1, 2022.

Mitchell, D. L., A. Garnier and J. Mejia, 2022: Evidence of relatively high contributions of homogeneous ice nucleation over land during winter at mid-to-high latitudes, with comparisons against global climate model predictions. AMS Collective Madison Meeting, 16th Conference on Cloud Physics, Madison, WI, 8-12 August 2022.

Mitchell, D. L. and A. Garnier, 2022: An improved CALIPSO (IIR-CALIOP) cirrus cloud retrieval of ice particle number concentration, effective size and ice water content with observations relevant to extreme weather. AMS Collective Madison Meeting, 17th Conference on Polar Meteorology and Oceanography, Madison, WI, 8-12 August 2022.

Mitchell, D. L., and A. Garnier, 2022: A reformulated CALIPSO (IIR-CALIOP) retrieval for cirrus cloud ice particle number concentration, effective diameter, and ice water content, NASA CloudSat-CALIPSO Science Team Meeting, Fort Collins, Colorado, 12-14 September 2022.

Mitchell, D. L., A. Garnier, J. Mejia, and Sarah Woods, 2022: Advances in CALIPSO (IIR) cirrus cloud retrievals and comparisons with WACCM6 predictions. Atmosphere Model Working Group (AMWG) winter meeting, National Center for Atmospheric Research (NCAR), Boulder Colorado, Feb. 2022.

Mitchell, D. L., and A. Garnier, 2022: On the Contribution of Homogeneous Ice Nucleation to Arctic Cirrus and INP Implications. QuIESCENT Arctic Workshop, Trondheim, Norway, 1 April 2022.

Mitchell, D. L. and Garnier, A., 2023: Characterizing two types of cirrus clouds that differ in nucleation mechanism and radiative effect, based on a new CALIPSO retrieval. Atmosphere Model Working Group (AMWG) winter meeting, National Center for Atmospheric Research (NCAR), Boulder Colorado, 30 Jan. – 1 Feb. 2023.

Mitchell, D. L., and A. Garnier, 2023: Characterizing two types of cirrus clouds that differ in nucleation mechanism and radiative effect, European Geophysical Union, Vienna, Austria, 23-28 April 2023.

INVITED SEMINARS OR TALKS

Mitchell, D.L., 1993: Modeling the microphysical and radiative properties of cirrus clouds. *Earth and Environmental Sciences Division, Los Alamos National Laboratory*, New Mexico, April.

Mitchell, D.L., 1993: The effect of ice crystal morphology on the radiative properties of cirrus clouds. *University of California's Institute for Cooperative Research Conference, Scripts Institute of Oceanography*, May, LaJolla, California.

Mitchell, D.L., 1993: Ice crystal morphology and its effect on optical depth and albedo in cirrus clouds. *Meteorological Research Institute*, Tsukuba, Japan, July.

Mitchell, D.L., 1994: Ice crystal morphology and its effect on the radiative properties of cirrus clouds. *Department of Meteorology, Pennsylvannia State University*, January, University Park, Pennsylvannia.

Mitchell, D.L., 1994: Modeling the microphysical and radiative properties of cirrus clouds. *ECMWF/GEWEX Cloud System Study workshop*, Reading, England, Oct. 31 - Nov. 4, 1994.

Mitchell, D.L., 1994: A new treatment for predicting the radiative properties of cirrus clouds, with application to remote sensing. *United Kingdom Meteorological Office*, Bracknell, England, November 1.

Mitchell, D.L., 1994: Modeling the microphysical and radiative properties of cirrus clouds. *University of Uppsala*, Sweden, November.

Mitchell, D.L., 1994: Modeling the microphysical and radiative properties of cirrus clouds. *Stockholm University*, Sweden, November.

Mitchell, D.L., 1994: Modeling the microphysical and radiative properties of cirrus clouds. *University of Oslo*, Norway, November.

Mitchell, D.L., M. Wetzel and A. Macke, 1995: New potentials in satellite remote sensing, using a unique treatment of cirrus cloud radiative properties. *International Association for Meteorology and Atmospheric Science (IAMAS)*, as part of the International Union of Geodesy and Geophysics (IUGG) XXI General Assembly, July 2-14, 1995. Title of session: ISCCP and Regional Experiments: Studies of Cloud Radiation Interaction. (Invited talk)

Mitchell, D.L., J.E. Kristjansson and A. Macke, 1996: Advances in understanding cirrus cloud radiative properties and their potential impact on climate. *University of Oslo*, Norway, August.

Mitchell, D.L., and A. Macke, 1996: Advances in understanding cirrus cloud radiative properties. *23rd October Royal Meteorological Society Physical Processes Group at the Royal Society, CIRRUS MODELLING AND CRYSTAL PROPERTIES.*, October, London, U.K.

Mitchell, D.L., and A. Macke, 1996: Representing atmospheric ice in GCMs: Why should we care? *United Kingdom Meteorological Office, Hadley Centre for Climate Prediction and Research*, 17 September, Bracknell, U.K.

Mitchell, D.L., and A.J. Baran, 1996: Remote sensing in the thermal infrared: Different physics for water and ice? *Laboratoire de Meteorologie Dynamique (LMD), Ecole Polytechnique, France*, November.

Mitchell, D.L., and T. Brown, 1996: Role of the eastern Pacific warm pool in the Mexican Monsoon. *University of Reading*, United Kingdom, November.

Mitchell, D.L., and A. Macke, 1996: Advances in understanding cirrus cloud radiative properties. *Institute of Atmospheric Physics, GKSS Forschungszentrum*, Germany, December.

Mitchell, D.L., and A. Macke, 1996: Advances in understanding cirrus cloud radiative properties. *Institut fuer Meereskunde, Abteilung Maritime Meteorologie, Universitaet zu Kiel*, Germany, December.

Mitchell, D.L., J.M. Edwards, and J.E. Kristjansson, 1997: Treatment of non-spherical ice in GCMs: Impact on global albedo, OLR and heating rates. *National Center for Atmospheric Research*, Boulder, Colorado, July.

Mitchell, D.L., J.M. Edwards, P.N. Francis, and A.J. Baran, 1998: A comprehensive system for treating absorption and extinction in ice clouds, with application to satellite remote sensing and global climate modeling. *NASA Langley Research Center*, Hampton, Virginia, November.

Mitchell, D.L., D. Ivanova and T. Brown, 1999: Sea surface temperatures and the North American Monsoon: Mechanistic Implications. *United Kingdom Meteorological Office, Hadley Centre for Climate Prediction and Research*, 20 July.

Mitchell, D.L., D. Ivanova and W.P. Arnott, 1999: Parameterizing bimodal size spectra in large scale models: Possible radiative differences between tropical and mid-latitude cirrus. *European Centre for Medium Range Weather Forecasting*, 22 July.

Mitchell, D.L., D. Ivanova, R. Rabin and K. Redmond, 2000: Sea surface temperatures and the North American Monsoon: Mechanistic Implications. *Scripps Institution of Oceanography*, 18 October.

Mitchell, D.L., D. Ivanova, R. Rabin and K. Redmond, 2000: Sea surface temperatures and the North American Monsoon: Mechanistic Implications. *Centro de Investigación Científica y de Educación Superior de Ensenada* (*CICESE*), 20 October.

Mitchell, D.L., R.P. d'Entremont, D.H. DeSlover, W.P. Arnott and A.J. Baran, 2002: Multi-spectral thermal retrievals of size distribution shape, effective size, ice water path and photon tunneling contribution to absorption. *University of Oslo, Norway*, 13 May 2002.

Mitchell, D.L., D. Ivanova, Miguel Lavín and B. Hall, 2003: A possible ocean-atmosphere mechanism for the Arizona onset of the North American monsoon. Workshop on the North American Monsoon Experiment (NAME): Oceanographic Component. *Centro de Investigación Científica y de Educación Superior de Ensenada* (*CICESE*), 21 April 2003.

Mitchell, D.L., D. Ivanova, B. Hall, Miguel Lavín and A. Mascarenhas, Jr., 2003. Predicting the onset of the North American monsoon and progress toward a mechanistic understanding. National Center for Atmospheric Research (NCAR), 27 June 2003.

Mitchell, D.L., R.P. d'Entremont, D. DeSlover and A.J. Baran, 2005: Characterizing Particle Size, Water Path, and Photon Tunneling in Ice and Water Clouds. Invited talk for CIRA, 16 June 2005.

Mitchell, D.L., D. DeSlover, P.J. Rasch and R.P. d'Entremont, 2005: Cirrus Cloud Size Distributions and the Impact of Measurement Uncertainties on Radiation. Invited talk for the Air Force, Hanscom AFB, Massachusetts, 27 May 2005.

Mitchell, D.L., and Robert P. d'Entremont, 2007: Satellite remote sensing of controversial small ice crystals in cirrus clouds. Guest speaker at Dept. of Atmospheric Sciences, Texas A & M University, College Station, Texas.

Mitchell, D.L., and S. Mishra, 2011: Engineering of cirrus clouds to reduce global warming. International Union of Geophysics and Geodesy (IUGG), IUGG XV General Assembly, "Earth on the edge: Science for a Sustainable Planet", 28 June – 7 July 2011, Melbourne, Australia. Invited by steering committee of Union Session U-06: Geoengineering: What are the Potentials for Climate Intervention, Carbon Scrubbing, and other Approaches to Moderate Climate Change and its Impacts?

Mitchell, D.L., 2012: Manipulating cirrus clouds. IMPLICC Final Symposium: The Atmospheric Science and Economics of Climate Engineering via Aerosol Injections , Max Planck Institute for Chemistry, Mainz, Germany, 14-16 May 2012.

Mitchell, D.L., E. Erfani, D. Ivanova, M. F. Lavin, and A. S. Mascarenhas, Jr., 2013: Progress towards a mechanistic understanding of the North American monsoon. Guest speaker for seminar program at the National Weather Center, Norman Oklahoma.

Mitchell, D. L., 2014: An overview of cirrus cloud thinning and determining its scientific feasibility. Climate Engineering Conference 2014, Critical Global Discussions, Berlin, Germany, 18-21 August 2014.

Mitchell, D. L., E. Erfani, and D. Ivanova, 2014: Evolution of the North American monsoon: Potential large- and small-scale mechanisms. Pennsylvania State University, Dept. of Meteorology seminar series, 10 Dec. 2014.

Mitchell, D. L., E. Erfani, D. Ivanova, and M. Avery, 2015: Observational and Modeling Evidence for both Local- and Large-scale NAM Mechanisms. 3rd Annual Regional Climate and Meteorology Meeting for Northwest Mexico and the Southwest U.S., Centro de Ciencias de la Atmósfera, UNAM, Mexico City, 4-5 June 2015.

Mitchell, D. L., 2015: Panelist, "*Local vs Large-Scale Forcing and NAM Variability"*, 3rd Annual Regional Climate and Meteorology Meeting for Northwest Mexico and the Southwest U.S., Centro de Ciencias de la Atmósfera, UNAM, Mexico City, 4-5 June 2015.

Mitchell, D. L., 2015: Panelist, "What do the models need to get right?", 3rd Annual Regional Climate and Meteorology Meeting for Northwest Mexico and the Southwest U.S., Centro de Ciencias de la Atmósfera, UNAM, Mexico City, 4-5 June 2015.

Mitchell, D. L., A. Garnier and M. Avery, 2015: Cirrus cloud thinning: Do the right conditions exist, and how can it be tested with observations? Workshop 1. Solar Radiation Management: Foresight for Governance (SRM4G). Institute for Advanced Sustainability Studies (IASS), Potsdam, Germany, 13 July 2015.

Mitchell, D. L., 2015: Dependence of global sustainability on the degree of fear and aspiration. A Mindset for the Anthropocene project, Institute for Advanced Sustainability Studies (IASS), Potsdam, Germany, 14 July 2015.

Mitchell, D. L., A. Garnier, M. Avery and E. Erfani, 2016: Insights on the Feasibility, Modeling and Field Testing of Cirrus Cloud Thinning from Satellite Remote Sensing. Sixth GeoMIP Meeting, 21–22 June 2016, Norwegian Meteorological Institute, Oslo, Norway.

Mitchell, David L., Anne Garnier, John Mejia, Melody Avery and Ehsan Erfani, 2016: The dependence of homo- and heterogeneously formed cirrus clouds on latitude, season and surface-type based on a new CALIPSO remote sensing method. American Geophysical Union Fall Meeting, San Francisco, 12-16 December 2016.

Mitchell, D. L., J. Mejia, Y. Tomii and F. Hosseinpour, 2019: Evaluating cirrus cloud thinning using CALIPSO retrievals and the Whole Atmosphere Community Climate Model v. 6, Geoengineering Modeling Research Consortium (GMRC), Harvard University, School of Engineering and Applied Sciences (SEAS), 30 September 2019.

Mitchell, D. L., 2021: Cirrus cloud formation mechanisms: Why should we care? Department of Meteorology and Climate Science seminar series, San Jose State University, College of Science, 4 March 2021.

Mitchell, D. L., D. Ivanova, R. Simpson and R. Arnold, 2022: Lower Colorado River Basin issues: modeling of region. Can precipitation in the Colorado Basin be increased? Conference titled "Increasing the Water Supply in the Colorado Basin", sponsored by the International Water Holdings Corp. (IWH) in conjunction with American Ground Water Trust (AGWT), Las Vegas, Nevada, 20-21 July 2022.

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