

Christopher R. Williams, PhD

Research Professor
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Research Interest

My research vision is to advance our understanding of precipitation microphysical processes and cloud dynamics with the ultimate aim of improving parameterizations in numerical models. I pursue this vision by analyzing ground-, air-, and space-based radar observations to retrieve raindrop number and size estimates that lead to improved global rainfall estimates and improved understanding of precipitation processes and dynamics.

Education

- Ph.D. 1994 University of Colorado Boulder, CO (Electrical Engineering)
Thesis: Deep convective clouds and their association with nonmigrating atmospheric diurnal tides in the tropical troposphere (Prof. Susan Avery)
- M.S. 1986 Purdue University, West Layette, IN (Electrical Engineering)
- B.S. 1985 California Polytechnic State University, San Luis Obispo, CA
(Electronic Engineering)

Professional Experience

- 2018-Present **Research Professor**, Ann and H.J. Smead Department of Aerospace Engineering Sciences, University of Colorado Boulder
- 2015-2017 **Senior Scientist**, Cooperative Institute for Research in Environmental Sciences (CIRES) / University of Colorado Boulder (CU),
in partnership with
National Oceanic and Atmospheric Administration (NOAA) /
Earth System Research Laboratory (ESRL)
- 2005-2015 **Research Scientist III**, CIRES / CU & NOAA ESRL
- 2001-2005 **Research Scientist III**, CIRES / CU & NOAA Aeronomy Laboratory
- 1997-2001 **Research Scientist II**, CIRES / CU & NOAA Aeronomy Laboratory
- 1994-1997 **Research Associate**, CIRES / CU & NOAA Aeronomy Laboratory
- 1991-1994 **Graduate Research Assistant**, CIRES / CU & NOAA Aeronomy Lab
- 1988-1991 **Development Engineer**, Next Generation Perfusation Team,
COBE Laboratories, Arvada, Colorado
- 1987-1988 **Design Engineer**, CO₂ Laser Tube Development Group,
HGM Medical Laser Systems, Salt Lake City, Utah

Patents

- 7,920,959 5 April 2011: Method and apparatus for estimating the velocity vector of multiple vehicles on non-level and curved roads using a single camera.
Inventor: Christopher R. Williams

Peer-Reviewed Publications

All Peer-Reviewed Publications are listed on www.ResearcherID.com with ID#: A-2723-2015
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- 86 published peer-reviewed publications
- Collaborated with over 120 different co-authors
- Publications cited over 4250 times in other peer-reviewed articles
- Publications cited over 265 times in 2022
- *h-index* = 38 (38 papers have at least 38 citations), as of January 2023

Publication number. (Citation count) Publication detail

88. (N/A) **Williams, C.R.**, J. Barrio, J.E. Johnston, P. Myradyan, and S.E. Giangrande, 2022: Calibrating radar wind profiler reflectivity factor using surface disdrometer observations. *J. Atmos. Meas. Techn.*, submitted, <https://egusphere.copernicus.org/preprints/2023/egusphere-2022-1405/>
87. (N/A) Chen, H., C. W. Fairall, **C. R. Williams**, and E. J. Thompson, 2022: Vertical air motion retrievals from airborne W-band cloud radar. *IEEE Geosci. Remote Sens. Letts.*, submitted.
86. (N/A) Johnston, P. E., **C. R. Williams**, A. B. White, 2021: Rain Drop Size Distributions Estimated from NOAA Snow-Level Radar Data. *J. Atmos. Oceanic Technol.*, <https://doi:10.1175/JTECH-D-21-0049.1>.
85. (N/A) Kramer, A. K. Harlow, C. Heckman, and **C.R. Williams**, 2022: ColoRadar: The direct 3D millimeter wave radar dataset. *Intern. J. Robotics Research*, vol. 41(4), 351-360, doi:10.1177/02783649211068535.
84. (N/A) **Williams, C.R.**, 2022: How much attenuation extinguishes mm-wave vertically pointing radar return signals? *Remote Sensing*, 14, 1305, doi:10.3390/rs14061305.
83. (2) Yeung, NKH, S.C. Sherwood, A. Protat, T.P. Lane, and **C.R. Williams**, 2021: A Doppler radar study of convective draft lengths over Darwin, Australia. *Mon. Wea. Rev.*, 149, 2965-2974, <https://doi.org/10.1175/MWR-D-20-0390.1>.
82. (0) Gatlin, P., M. Thurai, **C.R. Williams**, and E. Adirosi, 2021: Measurement and modeling of the precipitation particle size distribution. *Atmosphere*, doi: 10.3390/atmos12070819.
81. (0) **Williams, C.R.**, K.L. Johnson, S. E. Giangrande, J. C. Hardin, R. Oktem, and D. M. Romps, 2021: Identifying insects, clouds, and precipitation using vertically pointing polarimetric radar Doppler velocity spectra. *J. Atmos. Meas. Techn.*, doi: 10.5194/amt-14-4425-2021.
80. (9) Narsey, S., C. Jakob, M.S. Singh, M. Bergemann, V. Louf, A. Protat, and C.R. Williams, 2019: Convective precipitation efficiency observed in the Tropics. *Geophys. Res. Lett.*, 270 Nov-2019, doi: 10.1029/2019GL085031.
79. (2) Wohltmann, Ingo, R. Lehmann, G.A. Gottwald, K. Peters, A. Protat, V. Louf, C.R. Williams, W. Fen, and M. Rex, 2019: A Lagrangian convective transport scheme including a simulation of the time air parcels spend in updrafts. *Geoscientific Model Development*, doi: 10.5194/gmd-2019-5.

78. (3) Tian, J., X. Dong, B. Xi, **C.R. Williams**, and P. Wu, 2019: Estimation of liquid water path in stratiform precipitation systems using radar measurements. *J. Atmos. Meas. Tech.*, **12**, 3759-3759, doi: 10.5194/amt-12-3743-2019.
77. (30) Han, B., J. Fan, A. Varble, H. Morrison, **C.R. Williams**, B. Chen, X. Dong, S.E. Giangrande, A. Khain, E. Mansell, J.A. Milbrandt, J. Shpund, and Gregory Thompson, 2019: Cloud-resolving model intercomparison of an MC3E squall line case: Part II – Stratiform precipitation properties. *Journal of Geophysical Research*, doi: 10.1029/2018JD029596.
76. (4) Ovchinnikov, M., S. Giangrande, V.E. Larson, A. Protat, and **C.R. Williams**, 2019: Dependence of vertical alignment of cloud and precipitation properties on their effective fall speeds. *J. Geophys. Res. Atmos.*, **124**, doi: 10.1029/2018JD029346.
75. (0) Ghatge, V., P. Kollias, S. Crewell, A. Fridlind, T. Heus, U. Löhnert, M. Maahn, G. McFarquhar, D. Moisseev, M. Oue, M. Wendisch, and **C. Williams**, 2019: The second ARM training and science application Event: Training the next generation of atmospheric scientists. *Bull. Amer. Meteor. Soc.*, doi: 10.1175/BAMS-D-18-0242.1.
74. (14) **Williams, C.R.**, M. Maahn, J.C. Hardin, and G. de Boer, 2018: Clutter mitigation, multiple peaks, and high-order spectral moments in 35-GHz vertically pointing radar velocity spectra. *J. Atmos. Meas. Tech.*, **11**, 4963-4980, doi: 10.5194/amt-11-4963-2018.
73. (30) de Boer, G., and 24 co-authors, 2018: A bird's eye view: Development of an operational ARM Unmanned aerial capability for atmospheric research in Arctic Alaska. *Bull. Amer. Meteor. Soc.*, doi: 10.1175/BAMS-D-17-0156.1.
72. (6) Fairall, C.W., S.Y. Matrosov, **C.R. Williams**, and E.J. Walsh, 2018: Estimation of rain rate from airborne Doppler W-band radar in CalWater-2. *J. Atmos. Oceanic Technol.*, **35**, 593-608, doi: 10.1175/JTECH-D-17-0025.1.
71. (45) Giangrande, S.E., T. Toto, M. P. Jensen, M.J. Bartholomew, Z. Feng, A. Protat, **C.R. Williams**, C. Schumacher, and L. Machado, 2016: Convective cloud vertical velocity and mass-flux characteristics from radar wind profiler observations during GoAmazon2014/15. *J. Geophys. Res. Atmos.*, **121**, 12 891-12 913, doi: 10.1002/2016JD025303.
70. (16) **Williams, C.R.**, R.M. Beauchamp, and V. Chandrasekar, 2016: Vertical air motions and raindrop size distributions estimated using mean Doppler velocity different from 3- and 35-GHz vertically pointing radars. *IEEE Trans. Geosci. Remote Sens.*, **54**, 6048-6060, doi: 10.1109/TGRS.2016.2580526.
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68. (10) Kumar, V.V., A. Protat, C. Jakob, **C.R. Williams**, S. Rauniyar, G.L. Stephens and P.T. May, 2016: The estimation of convective mass flux from radar reflectivities. *J. Appl. Meteorol. and Climatol.*, **55**, 1239-1257, doi: 10.1175/JAMC-D-15-0193.1.
67. (31) **Williams, C.R.**, 2016: Reflectivity and liquid water content vertical decomposition diagrams to diagnose vertical evolution of raindrop size distributions. *J. Atmos. Oceanic Technol.*, **33**, 579-595, doi: 10.1175/JTECH-D-15-0208.1.
66. (1) **Williams, C.R.**, V.N. Bringi, L. Carey, V. Chandrasekar, P. Gatlin, Z.S. Haddad, R. Meneghini, S.J. Munchak, S.W. Nesbitt, W.A. Petersen, S. Tanelli, A. Tokay, A. Wilson and D. Wolff, 2015: Reply to "Comments on 'Describing the shape of raindrop size distributions using uncorrelated raindrop mass spectrum parameters'". *J. Appl. Meteorol.*

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65. (26) Fridlind, A.M., A.S. Ackerman, A. Grandin, F. Dezitter, M. Weber, J.W. Strapp, A.V. Korolev, and **C.R. Williams**, 2015: High ice water content at low radar reflectivity near deep convection – Part 1: Consistency of in situ and remote-sensing observations with stratiform rain column simulations. *Atmos. Chem. Phys. Discuss.* **15**, 16505-16550. Doi: 10.5194/acpd-15-16505-2015.
64. (2) Lebo, Z.J., **C.R. Williams**, G. Feingold, and V.E. Larson, 2015: Parameterization of the spatial variability of rain for large-scale models and remote sensing. *J. Appl. Meteor. and Climatol.*, **54**, 2027-2046.
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62. (0) **Williams, C.R.**, V.N. Bringi, L. Carey, V. Chandrasekar, P. Gatlin, Z.S. Haddad, R. Meneghini, S.J. Munchak, S.W. Nesbitt, W.A. Petersen, S. Tanelli, A. Tokay, A. Wilson and D. Wolff, 2015: Corrigendum ‘Describing the shape of raindrop size distributions using uncorrelated raindrop mass spectrum parameters’. *J. Appl. Meteorol. and Climatol.*, **54**, 932, doi: 10.1175/JAMC-D-15-0055.1.
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59. (21) Thurai, M., **C.R. Williams**, and V.N. Bringi, 2014: Examining the correlations between drop size distribution parameters using data from two side-by-side 2D-video disdrometers. *Atmospheric Res.*, dx.doi.org/10.1016/j.atmosres.2014.01.002.
58. (83) **Williams, C.R.**, V.N. Bringi, L. Carey, V. Chandrasekar, P. Gatlin, Z.S. Haddad, R. Meneghini, S.J. Munchak, S.W. Nesbitt, W.A. Petersen, S. Tanelli, A. Tokay, A. Wilson and D. Wolff, 2014: Describing the shape of raindrop size distributions using uncorrelated raindrop mass spectrum parameters. *J. Appl. Meteorol. and Climatol.*, **53**, 1282-1296, doi: 10.1175/JAMC-D-13-076.1.
57. (75) Giangrande, S. E., S. Collis, J. Straka, A. Protat, **C.R. Williams**, and S. Krueger, 2013: A summary of convective core vertical velocity properties using ARM UHF wind profilers in Oklahoma. *J. Appl. Meteor. Climatol.*, **52**, 2278-2295, doi: 10.1175/JAMC-D-12-0185.1.
56. (54) Collis, S., A. Protat, P.T. May, and **C.R. Williams**, 2013: Statistics of storm updraft velocities from TWP-ICE including verification with profiling measurements. *J. Appl. Meteor. and Climatol.*, **52**, 1909-1922, doi: 10.1175/JAMC-D-12-0230.1
55. (30) Tridon, F., A. Battaglia, P. Kollias, E. Luke, and **C.R. Williams**, 2013: Signal Post-processing and Reflectivity Calibration of the Atmospheric Radiation Measurement Program 915 MHz Wind Profilers. *J. Atmos. Oceanic Technol.*, **30**, 1038-1054, doi: 10.1175/JTECH-D-12-00146.1.
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53. (50) **Williams, C.R.**, 2012: Vertical air motion retrieved from dual-frequency profiler observations. *J. Atmos. Oceanic Technol.*, **29**, 1471-1480, doi:

<http://dx.doi.org/10.1175/JTECH-D-11-00176.1>.

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49. (42) Protat, A., and **C.R. Williams**, 2011: The accuracy of radar estimates of ice terminal fall speed from vertically pointing Doppler radar measurements. *J. Appl. Meteor. and Climate*, **50**, 2120-2138, doi:10.1175/JAMC-D-10-05031.1.
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47. (28) Lerach, D.G., S.A. Rutledge, **C.R. Williams**, and R. Cifelli, 2010: Vertical structure of convective systems during NAME 2004. *Mon. Wea. Rev.*, **138**, 1695-1714.
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12. (20) **Williams, C.R.**, and S.K. Avery, 1996: Diurnal winds observed in the tropical troposphere using 50 MHz wind profilers. *J. Geophys. Res.*, **101**, 15051-15060.
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8. (240) **Williams, C.R.**, W.L. Ecklund, and K.S. Gage, 1995: Classification of precipitating clouds in the Tropics using 915-MHz wind profilers. *J. Atmos. Oceanic Technol.*, **12**, 996-1012.
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1. (2) **Williams, C.R.**, L.A. Geddes, J.D. Bourland, and E.S. Furgason, 1987: Analysis of the current-density distribution from a tapered, gelled-pad external cardiac pacing electrode. *Medical Instrumentation*, **21**, 329-334.

Honors and Awards

- 2015 NASA Goddard Space Flight Center Robert H. Goddard Award (Ground Validation Team) for the category of *Exceptional Achievement in Science in 2014*.
- 2015 - NASA Group Achievement Award, Global Precipitation Measurement (GPM) Post-Launch Team, “For exceeding all expectations for GPM operations, data processing, algorithm performance, science impact, and education and public outreach within one year after launch”.
- 2014 American Meteorological Society Editor’s Award from *Journal of Atmospheric and Oceanic Technology*
- 2006 CIRES/University of Colorado Outstanding Scientist of the Year

Professional Service and Contribution

NASA Precipitation Measurement Mission (PMM)

- Coordinated and hosted the *NASA Cal/Val and Algorithm Symposium*, March 2020
- NASA PMM Science Team, Member, 2000 – Present
- NASA PMM Raindrop Size Distribution Working Group, Chair, 2007 – Present

Department of Energy (DOE), Atmospheric Science Research (ASR) Program

- DOE ASR Science Team, Member, 2011 – Present

Department of Energy (DOE), Atmospheric Radiation Measurement (ARM) Program

- DOE ARM Cloud and Precipitation Measurement and Science Group (CPMSG)
- Member, 2021 – Present

American Meteorological Society (AMS) – Leadership Positions

- 36th AMS Conference on Radar Meteorology, Conference co-chair, 14-20 September 2013, Breckenridge, CO, (over 400 abstracts and over 400 attendees)
- AMS Radar Committee, Member, 2013 - 2019.

Scientific and Professional Memberships

- Project Management International (PMI, certified Project Manager Professional, PMP)
- American Geophysical Union (AGU)
- American Meteorological Society (AMS)
- Institute of Electrical and Electronics Engineers (IEEE, Senior Member)

Editorships

- Associate Editor, *IEEE Journal of Selected Topics in Applied Earth Observations and Remote Sensing (JSTAR)*, 2021 – Present.

Professional Presentations / Non-Reviewed Publications

Over 280 professional presentations or non-reviewed publications