Christopher R. Williams, PhD

Research Professor
Ann and H.J. Smead Department of Aerospace Engineering Sciences
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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 Perfusion Team, COBE Laboratories, Arvada, Colorado
1987-1988	**Design Engineer**, CO_2 Laser Tube Development Group, HGM Medical Laser Systems, Salt Lake City, Utah

Academic Appointments

2017-Present	Affiliate Member, Earth Science and Observation Center (ESOC), CIRES, University of Colorado Boulder (non-paid)
2007-2008	Adjunct Faculty, Department of Aerospace Engineering Sciences, University of Colorado Boulder (co-taught ASEN 5245: Radar and Remote Sensing)
2005-2007	Adjunct Faculty, Department of Atmospheric Science, Colorado State University, Fort Collins (non-paid)
2004-2007	Adjunct Faculty, Department of Atmospheric Science, University of Alabama at Huntsville (non-paid)

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
ORCID Number: https://orcid.org/0000-0001-9394-8850

- *89 published peer-reviewed publications*
- *Collaborated with over 125 different co-authors*
- *Publications cited over 4500 times in other peer-reviewed articles*
- *Publications cited over 225 times in 2023*
- *h-index = 40 (40 papers have at least 40 citations), as of January 2024*

<u>Publication number. (Citation count) Publication detail</u>

89. (0) **Williams, C.R.**, J. Barrio, J.E. Johnston, P. Myradyan, and S.E. Giangrande, 2023: Calibrating radar wind profiler reflectivity factor using surface disdrometer observations. J. Atmos. Meas. Techn., https://doi.org/10.5194/egusphere-2022-1405.
88. (0) May, P.T., B. Dolan, M. Katsumata, P.A. Kucera, V. Louf, A. Protat, and **C.R. Williams**, 2023: Ocean-going weather and profiling radar for clouds and precipitation. Book Chapter for The Institution of Engineering and Technology (IET) Press "Advances in Weather Radar", Eds. V.N. Bringi, K.V. Mishra, and M. Thurai, ISBN-13: 978-1-83953-624-3.
87. (0) Chen, H., C. W. Fairall, C. R. Williams, and E. J. Thompson, 2023: Vertical air motion retrievals from airborne W-band cloud radar. IEEE J. Selected Topics in Applied Earth Obs. and Remote Sensing, 9350-9357, 16, 10.1109/JSTARS.2023.3322346.
86. (0) Johnston, P. E., **C. R. Williams**, A. B. White, 2022: 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. (39) 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. (4) **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. (4) **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. (24) 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. Let., 270 Nov-2019, doi: 10.1029/2019GL085031.
79. (11) 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. (6) 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. (48) 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. (8) 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. (1) Ghate, V., P. Kollias, S. Crewell, A. Fridlind, T. Heus, U. Löehnert, 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. (23) **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. (50) 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. (10) 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. (70) 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. (21) **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.

69. (170) Jensen, M.P., W.A. Petersen, A. Bansemer, N. Bharadwaj, L.D. Carey, D.J. Cecil, S.M. Collis, A.D. Del Genio, B. Dolan, J. Gerlach, S.E. Giangrande, A. Heymsfield, G. Heymsfield, P. Kollias, T.J. Lang, S.W. Nesbitt, A. Neumann, M. Poellot, S.A. Rutledge, M. Schwaller, A. Tokay, **C.R. Williams**, D.B. Wolff, S. Xie, and E.J. Zipser, 2016: The Midlatitude continental convective clouds experiment (MC3E), *Bull. Amer. Meteor. Soc.*, doi: 10.1175/BAMS-D-14-00228.1.
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. App. Meteorol. and Climatol.*, **55**, 1239-1257, doi: 10.1175/JAMC-D-15-0193.1.
67. (32) **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. and Climatol.,* **54**, 1977-1982, doi: 10.1175/JAMC-D-15-0058.1.
65. (29) 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. (5) 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.
63. (70) Kumar, V.V., C. Jakob, A. Protat, **C.R. Williams**, and P.T. May, 2015: Mass-flux characteristics of tropical cumulus clouds from wind profiler observations at Darwin, Australia. *J. Atmos. Sci.*, **72**, 1837-1855, doi: 10.1175/JAS-D-14-0259.1.
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.
61. (36) Schumacher, C., S.N. Stevenson, and **C.R. Williams**, 2015: Vertical motions of the tropical convective cloud spectrum over Darwin, Australia. *Q. J. Royal Meteor. Soc.*, doi: 10.1002/qj.2520.
60. (70) Varble, A., E.J. Zipser, A.M. Fridlind, P. Zhu, A.S. Ackerman, J.-P. Chaboureau, J. Fan, A. Hill, B. Shipway, and **C.R. Williams**, 2014: Evaluation of cloud-resolving and limited area model intercomparison simulations using TWP-ICE observations. Part 2: Rain microphysics. *J. Geophys. Res.*, doi/10.1002/2013JD021372.
59. (40) 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. (100) **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. (94) 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. (63) 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. (32) 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.
54. (65) Han, M., S.A. Braun, T. Matsui, and **C.R. Williams**, 2013: Evaluation of cloud microphysics schemes in simulations of a winter storm using radar and radiometer measurements. *J. Geophys. Res. Atmos.*, **118**, 1401-1419, doi:10.1002/jgrd.50115.
53. (62) **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.
52. (28) Riddle, A.C., L.M. Hartten, D.A. Carter, P.E. Johnston, **C.R. Williams**, 2012: A minimum threshold for wind profiler signal-to-noise ratios, *J. Atmos. and Oceanic Technol.*, **29**, 889-895, 10.1175/JTECH-D-11-00173.1.
51. (26) Moran, K.P., S. Pezoa, C.W. Fairall, **C. R. Williams**, T.E. Ayers, A. Brewer, S.P. de Szoeke, V. Ghate, 2012: A motion-stabilized W-band radar for shipboard observations of marine boundary-layer clouds. Bound.-Layer Meteor., 143, 3-24, doi:10.1007/s10546-011-9674-5.
50. (4) **Williams, C.R.**, 2011: Inexpensive FM-CW radar for boundary-layer precipitation studies. *IEEE Geoscience and Remote Sensing Letters*, **8**, 1031-1035, 10.1109/ LGRS.2011.2150733.
49. (57) 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.
48. (108) Ault, A.P., **C.R. Williams**, A.B. White, P.J. Neiman, J.M. Creamean, C.J. Gaston, F.M. Ralph, and K.A. Prather, 2011: Detection of Asian Dust in California Orographic Precipitation. *J. Geophys. Res.*, **116**, D16205, doi:10.1029/2010JD01535.
47. (32) 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.
46. (187) Bringi, V.N., **C.R. Williams**, M. Thurai, and P. May, 2009: Using dual-polarized radar and dual-frequency profiler for DSD characterization: A case study from Darwin, Australia. *J. Atmos. Oceanic Technol.*, **26**, 2107-2122.
45. (20) Kim, D.-K., K.R. Knupp, and **C.R. Williams**, 2009: Airflow and precipitation properties within the stratiform region of Tropical storm Gabrielle during landfall. *Mon. Wea. Rev.*, **137**, 1954-1971.
44. (79) Tokay, A., P. Hartmann, A. Battaglia, K.S. Gage, W.L. Clark, and **C.R. Williams**, 2009: A field study of reflectivity and Z-R relations using vertically pointing radars and disdrometers. *J. Atmos. Oceanic Technol.*, **26**, 1120-1134.
43. (7) Newman, A.J., P.A. Kucera, **C.R. Williams**, and L.F. Bliven, 2009: Snowflake size spectra retrieved from a UHF vertical profiler. *J. Atmos. Oceanic Technol.*, **26**, 180-199.

42. (55) **Williams, C.R.**, and K.S. Gage, 2009: Raindrop size distribution variability estimated using ensemble statistics. *Ann. Geophys.,* **27***, 555-567, 2009, www.ann-geophys.net/27/55/2009/.*
41. (15) Nikolopoulos, E. I., A. Kruger, W. F. Krajewski, **C. R. Williams**, and K. S. Gage, 2008: Compariative scaling analysis from two vertically pointing radars, an optical disdrometer and a rain gauge. *Nonlinear Processes in Geophysics*, **15**, 987-997.
40. (21) Prat, O. P., A. P. Barros, and **C. R. Williams**, 2008: An intercomparison of model simulations and VPR estimates of the vertical structure of warm stratiform rainfall during TWP-ICE, *J. Appl. Meteor. Climatol.*, **47**, 2797-2815.
39. (39) **Williams, C.R.** and P.T. May, 2008: Uncertainties in profiler and polarimetric DSD estimates and their relation to rainfall uncertainties. *J. Atmos. Oceanic Technol.*, **25**, 1881–1887.
38. (36) **Williams, C.R.**, A.B. White, K.S. Gage, and F.M. Ralph, 2007: Vertical structure of precipitation and related microphysics observed by NOAA profilers and TRMM during NAME 2004. *J. Climate*, **20**, 1693-1712.
37. (140) Higgins, W., et al. (36 co-authors plus **C.R. Williams**), 2006: The NAME 2004 field campaign and modeling strategy. *Bull. Amer. Meteor. Soc.*, **87**, 79-94.
36. (39) **Williams, C.R.**, K.S. Gage, W.L. Clark, and P.A. Kucera, 2005: Monitoring the reflectivity calibration of a scanning radar using a profiling radar and a disdrometer. *J. Atmos. Oceanic Technol.*, **22**, 1004-1018.
35. (57) Sassen, K., J.R. Campbell, P. Kollias, M. Shupe, **C.R. Williams**, and J. Zhu, 2005: Lidar and triple-wavelength Doppler radar measurements of the melting layer: A revised model for dark and bright band phenomena. *J. Appl. Meteor.*, **44**, 301-312.
34. (23) Gage, K.S., W.L. Clark, **C.R. Williams**, and A. Tokay, 2004: Determining reflectivity measurement error from serial measurements using paired disdrometers and profilers. *Geophys. Res. Lett.*, **31**, 10.1029/2004GL020591.
33. (85) Houze, R. Jr., Brodzik, S., Schumacher, C., S. Yuter, and **C.R. Williams**, 2004: Uncertainties in oceanic radar rain maps at Kwajalein and implications for satellite validation. *J. Appl. Meteor.*, **43**, 1114-1132.
32. (45) Atlas, D., C.W. Ulbrich, and **C.R. Williams**, 2004: Physical origin of a wet microburst: Observations and theory. *J. Atmos. Sci,* **61**, 1186-1195.
31. (6) Atlas, D., **C.R. Williams**, 2003: Radar echoes from lightning and their microphysical environment. *Geophys. Res. Lett.*, **30**, 10.1029/2002GL016521.
30. (42) Battaglia, A., C. Kummerow, D.-B. Shin, and **C.R. Williams**, 2003: Constraining microwave brightness temperatures by radar brightband observations. *J. Atmos. Oceanic Technol.*, **20**, 856-871.
29. (63) Atlas, D., and **C.R. Williams**, 2003: The anatomy of a continental Tropical convective storm. *J. Atmos. Sci.*, **60**, 3-15.
28. (52) Schafer, R., S. Avery, P. May, D. Rajopadhyaya, and **C. Williams**, 2002: Estimation of drop size distributions from dual frequency wind profiler spectra using deconvolution and a nonlinear least squares fitting technique. *J. Atmos. Oceanic Technol.*, **19**, 864-874.
27. (86) **Williams, C.R.**, 2002: Simultaneous ambient air motion and raindrop size distributions retrieved from UHF vertical incident profiler observations. *Radio Science*, **37**, 10.1029/2000RS002603.
26. (44) Gage, K.S., **C. R. Williams**, W. L. Clark, P. E. Johnston and D. A. Carter, 2002: Profiler contributions to Tropical Rainfall Measuring Mission (TRMM) Ground Validation Field Campaigns. *J. Atmos. Oceanic Tech.*, **19**, 843-863.

25. (62) Gage, K.S., **C.R. Williams**, P.E. Johnston, W.L. Ecklund, R. Cifelli, A. Tokay, and D.A. Carter, 2000: Doppler radar profilers as calibration tools for scanning radars. *J. Appl. Meteor.*, **39**, 2209-2222.
24. (12) VanZandt, T.E., W.L. Clark, K.S. Gage, **C.R. Williams**, and W.L. Ecklund, 2000: A dual-wavelength radar technique for measuring, ε, the turbulent energy dissipation rate. *Geophys. Res. Lett.*, **27**, 2537-2540.
23. (41) **Williams, C.R.**, W.L. Ecklund, P.E. Johnston, and K.S. Gage, 2000: Cluster analysis techniques to separate air motion and hydrometeors in vertical incident profiler observations. *J. Atmos. Oceanic Technol.*, **17**, 949-962.
22. (104) Cifelli, R.C., **C.R. Williams**, D.K. Rajopadhyaya, S.K. Avery, K.S. Gage, and P.T. May, 2000: Drop size distribution characteristics in tropical mesoscale convective systems. *J. Appl. Meteor.*, **39**, 760-777.
21. (67) **Williams, C.R.**, A. Kruger, K.S. Gage, A. Tokay, R. Cifelli, W.F. Krajewski, and C. Kummerow, 2000: Comparison of simultaneous rain drop size distributions estimated from two surface disdrometers and a UHF profiler. *Geophys. Res. Lett.*, **27**, 1763-1766.
20. (279) Atlas, D., C.W. Ulbrich, F.D. Marks, E. Amitai, **C.R. Williams**, 1999: Systematic variation of drop size and radar rainfall relations. *J. Geophys. Res.*, **104**, 6155-6169.
19. (8) Gage, K.S., **C.R. Williams**, W.L. Ecklund, and P.E. Johnston, 1999: Development and application of Doppler radar profilers to ground validation of satellite precipitation measurements. *Adv. In Space Res.*, **24**, 931-934.
18. (65) Gage, K.S., **C.R. Williams**, W.L. Ecklund and P.E. Johnston, 1999: Use of two profilers during MCTEX for unambiguous identification of Bragg scattering and Rayleigh scattering. *J. Atmos. Sci.*, **56**, 3679-3691.
17. (169) Tokay, A., D.A. Short, **C.R. Williams**, W.L. Ecklund, and K.S. Gage, 1999: Tropical rainfall associated with convective and stratiform clouds: Intercomparison of disdrometer and profiler measurements. *J. Applied Meteor.*, **38**, 302-320.
16. (69) Ecklund, W.L., **C.R. Williams**, P.E. Johnston and K.S. Gage, 1999: A 3 GHz profiler for precipitating cloud studies. *J. Atmos. Oceanic Technol.*, **16**, 309-322.
15. (46) Rajopadhyaya, D.K., P.T. May, R.C. Cifelli, S.K. Avery, **C.R. Williams**, W.L. Ecklund, and G.S. Gage, 1998: The effect of vertical air motions on rain rates and median volume diameter determined from combined UHF and VHF wind profiler measurements and comparisons with rain gauge measurements. *J. Atmos. Oceanic Technol.*, **15**, 1306-1319.
14. (6) **Williams, C.R.**, 1997: Principal component analysis of wind profiler observations. *J. Atmos. Oceanic Technol.*, **14**, 386-395.
13. (8) Gage, K.S., J.R. McAfee, and **C.R. Williams**, 1996: Recent changes in tropospheric circulation over the central equatorial Pacific. *Geophys. Res. Lett.*, **23**, 2149-2152.
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.
11. (39) Gage, K.S., J.R. McAfee, and **C.R. Williams**, 1996: On the annual variation of tropospheric zonal winds observed above Christmas Island in the central equatorial Pacific. *J. Geophys. Res.*, **101**, 15061-15070.
10. (59) Gage, K.S., **C.R. Williams**, and W.L. Ecklund, 1996: Application of the 915 MHz profiler for diagnosing and classifying tropical precipitating cloud systems. *Radar Meteor. and Atmos. Phys.*, **59**, 141-151.
9. (89) **Williams, C.R.**, and S.K. Avery, 1996: Diurnal nonmigrating tidal oscillations forced by deep convective clouds. *J. Geophys. Res.*, **101**, 4079-4091.

8. (264) **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.
7. (255) Carter, D.A., K.S. Gage, W.L. Ecklund, W.M. Angevine, P.E. Johnston, A.C. Riddle, J.S. Wilson, and **C.R. Williams**, 1995: Developments in UHF lower tropospheric wind profiling at NOAA's Aeronomy Laboratory. *Radio Science*, **30**, 977-1001.
6. (61) Ecklund, W.L., K.S. Gage, and **C.R. Williams**, 1995: Tropical precipitation studies using a 915-MHz wind profiler. *Radio Science*, **30**, 1055-1064, doi: 10.1029/95RS00640.
5. (127) Gage, K.S., **C.R. Williams**, and W.L. Ecklund, 1994: UHF wind profilers: A new tool for diagnosing tropical convective cloud systems. *Bull. Amer. Meteorol. Soc.*, **75**, 2289-2294.
4. (23) Gage, K.S., J.R. McAfee, W.L. Ecklund, D.A. Carter, **C.R. Williams**, P.E. Johnston, and A.C. Riddle, 1994: The Christmas Island wind profiler: A prototype VHF wind-profiling radar for the tropics. *J. Atmos. Oceanic Tech.*, **11**, 22-31.
3. (125) **Williams, C.R.**, and S.K. Avery, 1992: Analysis of long-period waves using the mesosphere- stratosphere-troposphere radar at Poker flat, Alaska. *J. Geophys. Res.*, **97**, 20855-20861.
2. (23) **Williams, C.R.**, S.K. Avery, J.R. McAfee, and K.S. Gage, 1992: Comparison of observed diurnal and semidiurnal tropospheric winds at Christmas Island with tidal theory. *Geophys. Res. Lett.*, **19**, 1471-1474.
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
Tau Beta Pi (National Engineering Honor Society)
Eta Kappa Nu (National Electrical Engineering Honor Society)
American Geophysical Union, Outstanding Student Presentation, Dec. 1990

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 – 2023

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.

Session Organizer, 102nd AMS Annual Meeting: "Ground-based Radar Studies to Advance Satellite Precipitation Retrieval Algorithms", January 2022.

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