

Christopher R. Williams, PhD

Research Professor
Ann and H.J. Smead Department of Aerospace Engineering Sciences
University of Colorado Boulder
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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)
- 1994-2015 **Research Scientist**, CIRES / CU & NOAA
- 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**, CO₂ 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>

- 71 published peer-reviewed publications
- Collaborated with over 120 different co-authors
- Publications cited over 1900 times in other peer-reviewed articles
- Publications cited over 150 times in 2017
- *h-index* = 25 (25 papers have at least 25 citations), as of April 2018

Publication number. (Citation count) Publication detail

74. (N/A) **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.*, accepted.
73. (N/A) 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.*, accepted.
72. (N/A) 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.*, in press.
71. (7) 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. (2) **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. (23) Jensen, M.P., W.A. Petersen, A. Bansemmer, 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, 12 November 2016.
68. (2) 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. (6) **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. (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: 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. (9) 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.
63. (8) 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. (8) 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. (13) Varble, A., E.J. Zipser, A.M. Fridlind, P. Zhu, A.S. Ackerman, J.-P. Chaboureaud, 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. (13) 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. (21) **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. (25) 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. (28) 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. (11) 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. (14) 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. (18) **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. (9) 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. (9) Moran, K.P., S. Pezoa, C.W. Fairall, **C. R. Williams**, T.E. Ayers, A. Brewer, S.P. de Szoek, 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. (1) **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. (15) 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. (41) 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. (11) 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. (61) 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. (12) 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. (29) 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. (4) 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. (21) **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. (8) Nikolopoulos, E. I., A. Kruger, W. F. Krajewski, **C. R. Williams**, and K. S. Gage, 2008: Comparative scaling analysis from two vertically pointing radars, an optical disdrometer and a rain gauge. *Nonlinear Processes in Geophysics*, **15**, 987-997.
40. (11) 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. (11) **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. (20) **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. (52) 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. (20) **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. (22) 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. (11) 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. (54) 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. (10) 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. (4) Atlas, D., **C.R. Williams**, 2003: Radar echoes from lightning and their microphysical environment. *Geophys. Res. Lett.*, **30**, 10.1029/2002GL016521.
30. (24) 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. (31) Atlas, D., and **C.R. Williams**, 2003: The anatomy of a continental Tropical convective storm. *J. Atmos. Sci.*, **60**, 3-15.
28. (30) 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. (34) **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. (18) 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. (33) 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. (7) 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. (23) **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. (56) 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. (38) **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. (121) 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. (5) 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. (35) 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. (75) 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. (37) 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. (40) 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. (3) **Williams, C.R.**, 1997: Principal component analysis of wind profiler observations. *J. Atmos. Oceanic Technol.*, **14**, 386-395.
13. (5) 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. (14) **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. (20) 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. (34) 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. (67) **Williams, C.R.**, and S.K. Avery, 1996: Diurnal nonmigrating tidal oscillations forced by deep convective clouds. *J. Geophys. Res.*, **101**, 4079-4091.
8. (138) **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. (144) 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. (30) 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.
5. (81) 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. (16) 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. (87) **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. (16) **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.

Field Campaign Deployments

Involved with instrument deployment and data analysis from these experiments

17. Mid-Latitude Continental Convective Cloud Experiment (MC3E), April-June 2011, Oklahoma
16. CalWater Experiment, November 2009-March 2010, California Sierra Nevada
15. CalWater Early Start Campaign, February-March 2009, California Sierra Nevada
14. Hydrometeorological Testbed 2008-2009 Winter Season (HMT-09), Dec. 2008-March 2009, California Sierra Nevada
13. Hydrometeorological Testbed 2007-2008 Winter Season (HMT-08), Dec. 2008-March 2009, California Sierra Nevada
12. Tropical Warm Pool-International Cloud Experiment (TWP-ICE), January-February 2006, Darwin, Australia.
11. Wallops Island Precipitation Variability Experiment, 2004-2006, Wallops Island, VA.
- 10 North American Monsoon Experiment (NAME), July-August 2004, Estacion Obispo, Mexico.
- 11 Front Range Pilot Project (FRPP), May-August 2004, Platteville, CO.
8. Distrometer Evaluation Experiment (DEVEX), April-Sept. 2002, Iowa City, IA.
7. Cirrus Regional Study of Tropical Anvils and Cirrus Layers – Florida Area Cirrus Experiment (CRYSTAL-FACE), July 2002, Miami, FL.
6. 2001 Multi-Frequency Radar IOP, ARM Southern Great Plains (SGP) Site, Lamont, OK.
5. Kwajalein Experiment (KWAJEX), July-Sept. 1999, Kwajalein Island, Republic of the Marshall Islands.
4. Tropical Rainfall Measuring Mission-Land-Biosphere-Amazonia (TRMM-LBA), January-February 1999, Ji Parana, Brazil.
3. Texas-Florida Underflight Experiment – Florida Phase (TEFLUN-B), August-Sept. 1998, Melbourne, FL.
2. Texas-Florida Underflight Experiment – Texas Phase (TEFLUN-A), April-June 1998, Houston, TX.
1. Tropical Eastern Pacific Precipitation Study (TEPPS), July-Sept. 1997, on the NOAA *R/V Ronald H. Brown*, 1500 nmi west of Panama City, Panama.

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)

- 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
- DOE ASR Radar Science Committee, Member, Member, 2011 – 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 - Present.

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)

Teaching Experience

- ASEN 5245 “Radar Remote Sensing”, Ann and H.J. Smead Department of Aerospace Engineering Sciences, University of Colorado Boulder, Spring Semester 2017 and 2018

Professional Presentations / Non-Reviewed Publications

Over 200 professional presentations or non-reviewed publications