



WeatherExtreme Ltd.

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EDUCATION

Ph.D.	1994	Physics	University of Nevada, Reno
M.S.	1991	Atmospheric Physics	University of Nevada, Reno
B.S.	1987	Atmospheric Science	UCLA

PROFESSIONAL EXPERIENCE

1994-Present	President , WeatherExtreme Ltd. (formerly Firnspiegel LLC), A Research and Consulting Company, Reno, Nevada (& a registered corporation in California)
2009-Present	Affiliate Associate Research Professor , Division of Atmospheric Sciences, Desert Research Institute
2009-Present	Professor , University of Nevada, Reno
1997-2002	Associate Professor of Mathematics, Physics and Meteorology , Sierra Nevada College, Incline Village, Nevada (<u>part-time</u>)
1995-1997	Assistant Professor of Mathematics, Physics and Meteorology , Sierra Nevada College, Incline Village, Nevada (<u>part-time</u>)
1994-1995	Associate Scientist , Atmospheric Sciences Center, Desert Research Institute, University of Nevada, Reno
1989-1995	Adjunct Professor of Mathematics, Physics and Meteorology , Sierra Nevada College, Incline Village, Nevada
1987-1994	Graduate Research Assistant , Atmospheric Sciences Center, Desert Research Institute, Reno, University of Nevada, Reno
1986	National Weather Service Assistantship , UCLA, Los Angeles Office
1985-1986	Student Research Program , UCLA, Advisor: Dr. G.L. Siscoe
1985	Weather Forecaster , <u>Daily Bruin</u> , UCLA Newspaper (circulation 22,000)
1984-1985	Plasma Physics Research Assistant , Carmel Research Center, Inc., Santa Monica, California

FORENSIC METEOROLOGY EXPERIENCE

- * Qualified Expert, Federal Court
- * Qualified Expert, numerous States
- * Over 700 Meteorological Investigations for Legal Matters
- * Past Weather Reconstruction using Satellite and Radar Data
- * Sun/Moon Position Calculations for Specific Location/Terrain
- * Civil, Nautical, & Astronomical Twilight Calculations for Specific Location/Terrain
- * Ice & Snow Type/Amount
- * GIS/GPS Mapping Capabilities (2-D & 3-D)

- * Reconstruction of events (e.g., aircraft, maritime, trucking, highways)
- * In-Court Computer Capabilities
- * Expert Testimony, Reports, & Consulting

PROFESSIONAL AWARDS

- * **Fulbright Senior Specialist**, Laboratoire de Physique de l'Atmosphère, CNRS, Université de La Réunion, Réunion Island, France (May 5-25, 2003)
- * **United Nations Development Program Invited Speaker**, International Skiing Industry Cooperation Forum, Harbin City, People's Republic of China (December 2001)
- * **Certified Consulting Meteorologist** (#572), American Meteorological Society
- * **Distinguished Teaching Award**, Sierra Nevada College (1996-97)
- * **First Place**, Peter B. Wagner Memorial Scholarship, Atmospheric Sci. Center, Desert Research Institute
- * **Excellence in Teaching**, Sierra Nevada College, Elected Member

PROFESSIONAL ACTIVITIES

- * Board of Certified Consulting Meteorologists (BCCM), American Meteorological Society, Jan. 11, 2009 – January 2013.
- * Chair, American Meteorological Society Annual Meeting Session 'Urban High-Impact Weather Forecasting', January 14, 2009.
- * Mountain Meteorology Committee Member, Feb. 1, 2003-Jan. 31, 2006 (American Meteorological Soc.)
- * National Research Council & National Academies: Board on Atmospheric Sciences & Climate, Weather Research for Surface Transportation (elected member March 2003-March 2004)
- * Continuing Education Committee Member, Jan. 11, 2004-Jan. 31, 2007 (American Meteorological Soc.)
- * American Meteorological Society, Elected Member
- * Research Article Peer Reviewer for: *Journal of Applied Meteorology*
- * Regional Editor: *Weather Watch Magazine* (1996-1997)
- * Research proposal and grant Peer Reviewer for the *Australian Research Council*
- * Sigma Xi, The Scientific Research Society, Elected Full Member
- * American Geophysical Union, Member
- * National Weather Association, Member

CURRENT & PAST PROJECT DESCRIPTIONS (non proprietary listed only)

- * The Perlan Project: Gliding to 100,000 Feet in a Manned Sailplane (**Chief Meteorologist**)
- * Establishing Real-Time Weather Forecasting for the Eritrean Meteorological Center, Eritrea, Africa (**Principal Investigator**)
- * Pacific Jets Landfalling Experiments (PACJET), National Oceanic & Atmospheric Administration (NOAA) & California Department of Transportation: Wind Profiler Derived Snow Level Algorithm (**Contractor**)
- * Meteorological Support & Modeling for the X43-A Supersonic NASA Flight Project (NASA-**Contractor**)
- * Implementing Real-Time Atmospheric Forecasting at NASA/Dryden Flight Research (NASA) (**Contractor**)
- * Modeling & Forecasting Stratospheric Mountain Waves & The Polar Vortex over New Zealand (NASA) (**Contractor**)
- * Research on Stratospheric Mountain Waves for Flight with a Sailplane to 100,000 feet (NASA) (**Contractor**)
- * Crystal Bay, Lake Tahoe, Nevada, Avalanche Hazard Assessments
- * Incline Village, Lake Tahoe, Nevada, Avalanche Hazard Assessments
- * Incline Village General Improvement District, Diamond Peak Ski Resort, Lake Tahoe, Climatology (precipitation, temperature & wet-bulb temperature) Analysis for Snowmaking Expansion (**Contractor**)
- * Twin Lakes Avalanche Hazard Analysis Project (**Contractor**)
- * Alpine Meadows Canyon/Wolf Creek Ski Resort Avalanche Hazard Evaluation (**Contractor**)
- * El Niño/Southern Oscillation (ENSO) v. Sierra Snowpack & Climate Research (**Principal Investigator**)
- * Precipitation Trajectory Estimation in Clouds Seeded for Precipitation Enhancement, Australia (**PI**)
- * California State Department of Water Resources: Gauge Adjusted Radar-Rainfall Data (**Senior Co-Consultant**)
- * Wind Study-Western Nevada: Lightning W Ranch (**Principal Investigator**)
- * National Science Foundation (NSF) Supercooled Liquid Water and Precipitation Development in Winter Mountain Clouds of Extratropical Cyclones (**Principal Investigator**)
- * Department of Energy (DOE) Atmospheric and Radiation Measurement (ARM) Project (**Research Assoc.**)

- * National Atmospheric and Oceanic Administration (NOAA) - Nevada Project Atmospheric Modification Program: Mesoscale Structure and Microphysical Response to Seeding of the Sierra Nevada Storms (Research Associate)
- * COMET: Cooperative Project between the Desert Research Institute and the National Weather Service, University Corporation for Atmospheric Research (UCAR) Project (Senior Investigator)
- * NSF Australian Winter Storms Experiment (Graduate Research Assistant)
- * NSF Cloud Condensation Nuclei Studies (Graduate Research Assistant)
- * NSF Storm Peak Laboratory Project: Studies of Aerosol Scavenging by Ice Particles in Clouds (Grad RA)
- * NSF Mesoscale Kinematics and Supercooled Liquid Water Development in Winter Orographic Clouds (Graduate Research Assistant)
- * Numerous consulting projects for ski resorts, private industry, state and local agencies, investigators, attorneys and insurance companies regarding weather and climate data.

COMPUTING EXPERIENCE

- * 1996 One-Week GIS Workshop, Columbia College, Columbia, California.
- * 1995 One-Week Cloud Model (MM5) Workshop, National Center for Atmospheric Research.
- * 1994 Two-Week Cloud Model (Clark Model) Workshop, National Center for Atmospheric Research.
- * 1993 Two-Week Cloud Model (Clark Model) Workshop, National Center for Atmospheric Research.
- * User of Clark Model, a three-dimensional, non-hydrostatic, terrain-following numerical cloud model.
- * User of Regional Atmospheric Modeling System (RAMS), a three-dimensional, cloud model.
- * User of Mesoscale Model 5 (MM5), a three-dimensional, non-hydrostatic, numerical cloud model.

PRESENTATIONS

- Carter, E. and G.L. Siscoe, 1986: The Fractal Dimension of Clouds. Workshop on Nonlinear Models of Climate Dynamics, Dec. 6, UCLA.
- Carter, E.J., R.D. Borys and E.E. Hindman, 1988: The Variation of the Chemical Composition of Cloud Water Across the Droplet Size Distribution. Presented at Fall Amer. Geophys. Union Ann. Meeting, San Francisco, CA.
- Carter, E.J., R.D. Borys and E.E. Hindman, 1989: Cloud Sieves: Passive, Size Selective Cloud Droplet Collectors. Presented at Amer. Assoc. for Aerosol Research Ann. Meeting, 9-13 Oct., Reno, NV.
- Borys, R.D., B.B. Demoz and E.J. Carter, 1989: Field Study of the Distribution of Elemental Carbon in Cloud Droplets of Different Sizes. Presented at Amer. Assoc. for Aerosol Research Ann. Meeting, 9-13 Oct., Reno, NV.
- Mitchell, D.L., R.D. Borys and E.J. Carter, 1989: The Phase Partitioning of Chemical Species within Mixed Phase Clouds. Presented at Amer. Assoc. for Aerosol Research Ann. Meeting, 9-13 Oct., Reno, NV.
- Carter, E.J., R.D. Borys and E.E. Hindman, 1991: Unraveling the Relationship Between Atmospheric Aerosols and Cloud Droplets and their Effects on Climate. Presented at XX General Assembly International Union of Geodesy and Geophysics, 13-20 Aug., Vienna, Austria.
- Mitchell, D.M. and E.J. Carter, 1993: Dependence of Cloud Liquid Water Content and Precipitation Rates on a CCN Cloud Feedback Effect. Internat. Assoc. of Meteor. and Atmospheric Physics - Internat. Assoc. of Hydrological Sciences Joint Internat. Meeting, 11-23 July, Yokohama, Japan.
- Long, A.B. and E.J. Carter, 1994a: Seedability of Winter Mountain Clouds in Southeast Australia. Proceeding of the 6th WMO Scientific Conference on Weather Modification, Italy, June.
- Carter, E.J. and A.B. Long, 1995: Australian Winter Storms Experiment II. Water Budget, Precipitation Efficiency and Modeling. Conference on Cloud Physics Preprint Volume, American Meteorological Society, 292-297.
- Carter, E.J. and R.L. Reinhardt, 1995: Hydrometeorological Data Base: On-Line Near-Real Time Access. Specific Application to ALERT Data. *Invited Paper*. National Hydrologic Warning Council, First National Conference, Baltimore, June 7-9.
- Mitchell, D.M., D. Koracin, E.J. Carter and Q. Jiang, 1995: A New Treatment of Cirrus Cloud Radiative Properties: Validation via Field and Laboratory Experiments. Dept. of Energy ARM Science Team Meeting, March 19-23, San Diego, CA, p. 54.
- Carter, E.J., 1998: Weather for Snowmaking. 1.5 Hour Invited Lecture. Maintenance and Operations Conference, California Ski Industry Association, May 12-14, Diamond Peak Ski Resort, Incline Village, Nevada.
- Carter, E.J., and C. Levitan 1998: The Adventures of Gender-Based Calculus Instruction. 1.5 Hour Lecture. National Council of Teachers of Mathematics Annual Conference, November, Reno, Nevada.
- Carter, E.J., 2000: Basic Weather Forecasting. 1.5 Hour Invited Lecture. National Ski Area Association Annual Operations/Maintenance/Grooming Conference, May 31 - June 2, Hood River, Oregon.
- Carter, E.J., 2000: Advanced Weather Forecasting. 1.5 Hour Invited Lecture. National Ski Area Association Annual Operations/Maintenance/Grooming Conference, May 31 - June 2, Hood River, Oregon.
- Carter, E.J., 2000: Weatherwise Snowmaking Part 1 & 2 (Three hour invited lecture), National Ski Areas Association Fall 2000 Education Seminars. Sept. 6-8 Attatish Bear Peak, New Hampshire; Sept. 14-15 Massanutten Ski Resort, Virginia; Sept. 18-20 Lake Placid, New York; Sept. 21-22 The Canyons, Utah; Sept. 25-26 Northstar-at-Tahoe, California; Oct. 9-10 Portland, Oregon.
- Carter, E.J., 2001: The Sierra Weather & Avalanche Center (Invited Lecture), Operation Sierra Storm Conference, Jan. 10-12, South Lake Tahoe, California.
- Carter, E.J., 2001: Weatherwise Snowmaking in Colorado (Invited Lecture), Snow Conference 2001, Colorado Ski Country U.S.A., April 10-12, Grand Junction, Colorado.

- Carter, E.J., 2001: Weather for Snowmaking (Invited Lecture), California Ski Industry Association Annual Conference, April 15-16, Heavenly, California.
- Enevoldson, E., and E.J. Carter, 2001: The Stratospheric Wave Project. PASCO (Pacific Soaring Council, Inc.) Annual Conference, Nov. 17, Dublin, California.
- Carter, E.J., 2001: The Importance of Weather for the Ski Industry (Invited Lecture), International Skiing Industry Cooperation Forum, December 4-8, Harbin City, People's Republic of China.
- Carter, E.J., 2002: The Sierra Weather & Avalanche Center, 82nd Annual American Meteorological Society Meeting, 13-17 January 2002, Orlando, Florida.
- Carter, E.J. and E.H. Teets, Jr., 2002: Stratospheric Mountain Waves: Observations and Modeling for A Proposed Sailplane that will use these Waves to Reach 100,000 Feet, 82nd Annual American Meteorological Society Meeting, 13-17 January 2002, Orlando, Florida.
- Carter, E.J., 2002: Weather for Snowmaking (Invited Lecture), Colorado Snow Country U.S.A., Grand Junction, Colorado, 9-11 April.
- Carter, E.J. and E.H. Teets, Jr., 2002: Meteorological Support and Modeling for the NASA X-43A Hypersonic Research Vehicle. 10th Conf. Aviation, Range & Aerospace Meteorology. American Meteor. Soc., 13-16 May, Portland, Oregon.
- Enevoldson, E., and E.J. Carter, 2002: Perlan Projekt, Mit Dem Segelflugzeug in die Stratosphäre. Segelfliegtag 2002, Deutcher Aero Club, Berlin, Germany, 1-2 November.
- Carter, E.J., E.H. Teets, Jr., and S.N. Goates, 2003: The Perlan Project: New Zealand Flights, Meteorological Support & Modeling. 19th Conference on Interactive Information Processing Systems (IIPS) for Meteorology, Oceanography, and Hydrology, 83rd Annual American Meteorological Society Meeting, 9-13 February 2003, Long Beach, California.
- Carter, E.J., F.M. Ralph, A.B. White, T.S. Dye, and S.N. Goates, 2003: Wind-Profiler Derived Snow Level Monitoring: California Highway I-80 Donner Summit. 19th Conference on Interactive Information Processing Systems (IIPS) for Meteorology, Oceanography, and Hydrology, 83rd Annual American Meteorological Society Meeting, 9-13 February 2003, Long Beach, California.
- Carter, E.J., E.H. Teets, Jr., J. Robinson, and S.N. Goates, 2003: The International Perlan Project: Soaring Stratospheric Mountain Waves in New Zealand. 7th Conference on Southern Hemisphere Meteorology and Oceanography, Annual American Meteorological Society Meeting, 24-28 March 2003, Wellington, New Zealand.
- A.B. White, D.J. Gattas, P.J. Neiman, F.M. Ralph, E.T. Strem & E.J. Carter, 2003: A Radar Wind Profiler Snow-Level Algorithm for NWS Forecast Applications and Climate Research. 10th Annual Workshop on Weather Prediction in the Intermountain West, November 6, Reno, Nevada.
- E.J. Austin, 2004: Virtual Weather. *The Inner Circle of Advocates*, 33rd Annual Convention, August 15-19, Dana Point, California.
- E.J. Austin and E. Enevoldson, 2005: The Perlan Project: Sierra & Argentina 2005. *Soaring Society of America Annual Convention*, February 9-12, Ontario, California.
- E.J. Austin 2010: Forensic Meteorology & Climatology: A Rapidly Emerging Niche. *Third Annual CCM Forum*, 90th Annual American Meteorological Society Meeting, 17-21 January 2010, Atlanta, Georgia.

PUBLICATIONS

- Carter, E. and G.L. Siscoe, 1987: A Study of Cumulus Clouds as Fractals. *UCLA Undergrad. Science Journal*.
- Carter, E.J. and B.B. Demoz, 1988: A Study of the Truckee Meadows Inversion: Formation, Breakup and Consequences. First Place Paper, Peter B. Wagner Memorial Scholarship, Desert Research Institute, Reno, NV.
- Carter, E.J., 1991: Cloud Droplet Capture of Atmospheric Aerosols. M.S. Thesis, Desert Research Institute, University of Nevada, Reno, 222pp.
- Hindman, E.E., E.J. Carter, R.D. Borys and D.L. Mitchell, 1992: Collecting Supercooled Droplets as a Function of Droplet Size. *J. Atmos. Ocean. Tech*, 9, no. 4, 337-353.
- Carter, E.J. and R.D. Borys, 1993: Aerosol-Cloud Chemical Fractionation: Analysis of Cloud Water. *J Atmos. Chem.*, 17, 277-292.
- Carter, E.J., 1994: Wintertime Precipitation Enhancement Opportunities in the Great Dividing Range of Southeastern Australia. Ph.D. Dissertation, Desert Research Institute, University of Nevada, Reno, 484 pp.
- Mitchell, D.M., D. Koracin and E.J. Carter, 1994: Improvements in Modeling the Microphysical and Radiative Properties of Cirrus Clouds using the Regional Atmospheric Modeling System (RAMS). Annual Report to the DOE/ARM Project. Atmospheric Sciences Center, Desert Research Institute, Reno, 22 pp.
- Carter, E.J. and A.B. Long, 1995: Australian Winter Storms Experiment II. Water Budget, Precipitation Efficiency and Modeling. Conference on Cloud Physics Preprint Volume, American Meteorological Society, 292-297.
- Carter, E.J., 1995: Forensic Meteorology: Precipitation and its Variability. *Nevada Lawyer*, Vol. 3, No. 4, April, p. 28-29.

- Huggins, A.W., R. Stone, S.K. Chai, and E.J. Carter, 1995: NOAA/Nevada Atmospheric Modification Program: Mesoscale Structure and Microphysical Response to Seeding of Sierra Nevada Storms. Semi-Annual Report to NOAA. Atmospheric Sciences Center, Desert Research Institute.
- Mitchell, D.M., D. Koracin and E.J. Carter, 1995: Radiative Properties of Cirrus Clouds. DOE ARM Report, Atmospheric Sciences Center, Desert Research Institute, Reno, NV.
- Huggins, A.W., R. Stone, D. Koracin, E.J. Carter, K. Smith-Miller, and R. Borys 1995: NOAA/Nevada Atmospheric Modification Program: Mesoscale Structure and Microphysical Response to Seeding of Sierra Nevada Storms. Second Semi-Annual Report to NOAA. Atmospheric Sciences Center, Desert Research Institute.
- Carter, E.J., 1995: Dr. Snow. *POWDER The Skier's Magazine*, Vol. 24, No. 1, September, p. 52.
- Carter, E.J., 1995: Dr. Snow. *POWDER The Skier's Magazine*, Vol. 24, No. 2, October, p. 30.
- Carter, E.J., 1995: Dr. Snow. *POWDER The Skier's Magazine*, Vol. 24, No. 3, November, p. 42.
- Carter, E.J., 1995: Dr. Snow. *POWDER The Skier's Magazine*, Vol. 24, No. 4, December, p. 44.
- Carter, E.J., 1996: Precipitation and Liquid Water of Winter Mountain Storms. Project Completion Report for NCAR Project #36841002.
- Carter, E.J., 1996: Supercooled Liquid Water and Precipitation Development in Winter Mountain Clouds of Extratropical Cyclones. NSF Final Report, Grant ATM-9108375.
- Carter, E.J., 1996: Region IX-Pacific West. *Weather Watch Magazine*, Vol. 19, March, p 23-26.
- Carter, E.J., 1996: Region IX-Pacific West. *Weather Watch Magazine*, Vol. 20, April, p 22-24.
- Carter, E.J., 1996: Region IX-Pacific West. *Weather Watch Magazine*, Vol. 21, May, p 20-22.
- Carter, E.J., 1996: Region IX-Pacific West. *Weather Watch Magazine*, Vol. 22, June, p 22-25.
- Long, A.B. and E.J. Carter, 1996: Australian Winter Mountain Storm Clouds: Precipitation Augmentation Potential. *J. Applied Meteor.*, Vol. 35, 1457-1464.
- Carter, E.J., 1996: Region IX-Pacific West. *Weather Watch Magazine*, August, p 18-20.
- Carter, E.J., 1996: Region IX-Pacific West. *Weather Watch Magazine*, September, p 16-19.
- Carter, E.J., 1997: Region IX-Pacific West. *Weather Watch Magazine*, January - December, Monthly Articles.
- Carter, E.J. and A.B. Long, 1999: The Water Budget and Precipitation Efficiency of Australian Winter Mountain Storm Clouds. 7th Conf. on Weath. Modification, Chiang Mai, Thailand, Vol. I, 105-108.
- Carter, E.J., The Sierra Weather & Avalanche Center, *Preprint in 16th Conference on Hydrology*, 82nd Annual American Meteorological Society Meeting, 13-17 January 2002, Orlando, Florida, J230-J233.
- Carter, E.J. and E.H. Teets, Jr., 2001: Stratospheric Mountain Waves: Observations and Modeling for A Proposed Sailplane that will use these Waves to Reach 100,000 Feet. *Preprint in 18th Conference on Interactive Information Processing Systems (IIPS) for Meteorology, Oceanography, and Hydrology*, 82nd Annual American Meteorological Society Meeting, 13-17 January 2002, Orlando, Florida, 279-281.
- Teets, Jr., E.H. and E.J. Carter, 2002: Atmospheric Conditions of Stratospheric Mountain Waves: Soaring the PERLAN Aircraft to 30 km. *Preprint in 10th Conf. Aviation, Range & Aerospace Meteorology*. American Meteor. Soc. Meeting, 13-16 May, Portland, Oregon, 195-198.
- Carter, E.J. and E.H. Teets, Jr., 2002: Meteorological Support and Modeling for the NASA X-43A Hypersonic Research Vehicle. *Preprint in 10th Conf. Aviation, Range & Aerospace Meteorology*. American Meteor. Soc. Meeting, 13-16 May, Portland, Oregon, 199-202.
- Carter, E.J., E.H. Teets, Jr., and L.J. Ehernberger, 2002: Air Data Calibration and Atmospheric Modeling for the NASA X-43A Hypersonic Research Vehicle Program. To be submitted as a Technical Paper, NASA Dryden Flight Research Center.
- Carter, E.J., E.H. Teets, Jr., and S.N. Goates, 2003: The Perlan Project: New Zealand Flights, Meteorological Support & Modeling. *Preprint in 19th Conference on Interactive Information Processing Systems (IIPS) for Meteorology, Oceanography, and Hydrology*, 83rd Annual American Meteorological Society Meeting, 9-13 February 2003, Long Beach, California.
- Carter, E.J., F.M. Ralph, A.B. White, T.S. Dye, and S.N. Goates, 2003: Wind-Profiler Derived Snow Level Monitoring: California Highway I-80 Donner Summit. *Preprint in 19th Conference on Interactive Information Processing Systems (IIPS) for Meteorology, Oceanography, and Hydrology*, 83rd Annual American Meteorological Society Meeting, 9-13 February 2003, Long Beach, California.
- Carter, E.J., E.H. Teets, Jr., J. Robinson, and S.N. Goates, 2003: The International Perlan Project: Soaring Stratospheric Mountain Waves in New Zealand. *Preprint in 7th Conference on Southern Hemisphere Meteorology and Oceanography*, Annual American Meteorological Society Meeting, 24-28 March 2003, Wellington, New Zealand.
- National Research Council, National Academy of Science (Co-Author), 2004: Where the Weather Meets the Road: A Research Agenda for Improving Road Weather Services. The National Academies Press, Washington, D.C.