

## Dr. Randal S. Martin

---

Associate Research Professor, Environmental Engineering  
Associate Director, Utah Climate Center

Department of Civil & Environmental Engineering  
Utah Water Research Laboratory  
Utah State University  
Logan, UT 84322-4110

PHONE: (435) 797-1585  
FAX: (435) 797-1185  
randy.martin@usu.edu

### EDUCATION

MONTANA TECH, Butte, Montana, B.S., Environmental Engineering, 1982  
WASHINGTON STATE UNIVERSITY, Pullman, Washington, M.S., Environmental Engineering, 1989  
Thesis: *Measurement of Isoprene and Subsequent Oxidation Products in an Eastern Deciduous Forest*  
WASHINGTON STATE UNIVERSITY, Pullman, Washington, Ph.D., Civil Engineering, 1992  
Dissertation: *Concentration and Flux Measurements of Biogenic Hydrocarbons from Forest Ecosystems*

### EMPLOYMENT HISTORY

2000-present Utah State University, Department of Civil & Environmental Engineering  
Logan, Utah, Associate Research Professor

- EWB faculty mentor – began working with Uganda team in 2009 and traveled as faculty mentor to Byana Mary Hill Orphanage, Masaka, Uganda 2010, 2011

1992-2000 New Mexico Institute of Mining and Technology, Socorro, NM  
Department of Environmental Engineering,  
Assistant/Associate Professor

1987-1992 Washington State University  
Pullman, Washington, Graduate Student/Research Assistant I & II

1982-1987 Southern Research Institute  
Birmingham, Alabama, Assistant/Associate Environmental Engineer

### AFFILIATIONS

Air and Waste Management Association  
Chair, Higher Education Division (2003-2007)  
Vice-Chair, Higher Education Division (2001-2003; 2007- 2010)  
Chair, Scholarship Awards Committee (1996-2001)  
Chair, Student Affairs Committee (2000-2002)

American Geophysical Union  
Editorial Board, Earth-In Space Journal (1995-2000)

American Society of Agricultural & Biological Engineers  
Association of Environmental Engineering and Science Professors  
American Chemical Society  
Engineers Without Borders

### RECENT & RELEVANT PUBLICATIONS, REPORTS AND PRESENTATIONS

Moore, K.D., M.D. Wojcik, R.S. Martin, C.C. Marchant, G.E. Bingham, D.S. Jones, W.J. Bradford, R.L. Pfeiffer, J.H. Prueger, and J.L. Hatfield (2015), Particulate matter emission estimates from agricultural spring tillage operations using Lidar and inverse modeling, initially submitted to *J. of Applied Remote Sensing* Sept 2014, resubmitted following reviewers comments Jan. 2015.

Wang, S-Y, L. Higgs, O-Y Chung, R. Gillies, and R.S. Martin (2015), Long-Term Changes of Winter Inversion Properties in a Mountain Valley in Utah and Implications on Air Quality, submitted initially in 2013 to the J. of Applied Meteor. & Climat. In 2013, it currently going through its 3<sup>rd</sup> revisions.

Moore, K.D., R.S. Martin, W.J. Bradford, C.C. Marchant, D.S. Jones, M.D. Wojcik, R.L. Pfeiffer, J.H. Prueger, and J.L. Hatfield, (2014), Derivation and Use of Simple Relationships between Aerodynamic and Optical Particle Measurements, J. Environ. Eng., Oct. 2014, [10.1061/\(ASCE\)EE.1943-7870.0000893](https://doi.org/10.1061/(ASCE)EE.1943-7870.0000893), 04014078.

Edwards, P.M., K. Akin, J. deGouw, W.P. Dubé, J. Gillman, D. Helmig, J.S. Holloway, B. Lerner, R. McLaren, D.D. Parrish, J. Peischl, J.M. Roberts, T.B. Ryerson, R. Martin, C. Warneke, E.J. Williams, C.J. Young, and S.S. Brown (2013), Ozone photochemistry in a natural gas basin during winter: Simulations of results from the 2012 Uintah Basin Winter Ozone Study, submitted to *Atmos. Chem. and Phys.*, 13, 8955-8971.

Moore, K.D., M.D. Wojcik, R.S. Martin, C.C. Marchant, G.E. Bingham, R.L. Pfeiffer, J.H. Prueger, and J.L. Hatfield (2013), Particulate Emissions Calculations from Fall Tillage Operations using Point and Remote Sensors, *J. of Env. Quality*, 42(4), 1029-1038.

Moore, K.D., E. Young, C. Gurell, M. D. Wojcik, R. S. Martin, G. E. Bingham, R. L. Pfeiffer, J. H. Prueger, J. L. Hatfield (2013), Ammonia Measurements and Emissions from a California Dairy using Point and Remote Sensors, revised submission Aug. 2013, *Transaction of the ASABE*.

Petron, G. J.D. Kofler, G.J. Frosty, B.R. Miller, P.M. Edwards, W.P. Dube, S.A. Montzka, D. Helmig, J. Hueber, A. Karion, C. Sweeney, S.A. Conley, S.S. Brown, F. Geiger, C. Warneke, R.S. Martin, A.E. Andrews, E.J. Dlugokencky, P.M. Lang. M. Trainer, R.M. Hardesty, R.C. Schnell, and P.P. Tans (2012), Emissions from oil and natural gas operations in northeastern Utah, poster #A23B-0214, AGU Fall Meeting, San Francisco, CA, December 2012.

Smith, E., S.N. Lyman, R.S. Martin, R. Anderson (2012), Production of NO<sub>x</sub> and other precursors of ozone formation in the Uinta Basin, poster #A23B-0217, AGU Fall Meeting, San Francisco, CA, December 2012.

Moore, K.D., R.S. Martin, K. Harper, and S.N. Lyman (2012), Wintertime distributed ozone measurements in Utah's Uintah Basin during UBWOS 2012, poster #A23B-0224, AGU Fall Meeting, San Francisco, CA, December 2012.

Martin, R.S. (2012), Wintertime methane and non-methane hydrocarbon measurements in Utah's Uintah Basin, presentation #A23B-03, AGU Fall Meeting, San Francisco, CA, December 2012.

Martin, R. and C. Woods (2012), Estimation of VOC emission rates from produced water ponds in the Uintah Basin, project report, submitted to the Uintah Impact Mitigation Special Services District, Oct. 2012.

Wojcik, M.D., R.S. Martin, and J.L. Hatfield (2012), Using Lidar to Characterize Particles from Point and Diffuse Sources in an Agricultural Field, in *Environmental Remote Sensing and Systems Analysis*, Ni-Bin Chang, editor, ISBN 978-1-4398-7743-2, CRC Press, Chptr 14, pp. 299-332.

Watterson, T.L., B. Hamilton, R.S. Martin, R.A. Coulombe, Jr. (2012), Urban particulate matter activities Akt in human lung cells, *Arch. Toxicol.*, 86(1), 121-135.

Moore, K.D., E. Young, R.S. Martin, M.D. Wojcik, R.L. Pfeiffer, J.H. Prueger, J.L. Hatfield (2012), Gaseous ammonia emissions estimated from measurements taken at a commercial dairy in California, USA, Presentation #121337635, 2012 ASABE Annual International Meeting, Dallas, TX, July, 2012.

Wojcik, M., J. Hatfield, R. Martin, K. Moore, R. Pfeiffer, J. Prueger (2012), Aglite: A 3-wavelength lidar system for quantitative assessment of agricultural air quality and whole facility particulate emissions, Presentation #121337637, 2012 ASABE Annual International Meeting, Dallas, TX, July, 2012.

Moore, K.D., C. Marchant, R.S. Martin, M.D. Wojcik, R.L. Pfeiffer, J.H. Prueger, J.L. Hatfield (2012), Particulate matter emission estimates for a commercial dairy in California, USA, Presentation #121337636, 2012 ASABE Annual International Meeting, Dallas, TX, July, 2012.

Moore, K.D., M.D. Wojcik, C.C. Marchant, R.S. Martin, E. Young, R.L. Pfeiffer, J.H. Prueger, J.L. Hatfield (2012), Emissions Calculated from Particulate Matter and Gaseous Ammonia Measurements from a Commercial Dairy in California, USA. Paper #ILES12-2246, 9<sup>th</sup> International Livestock Environment Symposium, Valencia, Spain, July 2012.

Wojcik, M., J. Hatfield, R. Martin, K. Moore, R. Pfeiffer, J. Prueger (2012), Aglite: A 3-wavelength lidar system for quantitative assessment of agricultural air quality and whole facility particulate emissions, Paper #ILES12-1538, 9<sup>th</sup> International Livestock Environment Symposium, Valencia, Spain, July 2012.

Allpress T.N, C. Deering-Rice, G. S. Yost, R. S. Martin, J. R. Stevens, J. M. Veranth, J. Davis, N. Hergert, and R. A. Coulombe, Jr. (2012), Effects of Cache Valley Particulate Air Pollution on Pulmonary Function and Disease Biomarkers in Human Volunteers: A Preliminary Study, presented at the Society of Toxicology 2012 Annual Meeting, San Francisco, CA, Mar. 11-15, 2012.

Hill, S., R. Martin, K. Moore, H. Shorthill, and K. Harper (2012), Winter 2010-11 ozone measurements in Utah's Uinta Basin, presented at the Energy, Utility, and Environment Conference, Jan. 28-30, 2012, Phoenix, Az, Paper D8.2.

Martin, R.S., K.D. Moore, S. Hill, K. Harper (2011), Elevated wintertime ozone in Utah's Uinta Basin, Presentation #A14B-08, AGU 2011 Fall Meeting, San Francisco, CA, December 2011.

Wojcik, W., J. Hatfield, R. Martin, K. Moore, J. Prueger, C. Marchant (2011), Using multi-wavelength elastic lidar to quantify whole-facility PM emission rates, Poster #A41B-0074, AGU 2011 Fall Meeting, San Francisco, CA, December 2011.

Moore, K.D., R.S. Martin, S. Hill, H. Shorthill (2011), O<sub>3</sub>, VOC, NO<sub>x</sub>, PM<sub>2.5</sub>, and meteorological measurements during an inversion episode in Utah's Uinta Basin, Poster #A51A-0261, 2011 AGU Fall Meeting, San Francisco, CA, December 2011.

Wojcik, M., K. Moore, R. Martin, J. Hatfield (2011), Whole-facility particulate emissions measurement of a process water treatment facility using Aglite: A 3-wavelength elastic lidar, Optical Society of America Renewable Energy and the Environment Congress, Austin, TX, November 2011.

Wojcik, M.D., K. Moore, C.C. Marchant, V.V. Zavyalov, R.S. Martin, J.L. Hatfield, J.H. Prueger (2011), Lidar based particulate flux measurement of agricultural field operations, Air Quality VIII International Conference on Carbon Management, Mercury, Trace Substances, SO<sub>x</sub>, NO<sub>x</sub>, and Particulate Matter, Washington, DC, October, 2011.

Moore, K.D., M.D. Wojcik, C.C. Marchant, R.S. Martin, R.L. Pfeiffer, J.H. Prueger, J.L. Hatfield (2011), Comparisons of measurements and predictions of PM concentrations and emission rates from a wind erosion event, Paper, Presentation, and Poster #11020, ASABE International Symposium on Erosion and Landscape Evolution, Anchorage, AK, September, 2011.

Moore, K., R. Martin, M. Wojcik, R. Pfeiffer, J. Prueger, J. Hatfield (2011) Effects of various representations of temporally and spatially variable agricultural processes in air quality dispersion modeling, Presentation #1111847, 2011 ASABE Annual International Meeting, Louisville, KY, August, 2011.

Martin, R., K. Moore, M. Mansfield, S. Hill, K. Harper, and H. Shorthill (2011), Final Report: Uinta Basin Winter Ozone and Air Quality Study, submitted to the Uintah Impact Mitigation Special Services District, through USURF's Energy Dynamics Laboratory, EDL/11-039, June 14, 2011.

Marchant, C.C., K.D. Moore, M.D. Wojcik, R.S. Martin, R.L Pfeiffer, K.H Prueger, and J.L Hatfield (2011), Estimation of Dairy Particulate Matter Emission Rates by Lidar and Inverse Modeling, Transaction of the ASABE, Vol 54(4), 1453-1463.

Moore, K., R. Martin, W. Bradford, C. Marchant, M. Wojcik. (2010), Deriving empirical relationships between aerodynamic and optical aerosol measurements, Poster #2.F.29, AAAR 29<sup>th</sup> Annual Conference, Portland, OR, October 2010.

Wojcik, M.D., K.D. Moore, R.S. Martin, J. Hatfield (2010), Strategies for lidar characterization of particulates from point and area sources, in: C.M.U. Neale and A. Maltese (Ed.), Proceedings of SPIE, Vol. 7824: Remote Sensing for Agriculture, Ecosystems, and Hydrology XII. SPIE, Bellingham, WA. doi: 10.1117/12.865079.

Zavyalov, V.V., G.E. Bingham, M. Wojcik, J.L. Hatfield, T.D. Wilkerson, R.S. Martin, C. Marchant, K. Moore, W. Bradford (2010), Integration of remote lidar and in-situ measured data to estimate particulate flux and emission from tillage operations, in : U.N. Singh and G. Pappalardo, (Ed.), Proceedings of SPIE, Vol. 7832: Lidar Technologies, Techniques, and Measurements for Atmospheric Remote Sensing VI. SPIE, Bellingham, WA. doi: 10.1117/12.865140.

Moore, K., E. Reese, R. Martin, C. Marchant, M. Wojcik, C. Going, R. Pfeiffer, J. Prueger, J. Hatfield (2010), Preliminary Ammonia Measurements and Emission Calculation Results from a California Dairy,

Poster #12, ASABE International Symposium on Air Quality and Manure Management for Agriculture, Dallas, TX.

Marchant, C., K. Moore, M. Wojcik, R. Martin, R. Pfeiffer, J. Prueger, J. Hatfield (2010), Preliminary Particulate Matter Measurements and Emission Calculation Results from a California Dairy, Poster #13, ASABE International Symposium on Air Quality and Manure Management for Agriculture, Dallas, TX.

Moore, K., M. Wojcik, R. Martin, C. Marchant, D. Jones, J. Hatfield, R. Pfeiffer, J. Prueger, W. Bradford, V. Zavyalov, D. Ahlstrom, T. Jones, P. Silva, G. Bingham (2010), Particulate emissions from fall tillage operations as determined via inverse modeling and lidar mass balance techniques, Paper # 1009283, 2010 ASABE Annual International Meeting, Pittsburgh, PA.

Wojcik, M.D., K.D. Moore, R.S. Martin (2010), Successful strategies for using lidar for particle characterization of point and diffuse area sources, Paper # 352, AWMA International Specialty Conference on Leapfrogging Opportunities for Air Quality Improvement, Xi'an, Shaanxi Province, China.

Watterson, T.L., B. Hamilton, R. Martin, and R.A. Coulombe, Jr. (2009), Urban particulate matter causes ER stress and the unfolded protein response in human lung cells, *Toxicol. Sci.*, 112(1), 111-122.

Bingham, G.E., C.C. Marchant, V.V. Zavyalov, D.J. Ahlstrom, K.D. Moore, D.S. Jones, T.D. Wilkerson, L.E. Hips, R.S. Martin, P.J. Silva, and J.L. Hatfield (2009), Lidar based emissions measurements at the whole facility scale: Method and error analysis, *J. Applied Remote Sensing*, 3(1); 033510

Marchant, C.C., T.D. Wilkerson, G.E. Bingham, V.V. Zavyalov, J.M. Anderson, C.B. Wright, S.S. Conelsen, R.S. Martin, P.J. Silva, and J.L. Hatfield (2009), Aglite lidar: A portable lidar system for investigating aerosol and wind motions at or around agricultural production facilities, *J. Applied Remote Sensing*, 3(1) 033511.

Villanueva-Fierro, I., C.J. Popp, R.W. Dixon, R.S. Martin, J.S. Gaffney, N.A. Marley, and J.M. Harris (2009), Ground Level chemical Analysis of Air Transported from the 1998 Mexican-Central American Fires to the Southwestern USA, *Revista Internacional de Contaminacion Ambiental*, 25(1), 23-32.

Martin, R.S. (INVITED) (2008), Agricultural Ammonia & PM<sub>2.5</sub>: A Case Study of Cache Valley, UT/ID, invited presentation, 2008 Air Toxics Summit: What's Up in the West: Coming of Age in Air Toxics, USEPA, Regions 10 & 8, Boise, ID, Aug. 4-7, 2008.

Martin, R.S., P.J. Silva, K. Moore, M. Erupe, and V.S. Doshi (2008), Particle Composition and Size Distributions in and around a Deep Pit Swine Operation, *J. Atmos. Chemistry*, 59(2), 135-150, Feb. 2008.

Watterson, T.L., J. Sorenson, R. Martin, R.A. Coulombe, Jr. (2007), Effects of PM<sub>2.5</sub> Collected from Cache Valley, UT on Genes Associated with the Inflammatory Response in Human Lung Cells, *J. Tox. & Environ. Health*, 70, 1732-1744, Sept. 2007.

Martin, R. (INVITED) (2006), Dairy-related emissions of ammonia and particulate matter and their influence on air quality in northern Utah's and southern Idaho's Cache Valley, Proceedings, Western Dairy Air Quality Symposium, Las Vegas, Nevada, March 21-22, 2006: 59-60

Malek, E, T. Davis, R.S. Martin, and P.Silva (2006), Meteorological and Environmental Aspects of the Worst National Air Pollution (15 January 2004) in Logan, Cache Valley, Utah, U.S.A., *J. Atmos. Res.*, 79(2), 108-122.

Popp, C.J., O. Winjenter, S. Huang, R. Martin, R. Robinson, S. Campbell (2006), Final Technical Report: Western States Visibility Assessment Program, Dept. of Energy Grant No. DE-FG03-01ER63122.

Villanueva, I., C.J. Popp, R.S. Martin (2004), Biogenic Emissions and ambient Concentrations of Hydrocarbons, Organic Acids, and Carbonyl Compounds from Ponderosa Pines and Cottonwood Trees at Rural and Forested Sites in Central New Mexico", *Atmos. Env.*, 38(2), 249-260.

Martin, R.S., I. Villanueva, J. Zhang, and C.J. Popp (1999), Nonmethane hydrocarbon, monocarboxylic acid, and low molecular weight aldehyde and ketone emissions from vegetation in central New Mexico, *Environ. Sci. Technol.*, 33, 2186-2192.

Frost, G.J., M. Trainer, G. Allwine, M.P. Buhr, J.G. Calvert, C.A. Cantrell, F.C. Fehsenfeld, P.D. Goldan, J. Herwehe, G. Hübler, W.C. Kuster, R. Martin, R.T. Mcmillen, S.A. Montzka, R.B. Norton, D.D. Parrish, B.A. Ridley, R.E. Shetter, J.G. Walega, B.A. Watkins, H.H. Westberg, E.J. Williams (1998), Photochemical ozone production in the rural southeastern United States during the 1990 Rural Oxidants in the Southern Environment (ROSE) program, *J. Geophys. Res. - Atmos.*, **103**(D17), 22491-22508.

Gaffney, J.S., N.A. Marley, R.S. Martin, R.W. Dixon, L.G. Reyes, and C.J. Popp (1997), Potential air

quality effects of ethanol-gasoline blend fuel usage: A field study in Albuquerque, New Mexico, *Environ. Sci. Technol.*, 31, 3053-3061