CURRICULUM VITAE - SCOTT M. SPULER, Ph.D.

1. EDUCATION

- Ph.D. in Engineering Systems/Applied Optics, 2001, Colorado School of Mines
    - Thesis: “Sensitive Absorption Spectroscopy Techniques for Quantitative Detection of Species in Flames and Ambient Air”
- M.S. in Engineering Systems/Applied Optics, 1999, Colorado School of Mines
    - Thesis: “Development of a Cavity Ringdown Laser Absorption Spectrometer for Detection of Trace Levels of Mercury”
- B.S. in Civil/Environmental Engineering, 1993 Virginia Tech

2. WORK HISTORY

- 2007-present: Research Engineer, National Center for Atmospheric Research, Boulder CO
- 2002-2007: Optical Engineer, National Center for Atmospheric Research, Boulder CO
- 2001-2002: R&D Optical Engineer, Zolo Technologies Inc., Boulder CO
- 1997-2001: Research Assistant, Combustion/Emissions Lab, Colorado School of Mines, Golden CO
- 1992-1996: Sr. Staff Geo-Environmental Engineer, Schnabel Engineering Associates, Bethesda MD

3. SCIENTIFIC /TECHNICAL ACCOMPLISHMENTS

Research Goal: Design, build and utilize innovative optical and laser based instruments which can be applied to enhance the understanding of the atmospheric earth sciences.

- Developed high energy, eye-safe lidar system for 3D visualization of aerosols and atmospheric structure
- Designed and built a robust Raman shifter for high-pulse energy lidar applications
- Investigated high spectral resolution lidar for quantitative measurement of cloud/aerosols radiative properties
- Designed NCAR GV-aircraft optical viewports for airborne laser remote sensing
- Investigated eye-safe laser profiler for measurement of horizontal winds in the atmospheric boundary layer
- Developed in-line holographic imaging system for three dimensional measurement of cloud particles
- Co-designed and performed stray light analysis on novel multi-pass cell for enhanced trace gas detection
- Developed a fiber-based heterodyne laser remote sensor for measurement of winds from aircraft
- Co-designed and built a Er/Yb fiber amplifier for high power and low-noise performance
- Co-developed and redesigned a diode-laser-based Differential Absorption Lidar (DIAL) for Water Vapor Profiling

- Co-developed low-cost, diode-laser-based HSRL profiling
- Investigating low-cost temperature profiling solutions

4. COMMUNITY SERVICE

- General Co-chair, OSA Light Energy and the Environment Congress 6-9 Nov Boulder CO (2017)
- Local Organizing Committee Co-chair, OSA Light Energy and the Environment Congress 6-9 Nov Boulder CO (2017)
- PhD Committee member, Montana State University, Physics Department (2017)
- Committee Member, Optical Instrumentation for Energy & Environmental Applications (E2) 14 - 17 November, Leipzig, Germany (2016)
- Program sub-committee member, Conference on Lasers and Electro-Optics: Applications and Technology: Laser & Photonics Applications for Energy & Environment, San Jose, CA (2014)
- Program Committee member, 26th International Laser Radar Conference, Greece (2012)
- PhD examination member, Universitat Politécnica de Catalunya, Barcelona Tech, Spain (2011)
- Program Committee member, 25th International Laser Radar Conference, Russia (2010)
- Co-chair of Program Committee, 24th International Laser Radar Conference (2007-2008)
- Site-visit team member, NSF Engineering Research Center Program (2009)
- Reviewer: Appl. Opt., Appl. Phys. B, J. Atmos. Oceanic Technol., Atmos. Meas. Tech. (ongoing)
- Reviewer of NSF proposals (ongoing)
- Engineering Judge, for Colorado School of Mines EPICS design program (2013)
- Project client, for Colorado School of Mines EPICS design program (2011)
- Optical book reviewer, NCAR Library (2004-2012)
- Member, NCAR Workforce Management Subcommittee (2009)
- Co-lead, NCAR Technology Innovation Forum (2009-2012)
- Mentor, Photonics Engineering Students (Jan-Aug, 2010)
- Mentor, EOL Summer Engineering Students (2003, 2005, 2006, 2007)
- Co-chair, EOL Engineering visitor fund oversight (2008-current)
- Head of the EOL Engineering Group (2009-2012)
- Member, EOL Internal Advisory Committee (2007-2009) (2017-current)
- Member, EOL Development Advisory Committee (2005-2012)

5. HONORS AND AWARDS

- 1997 Colorado Fellowship recipient
- 1999 Center of Combustion and Environmental Research E. J. Mallet Student Seminar Award recipient
- 2006, co-author on best poster award, 23rd International Laser Radar Conference, Nara, Japan.

- 2012, co-author best scientific contribution award, 26th International Laser Radar Conference, Porto Heli, Greece
- 2015, EOL NCAR Outstanding Publication Nomination

6. RESEARCH GRANTS

- PI: “Development of a Three-Dimensional Laser Air Motion Sensor,” (2010) NCAR/EOL/TDF
- PI: “Development and Evaluation of an Ultra-Compact Wireless Network Enabled CO2 Diode Laser Spectrometer,” (2010) NCAR/EOL/TDF
- Co-PI: “Further Development of the HOLODEC 2 (Holographic Detector for Clouds 2) Instrument,” (2011) DOE/ARM Climate Research Facility, with PI: Raymond Shaw at Michigan Technological University
- PI: “Phase II Development: Water Vapor Diode-Laser-Based Micro-pulse Differential Absorption Lidar (DIAL),” (2013) NCAR/EOL
- Co-PI: “HSRL for Aerosols Winds and Clouds using the Optical Auto-covariance Wind Lidar (HAWC-OAWL) Instrument Incubator Program,” (2014) NASA/Ball Aerospace/NCAR
- PI “Diode-laser-based High Spectral Resolution Lidar Demonstration” (2016) NCAR/EOL
- Co-PI: “Development of a micro-pulse DIAL (MPD) testbed for sensing lower tropospheric water vapor profiles” (2016) NSF grant number is 1624736
- PI: “Water Vapor DIAL LAFE” (2016) DOE/PNNL

7. PUBLICATION LIST

7.1 THESIS

1. M.S. Thesis: Development of a Cavity Ringdown Laser Absorption Spectrometer for Detection of Trace Levels of Mercury, 1999, Colorado School of Mines
2. Ph.D. Thesis: Sensitive Absorption Spectroscopy Techniques for Quantitative Detection of Species in Flames and Ambient Air, 2001, Colorado School of Mines.

7.2 PATENTS

3. Huang P. and S. Spuler. 2004. Apparatus and Method for producing a flat-topped filter response for (de)multiplexer having a diffraction grating with variable line spacing. US Patent 6,754,412, filed Jul 31, 2002, and issued Jun 22, 2004.
4. Mayor S. and S. Spuler. 2009. Polarization Lidar for the Remote Detection of Aerosol Particle Shape. US Patent 7,580,127, filed Jul 21, 2006, and issued Aug 25, 2009.
5. Mayor S. and S. Spuler. 2009. High Pulse-Energy, Eye-safe lidar system. US Patent 7,583,364, filed Mar 19, 2004, and issued Sep 1, 2009.
6. Spuler S. and S. Mayor. 2010. Lidar system for remote determination of calibrated, absolute aerosol backscatter coefficients. US Patent 7,656,526, filed Jul 21, 2006, and issued February 2, 2010.

7. Spuler S. 2011. Raman cell for high power applications. US Patent 7,869,469, filed May 27, 2005, and issued Jan 11, 2011.

7.2.1 PATENTS PENDING

8. Cooper W., S. Spuler, M. Spowart, D. Richter. Calibration of aircraft instruments using a laser sensor. US Patent App. 14/494,746 (filed 24 Sep 2014)
9. Spuler S., K. Repasky, A. Nehrir. Micropulse Differential Absorption Lidar. US Patent App. 62/167,118 (filed 27 May 2015)
10. Abari F. C. F, and S. Spuler. A system and method to measure an atmospheric thermodynamic profile with a compact, all-fiber and eye-safe lidar, US Patent App. 14/940,884 (filed Oct 2015)
11. Spuler, S., M. Hayman, B. Morley, and E. Eloranta. Diode Laser Based High Spectral Resolution Lidar. US Patent App. 15/090,063 (filed 18 Apr 2016)
12. M. Hayman and S. Spuler. Analog Photon Counting. US Patent App. (filed Apr 05, 2017)

7.3 REFEREED JOURNAL ARTICLES

13. Spuler S., M. Linne, A. Sappey, S. Snyder, 2000: Development of a cavity ringdown laser absorption spectrometer for detection of trace levels of mercury. *Appl. Optics*, **39**, 2480-2486.*
14. Dreyer C.B, S. M. Spuler, and M. Linne, 2001: Calibration of Laser Induced Fluorescence of the OH radical by Cavity Ringdown Spectroscopy in Premixed Atmospheric Flames. *Combust. Sci. Technol.*, **171**, 163-190.*
15. Spuler S. and M. Linne, 2002: Numerical analysis of beam propagation in pulsed cavity ringdown spectroscopy. *Appl. Optics*, **41**, 2858-2868.*
16. Mayor S. and S. M. Spuler, 2004: Raman-shifted Eye-safe Aerosol Lidar. *Appl.Optics*, **43**, 3915-3924.
17. Spuler S. M. and S. Mayor, 2005: Scanning eye-safe elastic backscatter lidar at 1.54 microns. *J. Atmos. Oceanic Technol.,* **22,** 696-703
18. Huang X. P, S. M. Spuler and A. D Sappey, 2007: Varied Line-space grating for flat spectral response of coupling to single mode fiber. *Appl. Optics,* **46,** 147-153
19. Mayor S. D., S. M. Spuler, B. Morley, E. Loew, 2007: Polarization lidar at 1.54 um and observations of plumes from aerosol generators. *Opt.l Eng.*, **46**, 096201-11
20. Refaat, T. F., S. Ismail, T. L. Mack, M. N. Abedin, S. D. Mayor, S. M. Spuler, 2007: Infrared Phototransistor Validation for Atmospheric Remote Sensing Application using the Raman-Shifted Eye-Safe Aerosol Lidar (REAL). *Opt.l Eng.*, **46**, 086001-8.
21. Spuler S. M. and S. D. Mayor, 2007: Raman shifter optimized for lidar at 1.5 microns. *Appl. Optics*, **46**, 2990-2995.
22. Warner T., P. Benda, S. Swerdlin, J. Knievel, E. Argenta, B. Aronian, B. Balsey, J. Bowers, R. Carter, K. Clawson, J. Copeland, A. Crook, R. Frehlich, M. Jensen, Y. Liu, S. Mayor, Y. Meillier, B. Morley, R. Sharman, S. Spuler, D. Storwold, J. Sun, J. Weil, M. Xu, A. Yates, Y. Zhang, 2007: The Pentagon Shield Field Program – Toward Critical Infrastructure Protection. *Bull. Amer. Meteor. Soc.,* **88,** 167-176

23. Refaat, T. F., S. Ismail, M. N. Abedin, S. M. Spuler, S. D. Mayor, U. N. Singh, 2008: Lidar backscatter signal recovery from phototransistor systematic effect by deconvolution. *Appl. Optics*, **47**, 5281-5295
24. Spuler, S. M., J. Fugal, 2011: Design of an in-line, digital holographic imaging system for airborne measurement of clouds. *Appl. Optics,* **50**, 1405-1412.
25. Spuler, S. M., D. Richter, M. P. Spowart, and K. Rieken, 2011: Optical fiber-based laser remote sensor for airborne measurement of wind velocity and turbulence. *Appl. Optics,* **50**, 842-851.
26. Lewander, M., A. Fried, P. Weibring, D. Richter, S. Spuler, and L. Rippe, 2011: Fast and sensitive time multiplexed gas sensing of multiple lines using a miniature telecom diode laser between 1529 nm and 1565 nm. *Appl. Phys. B,* **104(3)**, 715-723.
27. Patton, E, T. Horst, P. Sullivan, D. Lenschow, S. Oncley, W. Brown, S. Burns, A. Guenther, A. Held, T. Karl, S. Mayor, L. Rizzo, S. Spuler, J. Sun, A. Turnipseed, E. Allwine, S. Edburg, B. Lamb, R. Avissar, R. Calhoun, J. Kleissl, W. Massman, K. Paw, J. Weil, 2011: The Canopy Horizontal Array Turbulence Study. *Bull. Amer. Meteor. Soc.,* **92**, 593-611.
28. Hayman, M., S. Spuler, B. Morley, and J. VanAndel, 2012: Polarization lidar operation for measuring backscatter phase matrices of oriented scatterers. *Opt. Express,* **20**, 29553-67.
29. Repasky K.S., D. Moen, S. Spuler, A. R. Nehrir, J. Carlsten, 2013: Progress towards an Autonomous field deployable diode-laser-based differential absorption lidar (DIAL) for profiling water vapor in the lower troposphere. *Remote Sens.,* **5**, 6241-6259.
30. Hayman, M., S. Spuler, and B. Morley, 2014: Polarization lidar observations of backscatter phase matrices from oriented ice crystals and rain. *Opt. Express,* **22**, 16976-90.
31. Cooper W. A., S. Spuler, M. Spowart, D. H. Lenschow, and R. B. Friesen, 2014: Calibrating airborne measurements of airspeed, pressure and temperature using a Doppler laser air-motion sensor. *Atmos. Meas. Tech.*, **7**, 3215-3231.
32. Richter, D., P. Weibring, J. G. Walega, A. Fried, S. M. Spuler, and M. S. Taubman, 2015: Compact Highly Sensitive Multi-species Airborne Mid-IR Spectrometer. *Appl. Phys. B*., 1-13. (doi:10.1007/s00340-015-6038-8)
33. Spuler, S. M., Repasky K.S., D. Moen, B. Morley, M. Hayman, A. R. Nehrir, 2015: Field deployable diode-laser-based differential absorption lidar (DIAL) for profiling water vapor. *Atmos. Meas. Tech.,* 8, 1073-1087. (doi:10.5194/amt-8-1073-2015)
34. Beals,M.J., J. P. Fugal, R. A. Shaw, J.Lu, S. M. Spuler, J. L. Stith, 2015: Holographic measurements of inhomogeneous cloud mixing at the centimeter scale. *Science, 350 (6256), 87-90 (doi: 10.1126/science.aab075)*
35. Mayor, S. P. Derian, C. Mauzey, S. Spuler, P. Ponsardin, J. Pruitt, D.l Ramsey, and Scott Higdon, 2016: Comparison of an analog direct detection and a micropulse aerosol lidar at 1.5μm wavelength for wind field observations – with first results over the ocean. *JARS, 10, 016031-1-16. (doi: 10 .1117/1.JRS.10.016031)*

36. Weckwerth, T. M., K. Weber, D. D. Turner, S. M. Spuler, 2016: Validation of a Water Vapor Micropulse Differential Absorption Lidar (DIAL). *J. Atmospheric and Oceanic Technology (33) 2353-2372 (doi: 10.1175/JTECH-D-16-0119.1)*

37. Hayman, M., and S. Spuler, 2017: Demonstration of a diode-laser-based high spectral resolution lidar (HSRL) for quantitative profiling of clouds and aerosols. *Optics Express, 25(24) A1096 (doi 10.1364/OE.25.0A1096)*

38. Bunn C., K. Repasky, M. Hayman, R. Stillwell and S. Spuler, 2018: Perturbative solution to the two component atmosphere DIAL equation for improving the accuracy of the retrieved absorption coefficient, Appl. Opt. 57(16), 4440-4450. *(doi: 10.1364/AO.57.004440)*

7.4 JOURNAL ARTICLES IN PREPARATION OR SUBMITTED

39. Fernando H., J. Mann , J. L. Palma, J. Lundquist , M. S. Belo, S. Pereira, W. Brown , F. Katopodes , C. Hocut, P. M. Klein, L. Leo, J. C. Matos, S. Oncley, S. C Pryor , T. M. Bell, M. Carney, E. Creegan, R. Dimitrova, S. Gomes. M. Hagen, J. Hyde, S. Kingle, R. Krishnamurthy, J. C.a Lopes, L Mazzaro, R. Menke, S. Otarola-Bustos, A. Pattantyus, C. V. Rodrigues, A. Schady, S. Spuler, J. Tomaszewski, D. D. Turner, I. VanVeen, N. Vasiljevic, D. Vassall, S. Voß , N. Wildmann, and Y. Wang. 2018: The Perdigão: Peering into Microscale Details of Mountain Winds. *BAMS (submitted April 2018)*

7.5 INTERNALLY REFEREED PUBLICATIONS

40. Spuler S. M., B. Morley, S. D. Mayor, 2007: Research into the high-spectral-resolution technique as means of calibration for the Raman-shifted Eye-safe Aerosol Lidar
41. Cooper, W. A., and Coauthors, 2016: *Characterization of Uncertainty in Measurements of Wind from the NSF/NCAR Gulfstream V Research Aircraft*. NCAR Technical Note NCAR/TN-528+STR, 175 pp, doi:10.5065/D60G3HJ8.

7.6 NON-REFEREED PUBLICATIONS

42. Kok, G. L., D Baumgardner and **S. Spuler**, 2002 A Single Particle Soot Photometer for the Measurement of Aerosol Black Carbon, AGU Fall Meeting Dec 2002
43. **Spuler, S.** and S. Mayor, 2004: Raman-Shifted Eye-Safe Aerosol Lidar Development. *OSA Laser Applications to Chemical and Environmental Analysis (LACEA),* 9-Feb, Annapolis MD.
44. Mayor, S. D., **S. M. Spuler**, J. R. Fox, T. D. Rucker, and B. M. Morley, 2004: NCAR's New Raman-shifted Eye-safe Aerosol Lidar, *16th Symp. on Boundary Layers and Turbulence*, 9-13 August, Portland, ME.
45. Mayor, S. D., **S. M. Spuler**, and B. M. Morley, 2004: NCAR's New Raman-shifted Eye-safe Aerosol Lidar (REAL). Paper S20-10 in ESA SP-561, *Reviewed and Revised Papers Presented at the 22nd International Laser Radar Conference, Vol. 1*, 12-16 July 2004, Matera, Italy. 53-56.

46. Mayor, S. D., **S. M. Spuler**, and B. M. Morley, 2005: Scanning eye-safe depolarization lidar at 1.54 microns and potential usefulness in bioaerosol plume detection. *SPIE Lidar Remote Sensing for Environmental Monitoring IV, Paper 5887-23*, San Diego, CA.
47. Mayor, S. D. and **S. M. Spuler**, 2005: REAL: High-power, eye-safe, scanning lidar for aerosol cloud detection and tracking. *Optical Solutions for Homeland and National Security*, 15-Dec, Washington, D.C.
48. Mayor, S. D., **S. M. Spuler**, and B. M. Morley, 2006: Three Generations of Raman-shifted Eye-safe Aerosol Lidars, Poster 8.22-P. 7th International Symposium on Tropospheric Profiling, 11-17 June, Boulder, CO.
49. Ponsardin, P. L., C. S. Kletecka, R. D. Babnick, K. Krubsack, S. D. Mayor, and **S. M. Spuler**, 2006: Autonomous eye-safe lidar for continuous monitoring of atmospheric aerosols. *International Symposium on Spectral Sensing Research*.
50. **Spuler, S**. and S. Mayor, 2006: High-Energy Mulitpass Forward Raman Shifter as an Eye-Safe Laser Source for Lidar. *23rd International Laser Radar Conference (ILRC), 24-28 July, Nara Japan,* ICLAS.
51. Mayor, S.D., **S. M. Spuler**, B. M. Morley, E. Loew, T.W. Weckwerth, S. De Wekker, and D.J. Kirshbaum, 2006: REAL - 1.5 micron wavelength scanning polarization lidar. *23rd International Laser Radar Conference (ILRC), 24-28 July, Nara Japan,* ICLAS.
52. Mayor, S. D., **S. M. Spuler,** B. M. Morley, S. C. Himmelsbach, R. A. Rilling, T. M. Weckwerth, E. G. Patton, and D. H. Lenschow, 2007: Elastic backscatter lidar observations of sea-breeze fronts in Dixon, California. *Seventh Conference on Coastal Atmospheric and Oceanic Prediction and Processes,* 10-13 Sept., San Diego, American Meteorological Society.
53. Mayor, S. D., B. M. Morley, **S. M. Spuler**, S. C. Himmelsbach, D. Flanigan, T. M. Weckwerth, and T. Warner, 2007: Elastic backscatter lidar observations of a gust front passage over Washington DC on 7 May 2004. *Seventh Conference on Coastal Atmospheric and Oceanic Prediction and Processes,* 10-13 Sept., San Diego, American Meteorological Society.
54. **Spuler, S.** and S. Mayor 2007: Eye-safe aerosol lidar at 1.5 microns: progress towards a scanning lidar network. *Lidar Remote Sensing for Environmental Monitoring VIII, 26*-30 August, San Diego, CA, USA, SPIE (invited talk)
55. **Spuler, S.**, M. Morley, and S. Mayor, 2008: Advances in Eye-safe Atmospheric Volume Imaging Lidar. *Laser Applications to Chemical, Security and Environmental Analysis (LACSEA)*, 17-20 March, St. Petersburg, FL, USA, OSA Topical Meeting.
56. Refaat, T., S. Ismail, M. N. Abedin, **S. Spuler**, S. Mayor and U. Singh, 2008: Backscatter Lidar Detection System Using IR Phototransistors*, 24th International Laser Radar Conference (ILRC24)*, 23-27 June, Boulder CO, ICLAS.
57. **Spuler, S.**, M. Spowart, and D. Richter, 2008: Development of a Laser Air Motion Sensor for Aircraft Wind speed and direction. *24th International Laser Radar Conference (ILRC24)*, 23-27 June, Boulder CO, ICLAS
58. Vivekanandan J., E. Loew, **S. Spuler**, WC Lee, and T. Weckwerth, 2009: Ground-based and airborne weather radars and lidar for observing the atmosphere. *34th Conference on Radar Meteorology,* October 5-9, Williamsburg, VA.

59. Richter D. and **S. Spuler**, 2009: Design and analysis of a low volume, long path length, high transmission optical multi-pass absorption cell. *Field Laser Applications in Industry and Research (FLAIR)*, September 6-11, Grainau, Germany.
60. **Spuler S.**, D. Richter, and M. Spowart, 2009: Design and configuration of an all-fiber, cw laser velocimeter for airborne measurement of wind velocity and turbulence. *Field Laser Applications in Industry and Research (FLAIR)*, September 6-11, Grainau, Germany.
61. **Spuler S**. and J Fugal, 2009: Design of a digital, in-line, holographic imaging system for airborne measurement of clouds. *Field Laser Applications in Industry and Research (FLAIR)*, September 6-11, Grainau, Germany.
62. Vivekanandan, J., E. Loew, **S. Spuler**, W. C. Lee and T. Weckwerth, 2009: Ground-Based and Airborne Weather Radars and Lidar for Observing the Atmosphere. *34th Conference on Radar Meteorology* 5-9 October 2009, Williamsburg, VA
63. Richter D., P. Weibring, A. Fried, L. Rippe, M. Lewander, O. Batet, J., Walega, and **S. Spuler**, 2010: Spectrometers: Successes, Challenges, and Opportunities. *Laser Applications to Chemical, Security and Environmental Analysis (LACSEA)*, 31-January to 4-February, San Diego, CA, USA, OSA Topical Meeting.
64. Morley B., W. Brown, and **S. Spuler**, 2010: Wind Profiles with an Elastic backscatter Lidar Using Auto and Cross Correlation Techniques. *25th International Laser Radar Conference (ILRC25)*, 5-9 July, St. Petersburg, Russia, ICLAS.
65. Richter D., S. Meyer, **S. M. Spuler**, C. J. Smith, S. So, and G. Wysocki, 2011: Ultra compact VCSEL based CO2 spectrometer for flux measurements. *Field Laser Applications in Industry and Research (FLAIR)*, September 13-17, Murnau, Germany.
66. Richter D., **S. M. Spuler**, and K. Rieken, 2011: Development of a high-power CW single frequency fiber amplifier for low noise spectroscopic and Doppler wind measurements. *Field Laser Applications in Industry and Research (FLAIR)*, September 13-17, Murnau, Germany.
67. Richter D., P. Weibring, **S. M. Spuler**, J. G. Walega, and A. Fried, 2011: High performance airborne DFG laser spectrometer. *Field Laser Applications in Industry and Research (FLAIR)*, September 13-17, Murnau, Germany.
68. **Spuler, S. M.**, D. Richter, and M. Spowart, 2011: Development and application of a three-dimensional laser air motion sensor. *Field Laser Applications in Industry and Research (FLAIR)*, September 13-17, Murnau, Germany.
69. Mayor, S. D., A. Petrova-Mayor, R. W. Wortley, D S. Hofstadter, **S. M. Spuler,** and J. Ranson, 2011: Gas-fusion Mirrors for Atmospheric Lidar. *OSA's Frontiers in Optics (FIO),* 16-20 October, San Jose, CA, USA.
70. Repasky, K. S., A. R. Nehrir, J. L. Carlsten, **S. Spuler**, R. E. Carbone, and T. M. Weckwerth, 2012: Development of an Eye-Safe Micro-Pulse Differential Absorption Lidar (DIAL) for Water Vapor Profiling in the Lower Troposphere. *16th Symposium on Meteorological Observation and Instrumentation, part of the AMS 92nd Annual Meeting,* 22-26 January 2012, New Orleans, LA.
71. Morley, B., **S. M. Spuler**, J. Vivekanandan, M. Hayman, and E. W. Eloranta, 2012: Airborne and Ground Measurements with the NCAR GVHSRL. *16th International*

Symposium for the Advancement of Boundary Layer Remote Sensing (ISARS 2012), 5-8 June, Boulder, Colorado.

72. Hayman, M., **S. Spuler**, B. Morely, and J. VanAndel, 2012: Polarization Configuration of the GV-HSRL for Detection of Horizontally Oriented Ice Crystals. 26th International Laser Radar Conference (ILRC26), 25-29 June, Porto Heli, Greece.
73. Morley, B., **S. M. Spuler**, I. A. Razenkov, J. Vivekanandan, and E. W. Eloranta, 2012: Airborne and Ground Measurements with a High Spectral Resolution Lidar. *26th International Laser Radar Conference (ILRC26)*, 25-29 June, Porto Heli, Greece.
74. **Spuler, S. M.**, M. Spowart, and D. Richter, 2012: Development and Application of an Optical Fiber-based Laser Remote Sensor for Airborne Measurement of Wind Velocity. *26th International Laser Radar Conference (ILRC26)*, 25-29 June, Porto Heli, Greece.
75. Fugal J., M, Beals, R. Shaw, **S. Spuler**, and J. Stith, 2012: Ice particle size distributions measured with a holographic airborne instrument. *16th International Conference on Clouds and Precipitation (ICCP),* July 30-August 02, Leipzig, Germany.
76. Beals, M., J. Fugal, R. Shaw, **S. Spuler**, and J. Stith, 2012: Observations of cloud droplet size distributions on micro-physically relevant scales. *16th International Conference on Clouds and Precipitation (ICCP),* July 30-August 02, Leipzig, Germany.
77. **Spuler, S. M.**, D. H. Lenschow, R. B. Friesen, W. A. Cooper, M. P. Spowart, J. Ranson, and D. Richter, 2012: An optical fiber-based laser velocimeter for measuring mean and fluctuating wind components from an aircraft. *Lower Atmospheric Observing Facilities Workshop: Meeting the Challenges of Climate System Science, 18-19 June 2012, Boulder CO USA*
78. Morley, B., **S. M. Spuler**, J. Vivekanandan, and E. W. Eloranta, 2012: Optical Properties of Remote Ocean Aerosols As Measured by an Airborne High Spectral Resolution Lidar. *AGU Fall Meeting,* 3-7 Dec 2012, San Francisco CA USA
79. **Spuler, S.**, T. Weckwerth, R. Carbone, K. Repasky, and A. Nehrir, 2012: Diode-laser-based water vapor differential absorption lidar (DIAL) profiler evaluation. *AGU Fall Meeting,* 3-7 Dec 2012, San Francisco CA USA
80. Morley, B., **S. M. Spuler**, J. Vivekanandan, M. Hayman, and E. W. Eloranta, 2013: The National Center for Atmospheric Research Eye-safe High Spectral Resolution Lidar: A Facility for Airborne and Ground Based Measurements of the Optical Properties of Atmospheric Aerosols and Clouds. *American Meteorological Society Annual Meeting,* 6-10 Jan 2013, Austin TX USA
81. Weckwerth, T. M., **S. Spuler**, R. E. Carbone, K. S. Repasky, A. R. Nehrir, B. Demoz, and R. Ware, **2013**: Evaluation of an Eye-Safe Differential Absorption Lidar (DIAL) for Water Vapor Profiling in the Lower Troposphere. *American Meteorological Society Annual Meeting,* 6-10 Jan 2013, Austin TX USA
82. Mayor S. D., A. Petrova-Mayor, B. Morley, and **S. Spuler**, 2013: Recent improvements to the Raman-shifted eye-safe aerosol lidar (REAL). *SPIE Optical Engineering and Applications,* 25 Aug 2013, San Diego, CA USA
83. Repasky K. S., D. Moen, **S. Spuler**, A. Nehrir, and J. Carlsten, 2013: Progress Toward an Autonomous Field Deployable Diode Laser Based Differential Absorption Lidar

(DIAL) for Profiling Water Vapor in the Lower Troposphere. *AGU Fall Meeting,* 9-13 Dec 2013, San Francisco CA USA

84. **Spuler S. M.**, B. Morley, K. S. Repasky, D. Moen, and A. R. Nehrir, 2014: Continuous Water Vapor Profiling with a diode-laser-based Differential Absorption Lidar (DIAL). *17th Symposium on Meteorological Observations and Instrumentation,* 9–13 June 2014, Westminster, CO
85. Hayman M., **S. Spuler**, and B. Morley, 2014: Full Polarization Observations of Oriented Ice Crystals and Rain by the NCAR GV High Spectral Resolution Lidar. *17th Symposium on Meteorological Observations and Instrumentation,* 9–13 June 2014, Westminster, CO
86. Cooper W. A., **S. M. Spuler**, D. H. Lenschow, and R. B. Friesen, 2014: Calibration of Pressure Measurements on Research Aircraft using a Laser Air Motion Sensor. *17th Symposium on Meteorological Observations and Instrumentation,* 9–13 June 2014, Westminster, CO
87. Cooper W. A., **S. M. Spuler**, M. Hayman, D. H. Lenschow, and R. B. Friesen, 2014: A three-beam version of the NCAR Laser Air Motion Sensor (LAMS). *17th Symposium on Meteorological Observations and Instrumentation,* 9–13 June 2014, Westminster, CO
88. **Spuler S. M.**, B. Morley, K. S. Repasky, D. Moen, and A. R. Nehrir, 2014: Continuous Water Vapor Profiling with a diode-laser-based Differential Absorption Lidar (DIAL). *World Weather Open Science Conference*, 16-21 August, 2014 Montréal, Québec, Canada
89. Vivekanandan J., B. Morley and **S. Spuler**, 2014: Aerosol and Cloud Microphysics Retrieval Using High Spectral Resolution Lidar. *World Weather Open Science Conference*, 16-21 August, 2014 Montréal, Québec, Canada
90. **Spuler S. M.**, B. Morley, K. S. Repasky, D. Moen, and A. R. Nehrir, 2014: Continuous Water Vapor Profiling with a diode-laser-based Differential Absorption Lidar (DIAL). *International Conference on Mesoscale Meteorology and Tropical Cyclones,* 15-18 September, 2014 Boulder, CO
91. Weckwerth, T. M., **S. Spuler**, R. A. R. Nehrir, K. S. Repasky, 2015: NCAR/MSU Water Vapor DIAL Upgrades and Status. *American Meteorological Society Annual Meeting,* 6-10 Jan 2015, Phoenix AZ USA
92. Vivekanandan, B. Morley, **S. Spuler**, and E. Eloranta, 2015: High Spectral Resolution Lidar: System Calibration. *European Geosciences Union, General Assembly* 12-17 April 2015, Vienna, Austria
93. Richter, D., P. Weibring, J. G. Walega, A. Fried, **S. M. Spuler**, and M. S. Taubman, 2015: CAMS - Compact Atmospheric Multi-Species Spectrometer. *CLEO:2015*, 10-15 May 2015, San Jose, CA
94. **Spuler S.**, K. Repasky, B. Morley, D. Moen, T. Weckwerth, M. Hayman, and A. Nehrir, 2015: Advances in Diode-Laser-Based Lidar for Profiling Atmospheric Water Vapor. *CLEO:2015*, 10-15 May 2015, San Jose, CA
95. Abari C. F., X. Chu, J. Mann, and **S. Spuler**, 2015: A micropulse eye-safe all-fiber molecular backscatter coherent temperature lidar. *27th International Laser Radar Conference, 5-10 July 2015, NYC, NY*

96. **Spuler S.**, K. Repasky, B. Morley, D. Moen, T. Weckwerth, M. Hayman, and A. Nehrir, 2015: Advances in Diode-Laser-Based Lidar for Profiling Atmospheric Water Vapor. *27th International Laser Radar Conference, 5-10 July 2015, NYC, NY*

97. Hayman M., B. Morley and **S. Spuler**, 2015: Backscatter Matrix Observations by the GV-HSRL. *27th International Laser Radar Conference, 5-10 July 2015, NYC, NY*

98. Hayman M., **S. Spuler**, B. Morley and E. Eloranta, 2015: Design of a Low Cost Diode-Laser-Based High Spectral Resolution Lidar (HSRL). *27th International Laser Radar Conference, 5-10 July 2015, NYC, NY*

99. Turner D., **S. Spuler**, T. Weckwerth, and K. Weber, 2015: Ground-based Water Vapor Profilers: A Comparison and Combination of Spectral Infrared Retrievals and Differential Absorption Lidar Observations. Annual AMS meeting in the 18th Symposium on Meteorological Observation and Instrumentation".

100. Morley B., B. Pierce, E. Eloranta, and **S. Spuler**, 2015: High-Spectral Resolution Lidar Observations of Aerosols Between Northern California and Hawaii: Their Optical Properties and Possible Origins Using Back Trajectory Analysis. *2015 AGU Fall Meeting,* 14-18 Dec 2015.

101. Moen D., K. S. Repasky, **S. M. Spuler**, and A. R. Nehrir, 2015, Diode-Laser-Based Differential Absorption Lidar (DIAL) for Long Term Autonomous Field Deployment. *2015 AGU Fall Meeting,* 14-18 Dec 2015.

102. Cohn S., W. C. Lee, R. Carbone, S. Oncley, W. Brown, **S. Spuler**, T. Horst, 2015: LOTOS: A Proposed Lower Tropospheric Observing System from the Land Surface through the Atmospheric Boundary Layer, *2015 AGU Fall Meeting,* 14-18 Dec 2015.

103. Nehrir, A. R., R. Ferrare, S. A. Kooi, C. Butler, A. Notari, J. W. Hair, J. Collins, S. Ismail, **S. Spuler**, T. Weckwerth, K. Repasky, 2015: LASE measurements of water vapor and aerosol profiles during the Plains Elevated Convection at Night (PECAN) field experiment, *2015 AGU Fall Meeting,* 14-18 Dec 2015.

104. Mayor S. D., P. Dérian, C. F. Mauzey, **S. M. Spuler**, P. Ponsardin, J. Pruitt, D. Ramsey, and N. S. Higdon, 2015, Comparison of aerosol backscatter and wind field estimates from the REAL and the SAMPLE. Paper 9612-16, SPIE, 13 August, San Diego, CA.

105. Vivekanandan, J., J. Jensen, S. Ellis, B. Morley, P. Tsai, and **S. Spuler** 2016: Estimation of Droplet Size and Liquid Water Content Using Radar and Lidar: Marine Cumulus Clouds, EGU General Assembly 17–22 April 2016, Vienna, Austria.

106. Wulfmeyer, V., D. Turner, A. Behrendt, R. M. Hardesty, C. Senff, R. Banta, A. Brewer, A. Choukulkar, N. Smith, W. Feltz, Z. Sorbjan, J. Santanello, **S. Spuler**, T. Weckwerth, and T. Heus 2016: The Land-Atmosphere Feedback Experiment (LAFE), AGU Fall Meeting, San Francisco, CA Dec 12–16, 2016.

107. **Spuler, S.**, K. Repasky, M. Hayman, and A. Nehrir 2017: Micro-Pulse, Differential Absorption Lidar (DIAL) Network for Measuring the Spatial and Temporal Distribution of Water Vapor in the Lower Atmosphere, AMS Annual Meeting, Seattle, WA January 22–26, 2017.

108. Turner, D., T. Weckwerth T., and **S. Spuler** 2017: Ground-based Remotely Sensed Water Vapor and Temperature Profiles in the Lower Troposphere: Progress and Prospects, AMS Annual Meeting, Seattle, WA January 22–26, 2017.
109. Repasky, K., **S. Spuler** and M. Hayman 2017: Modeling of a Semiconductor Based Differential Absorption Lidar for Temperature Profiling in the Lower Troposphere, AMS Annual Meeting, Seattle, WA January 22–26, 2017.
110. Weckwerth, T. and **S. Spuler** 2017: Water Vapor Micropulse DIAL Profiles during PECAN, AMS Annual Meeting, Seattle, WA January 22–26, 2017.
111. Hayman M., **S. Spuler**, K. Repasky, A. Nehrir 2017: Low cost network deployable lidar for sensing range resolved water vapor and quantitative optical properties of clouds and aerosols, 10th International Symposium on Tropospheric Profiling (ISTP10), May 30 - June 2, 2017, Fort Collins, Colorado.
112. **Spuler, S.**, K. Repasky, M. Hayman, and A. Nehrir 2017: Micro-Pulse, Differential Absorption Lidar (DIAL) Network for Measuring the Spatial and Temporal Distribution of Water Vapor in the Lower Atmosphere, 28th International Laser Radar Conference (ILRC), Bucharest Romania Jun 26–30, 2017.
113. Hayman, M. and **S. Spuler** 2017: Demonstration of a low cost diode-laser-based High Spectral Resolution Lidar (HSRL), 28th International Laser Radar Conference (ILRC), Bucharest Romania Jun 26–30, 2017.
114. **Spuler, S.**, K. Repasky, and M. Hayman 2017: Laser remote sensing network to measure water vapor in the lower atmosphere, OSA Light, Energy and the Environment Congress, Boulder CO USA Nov 06-09, 2017.
115. Hayman, M. and **S. Spuler** 2017: Demonstration of a low-cost high spectral resolution lidar for quantitative cloud and aerosol profiling, OSA Light, Energy and the Environment Congress, Boulder CO USA Nov 06-09, 2017
116. Repasky, K.S., **S. M. Spuler**, M. Hayman, and C. E. Bunn 2017: Ground-based eye-safe networkable micro-pulse differential absorption and high spectral resolution lidar for water vapor and aerosol profiling in the lower troposphere, 2017 Fall AGU Meeting in New Orleans, Louisiana, 11-15 Dec 2017
117. Clayton, M. R. Ferrare, D. Turner, A. Scarino, **S. Spuler**, M. Hayman, E. Eloranta, T. Marke, T. Wagner, and R. Newsom 2018: Remote Sensing Measurements of the CBL Structure During LAFE, Atmospheric Radiation Measurement (ARM)/Atmospheric System Research (ASR) Joint User Facility and Principal Investigator meeting, Tysons Virginia, 19-23 Mar, 2018.
118. Stillwell, R. A., S. M. Spuler, M. Hayman, C. E. Bunn, and K. S. Repasky: 2018: Towards measuring atmospheric temperature using a combined differential absorption and high spectral resolution lidar, AGU Annual Meeting 10-14 Dec 2018 Washington DC
119. Bunn. C. E., K. S. Repasky, S. M. Spuler, M. Hayman , and R.Stillwell 2019: Ground-based eye-safe networkable micro-pulse differential absorption lidar (DIAL) for thermodynamic profiling in the lower troposphere, AMS Annual Meeting 6-10 Jan 2019 Phoenix AZ
120. Stillwell, R. A., S. M. Spuler, M. Hayman, C. E. Bunn, and K. S. Repasky: 2018: Design of a Combined High Spectral Resolution and Oxygen Differential Absorption

Lidar for Measuring Atmospheric Temperature, AMS Annual Meeting 6-10 Jan 2019 Phoenix AZ