

Ellsworth J Welton

Curriculum Vitae

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Dr. Welton is currently the Founder and Managing Member for Level One Data, LLC. Level One Data provides consulting services for Earth Science data projects, supporting the transformation of raw observational data to high-quality actionable products.

Dr. Welton received a B.S. in Physics in 1993 from Jacksonville University, an M.S. in Physics in 1996 and a Ph.D. in physics in 1998 from the University of Miami. He then completed a post-doctoral associate position at University of Miami from 1998 to 1999. Dr. Welton accepted a position at the Laboratory for Atmospheres at NASA Goddard Space Flight Center in 1999, working in various roles until his retirement in 2026. He received numerous awards during his civil service career, including: the NASA Exceptional Service Medal, the NASA Goddard Honor Award for Leadership, several group achievement awards, and two NRL Alan Berman Research Publication Awards.

Dr. Welton has specialized in aerosol related research since 1994, particularly characterization of the optical and physical properties of various aerosol species. In addition, he is an expert in the use of lidar and radiometry to retrieve aerosol and cloud properties. During graduate school he ran a small network of radiometers in the Caribbean as part of the Aerosol/Ocean Chemistry Experiment (AEROCE). He later became one of the first site operators in the global NASA Aerosol Robotic Network (AERONET), and continues a strong collaboration with them to this day. He has been active in lidar research since 1996, and is a co-founder of the NASA Micro Pulse Lidar Network (MPLNET) – a federated network of lidar sites around the world running continuously since 2000. He served as the MPLNET Principal Investigator/Project Head from 2002 to 2025.

Dr. Welton has been involved in numerous international field campaigns and co-led the development of several international research initiatives (listed in CV). Dr. Welton has also participated in NASA satellite missions as: atmospheric team member on NASA's Geoscience Laser Altimeter System (GLAS), the Deputy Project Scientist for NASA's Glory mission, the former Project Scientist on the ISS Cloud-Aerosol Transport System - CATS

(2011-2013), and was a science team member for the NASA CALIPSO lidar mission. Finally, Dr. Welton was a member of the science working group formulating the Aerosols, Clouds, and Ecosystems (ACE) mission which was recommended in the 2007 NRC Earth Sciences Decadal report for NASA (an early precursor to the NASA AOS and FALCON missions).

Dr. Welton has served on several teams at the World Meteorological Organization (WMO). He was a founding member of the WMO Global Atmospheric Watch (GAW) Aerosol Lidar Observation Network (GALION) in 2007, serving on the international steering committee until 2026. GALION is a global network of lidar networks, including MPLNET, EU ACTRIS, AD-Net, LALINET, and NDACC, that provide data on aerosol vertical distribution and properties. Dr. Welton served as the GALION co-chair from 2014 to 2026, and led the development of the GALION data center and network metadata with WMO in addition to representing the project internationally. Dr. Welton was a member of the WMO expert team on Atmospheric Composition Data Management (ET-ACDM) from 2016 to 2026, an international group responsible for providing guidance on best practices and processes for data management within WMO. He also served on the WMO Sand and Dust Storm Warning and Advisory System Pan-American Regional Steering Committee 2017 to 2025. In addition, he was active with other international organizations providing standards and developing improvements for operational aerosol forecasting: such as the WMO Vegetative Fire and Smoke Pollution Warning and Advisory System and the International Cooperative for Aerosol Prediction (ICAP) since 2010. In 2023, Dr. Welton served on the advisory group for the WMO Task Team on Tiered Networks.

Dr. Welton has dedicated his career to providing the global scientific community with high quality observed data products and collaborated on countless international research and application projects. He has authored and co-authored over 130 peer reviewed publications and given numerous conference and workshop presentations. His H-Index is currently 48, demonstrating his strong commitment to observable driven science. In addition to developing and running his own Earth science networks, Dr. Welton has strong collaborations with other networks across the globe through his leadership of WMO GALION, the WMO contributing network program, related networks such as AERONET and the Pandonia Global Network (PGN), and others.

Dr. Welton has decades of experience developing and managing data plans and data centers for large scale networks. This includes establishing secure internet-based telemetry systems capable of near-real time raw data delivery from field sites to the data center, and automated processing infrastructure to serve data to the user community within an hour. He also led implementation of long-term data archives, metadata systems, and data delivery

processes. These include front-end metadata and data web display and file delivery, and automated APIs for machine-2-machine interoperability. Dr. Welton has years of experience with several data and metadata formats (netcdf, hdf, various ascii formats, JSON, etc) and standards (CF, GEOMS, WIGOS, I-Adopt, GCMD, WIS/WIS2, etc) used widely in the community. In addition, he is familiar with FAIR and Open data practices and their implementation. Dr. Welton has experience with on-site and cloud data center infrastructure, including hybrid configurations. He is proficient in numerous languages (bash, python, Django, IDL, javascript, react, html, SQL programming, C) and operating systems (linux, Mac OS, Windows). He has several years of experience developing, implementing, and managing AWS data centers, including both full stack and dev/ops roles (EC2, S3, Cognito, IAM, Route 53, Load Balancing, VPC, Amplify, Cloudfront, Workmail, CodeArtifact, and more).

Education

- 1998 University of Miami - Physics. PhD
- 1996 University of Miami - Physics. MS
- 1993 Jacksonville University - Physics. BS

Work Experience

- January 2026 – Present: Level One Data, LLC
Scientist, Founder and Managing Member
Earth Science Observations and Data Management Consulting
- September 2025 – September 2026: University of Maryland Baltimore County
Visiting Scientist, Physics Department
- December 2002 – January 2026: NASA Goddard Space Flight Center
Scientist, Project Head MPLNET, US Government Civil Service (Retired)
Earth Science Observation, Project and Data Management, Research
- September 2000 – December 2002: University of Maryland Baltimore County
Scientist, Goddard Earth Science and Technology Center, MPLNET Project Scientist
Earth Science Observation and Research
- July 1999 – August 2000: Science Systems and Applications, Inc
Scientist, MPLNET co-founder
Earth Science Observation and Research
- June 1998 – June 1999: University of Miami
Post-Doctoral Research Scientist, Physics Department
Earth Science Observation and Research

Professional Service

NASA Micro Pulse Lidar Network (MPLNET)

2002 – 2025: Principal Investigator/Project Head

2000 – 2002: Project Scientist

1999 – 2000: Co-Founder, concept development and implementation

WMO Global Atmospheric Watch Aerosol Lidar Observation Network (GALION)

2014 – 2026: Co-Chair

2007 – 2026: Steering Committee

WMO Expert Team on Atmospheric Composition Data Management

2016 – 2026: Committee Member

WMO Sand and Dust Storm Warning and Advisory System. Pan-American Region

2017 – 2025: Steering Committee Member

NASA Cloud-Aerosol Lidar and Infrared Pathfinder Satellite Observation (CALIPSO) Mission

2006 – 2023: Science Team

NASA Geoscience Laser Altimeter System (GLAS) Mission

2000 – 2006: Atmospheric Science Team

NASA Glory Mission

2010 – 2011: Deputy Project Scientist

NASA ISS Cloud Aerosol Transport System (CATS) Lidar Mission

2011 – 2013: Project Scientist (pre mission formulation and concept)

Professional Organization Memberships

1996 – Present: American Geophysical Union (AGU)

2016 – Present: American Meteorological Society (AMS)

NRC NASA Decadal Mission Concept Team: Aerosols, Clouds, and Ecosystems (ACE)

2006 – 2014: member (early pre-cursor to NASA AOS and FALCON missions)

NASA Goddard Laser Safety Subcommittee

2004 – 2013: member

NASA Goddard Aerosol Research Group, Aerocenter

2004 – 2025: Member

2004 – 2008: Founding Committee Member

Field Campaigns and Regional Research Initiatives

2020 – 2026: MPLCAN

2009 – 2026: 7-SEAS

2026: INSPYRE (pre-mission planning)

2019: FIREX-AQ

2017: AEROCLO-SA

2009: TIGERZ

2008: ICEALOT

2007: CATZ

2006: NAMMA

2006: BASE-ASIA

2005: EAST-AIRE

2004: UAE2

2003: DOE ARM Aerosol IOP

2002: SMOCC

2002: CRYSTAL-FACE

2001: ACE-Asia

2000: SAFARI

2000: PRIDE

1999: ARREX

1999: INDOEX

1997: ACE-2

Awards

2025 NASA Exceptional Service Medal

2022 NASA Goddard Contract Source Evaluation Board (SEB) Team Award

2017 Naval Research Laboratory Alan Berman Research Publication Award

2014 NASA Goddard Honor Award for Exceptional Achievement in Leadership

2014 Naval Research Laboratory Alan Berman Research Publication Award

2011 NASA Group Achievement Award, Glory Project Team

2006 NASA Goddard Laboratory for Atmospheres Peer Award

2005 Federal Laboratory Consortium Regional Excellence in Technology Transfer Award

2005 NASA Goddard Special Act Award

2004 NASA Goddard Laboratory for Atmospheres Peer Award

2003 NASA Goddard Performance Award

2001 NASA Goddard Exceptional Scientific Support Award

1997 Outstanding Student Paper, American Geophysical Union Fall Meeting

1993 William B. Gager Physics Research Award, Jacksonville University

1993 American Institute of Physics, Sigma Pi Sigma Honor Society

Other Professional Information

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Web of Science

<https://www.webofscience.com/wos/author/record/1670340>

Google Scholar

<https://scholar.google.com/citations?user=owMyJvI7m5EC>

Research Gate

<https://www.researchgate.net/profile/Ellsworth-Welton>

Publications

Author and co-author of over 130 publications with an h-index of 48 (as of October 2026).

Barreto, Á., Quirós, F., García, O. E., Pereda-de-Pablo, J., González-Fernández, D., Bedoya-Velásquez, A., Sicard, M., Córdoba-Jabonero, C., Iarlori, M., Rizi, V., Krotkov, N., Carn, S., Roininen, R., Molina-Arias, A. J., Almansa, A. F., Álvarez-Losada, Ó., Aramo, C., Bustos, J. J., Ceolato, R., Comerón, A., Felpeto, A., García, R. D., González-Sicilia, P., González, Y., Hedelt, P., Hernández, M., López-Cayuela, M.-Á., Loyola, D., Meletlidis, S., Muñoz-Porcar, C., Pietropaolo, E., Ramos, R., Rodríguez-Gómez, A., Román, R., Romero-Campos, P. M., Stuefer, M., Toledano, C., and Welton, E. J., 2026. Volcanic plume height during the 2021 Tajogaite eruption (La Palma) from two complementary monitoring methods – implications for satellite-based products, *Atmos. Meas. Tech.*, **19**, 1385–1406, <https://doi.org/10.5194/amt-19-1385-2026>.

Yang, E.-G., Zhu, Y., Arnold, N. P., Ganeshan, M., Salmun, H., McGrath-Spangler, E. L., et al., 2026. Utilizing PBL Height Data From Multiple Observing Systems in the GEOS System. Part II: Assessment of PBL Height Data. *Journal of Geophysical Research: Atmospheres*, **131**, <https://doi.org/10.1029/2025JD044701>.

Lolli, S., Dolinar, E. K., Lewis, J. R., Salcedo-Bosch, A., Campbell, J. R., and Welton, E. J., 2026. Long-term trends in daytime cirrus cloud radiative effects: analyzing twenty years of Micropulse Lidar Network measurements at Greenbelt, Maryland in eastern North America, *Atmos. Chem. Phys.*, **26**, 411–426, <https://doi.org/10.5194/acp-26-411-2026>.

Toth, T. D., Clayton, M. B., Li, Z., Painemal, D., Rodier, S. D., Kar, J., Thorsen, T. J., Ferrare, R. A., Vaughan, M. A., Tackett, J. L., Bian, H., Chin, M., Garnier, A. E., Welton, E. J., Ryan, R. A., Trepte, C. R., and Winker, D. M., 2025. Mapping 532 nm lidar ratios for CALIPSO-classified marine aerosols using MODIS AOD constrained retrievals and GOCART model simulations, *Atmos. Meas. Tech.*, **18**, 6765–6793, <https://doi.org/10.5194/amt-18-6765-2025>.

Lolli, S., J.R. Lewis, A. Tokay, G. Vivone, J.R. Campbell, E.K. Dolinar, M. Sicard, A. Comerón, A. Rodriguez-Gomez, C. Muñoz-Porcar, A. García-Benadí, M. Udina, J. Bech, E.J. Welton, 2026. Evaluating the NASA MPLNET Rain Masking Algorithm at Goddard Space Flight Center and Barcelona sites: Relevance to EarthCARE Cloud Profiling Radar Validation, *Atmos. Res.*, **329**, <https://doi.org/10.1016/j.atmosres.2025.108535>.

Fromm, M. D., G.P. Kablick III, I.A. Taylor, R.G. Grainger, C. Seftor, E.J. Welton, and J. Fochesatto, 2025. Raikoke volcanic sulfate/SO₂ anticyclonic contained circulations: In situ proof, morphology, and radiative signature. *J. Geophys. Res. Atmos.*, **130**, <https://doi.org/10.1029/2024JD041653>.

Mukherjee L., D. L. Wu, N. Abuhassan, T. F. Hanisco, U. Jeong, Y. Jin, T. Leblanc, B. Mayer, F. M. Mims, I. Morino, T. Nagai, S. Nicholls, R. Querel, T. Sakai, E. J. Welton, S. Windle, P. Pantina, and O. Uchino Twilight Near-Infrared Radiometry for Stratospheric Aerosol Layer Height *Remote Sensing* **17** (12): 2071 [10.3390/rs17122071]

Zheng J., Z. Zhang, S. DeSouza-Machado, C. L. Ryder, A. Garnier, C. Di Biagio, P. Yang, E. J. Welton, H. Yu, A. Barreto, and M. Y. Gonzalez Assessment of Dust Size Retrievals Based on AERONET: A Case Study of Radiative Closure From Visible-Near-Infrared to Thermal Infrared *Geophysical Research Letters* **51** (4): [10.1029/2023gl106808]

Shang X., A. Lipponen, M. Filioglou, A. Sundström, M. Parrington, V. Buchard, A. S. Darmenov, E. J. Welton, E. Marinou, V. Amiridis, M. Sicard, A. Rodríguez-Gómez, M. Komppula, and T. Mielonen Monitoring biomass burning aerosol transport using CALIOP observations and reanalysis models: a Canadian wildfire event in 2019 *Atmospheric Chemistry and Physics* **24** (2): 1329-1344 [10.5194/acp-24-1329-2024]

Eck T. F., B. N. Holben, J. S. Reid, A. Sinyuk, D. M. Giles, A. Arola, I. Slutsker, J. S. Schafer, M. G. Sorokin, A. Smirnov, A. D. LaRosa, J. Kraft, E. A. Reid, N. T. O'Neill, E. Welton, and A. R. Menendez The extreme forest fires in California/Oregon in 2020: Aerosol optical and physical properties and comparisons of aged versus fresh smoke *Atmospheric Environment* 119798 [10.1016/j.atmosenv.2023.119798]

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Loría-Salazar S. M., A. M. Sayer, J. Barnes, J. Huang, C. Flynn, N. Lareau, J. Lee, A. Lyapustin, J. Redemann, E. J. Welton, J. L. Wilkins, and H. A. Holmes Evaluation of Novel NASA Moderate Resolution Imaging Spectroradiometer and Visible Infrared Imaging Radiometer Suite Aerosol Products and Assessment of Smoke Height Boundary Layer Ratio During Extreme Smoke Events in the Western USA *Journal of Geophysical Research: Atmospheres* **126** (11): [10.1029/2020jd034180]

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- Giles D. M., A. Sinyuk, M. G. Sorokin, J. S. Schafer, A. Smirnov, I. Slutsker, T. F. Eck, B. N. Holben, J. R. Lewis, J. R. Campbell, E. J. Welton, S. V. Korkin, and A. I. Lyapustin Advancements in the Aerosol Robotic Network (AERONET) Version 3 database – automated near-real-time quality control algorithm with improved cloud screening for Sun photometer aerosol optical depth (AOD) measurements *Atmospheric Measurement Techniques* **12 (1)**: 169-209 [10.5194/amt-12-169-2019]
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- Lolli S., P. Di Girolamo, B. Demoz, X. Li, and E. J. Welton Rain evaporation rate estimates from multi-wavelength lidar measurements and intercomparison against a model analytical solution *Journal of Atmospheric and Oceanic Technology* **34 (4)**: [10.1175/JTECH-D-16-0146.1]
- Tsay S., H. B. Maring, N. Lin, S. Buntoung, S. Chantara, H. Chuang, P. M. Gabriel, C. Goodloe, B. N. Holben, T. Hsiao, N. C. Hsu, S. Janjai, W. K. Lau, C. Lee, J. Lee, A. M. Loftus, A. X. Nguyen, C. M. Nguyen, S. K. Pani, P. Pantina, A. M. Sayer, W. Tao, S. Wang, E. J. Welton, W. Wiriya, and M. Yen Satellite-Surface Perspectives of Air Quality and Aerosol-Cloud Effects on the Environment: An Overview of 7-SEAS/BASELInE Aero. *Air Qual. Res.* **16 (11)**: 2581-2602 [10.4209/aaqr.2016.08.0350]
- Lee J., N. C. Hsu, C. Bettenhausen, A. M. Sayer, C. J. Seftor, M. Jeong, S. Tsay, E. J. Welton, S. Wang, and W. Chen Evaluating the Height of Biomass Burning Smoke Aerosols Retrieved from Synergistic Use of Multiple Satellite Sensors over Southeast Asia Aero. *Air Qual. Res.* **16** 2897-2906 [10.4209/aaqr.2015.08.0506]
- Lolli S., J. R. Lewis, E. J. Welton, J. R. Campbell, and Y. Gu Understanding Seasonal Variability in thin Cirrus Clouds from Continuous MPLNET Observations at GSFC in 2012 *EPJ Web of Conferences* **119** 11004 [10.1051/epjconf/201611911004]
- Campbell J. R., S. Lolli, J. R. Lewis, Y. Gu, and E. J. Welton Daytime Cirrus Cloud Top-of-Atmosphere Radiative Forcing Properties at a Midlatitude Site and their Global Consequence *Journal of Applied Meteorology and Climatology* JAMC-D-15-0217.1 [10.1175/jamc-d-15-0217.1]
- Lolli S., J. R. Lewis, J. R. Campbell, E. J. Welton, and Y. Gu Cirrus cloud radiative characteristics from continuous MPLNET profiling at GSFC in 2012 *Optica Pura y Aplicada* **49 (1)**: 1-6 [10.7149/opa.49.1.1]

- Campbell J. R., C. Ge, J. Wang, E. J. Welton, A. Bucholtz, E. J. Hyer, E. A. Reid, B. N. Chew, S. Liew, S. V. Salinas, S. Lolli, K. C. Kaku, P. Lynch, M. Mahmud, M. Mohamad, and B. N. Holben Applying Advanced Ground-Based Remote Sensing in the Southeast Asian Maritime Continent to Characterize Regional Proficiencies in Smoke Transport Modeling *Journal of Applied Meteorology and Climatology* **55 (1)**: 3-22 [10.1175/jamc-d-15-0083.1]
- Wang S., E. J. Welton, B. N. Holben, S. Tsay, N. Lin, D. M. Giles, s. a. Stewart, S. Janjai, X. A. Nguyen, T. Hsiao, W. Chen, T. Lin, S. Buntoung, S. Chantara, and W. Wiriya Vertical Distribution and Columnar Optical Properties of Springtime Biomass-Burning Aerosols over Northern Indochina during 2014 7-SEAS Campaign *Aerosol and Air Quality Research* **15** 2037-2050 [10.4209/aaqr.2015.05.0310]
- Nowottnick E. P., P. R. Colarco, E. J. Welton, and A. M. Da Silva Use of the CALIOP vertical feature mask for evaluating global aerosol models *Atmospheric Measurement Techniques* **8** 3647-3669 [10.5194/amt-8-3647-2015]
- Lolli S., E. J. Welton, J. R. Campbell, E. Eloranta, B. N. Holben, B. N. Chew, and S. Salinas High Spectral Resolution Lidar and MPLNET Micro Pulse Lidar aerosol optical property retrieval intercomparison during the 2012 7-SEAS field campaign at Singapore *SPIE Proc.* **9246** [doi:10.1117/12.2067812]
- Lolli S., E. J. Welton, A. Benedetti, L. Jones, M. Suttie, and S. Wang MPLNET lidar data assimilation in the ECMWF MACC-II Aerosol system: evaluation of model performances at NCU lidar station *SPIE proc.* **9246** [doi:10.1117/12.2068201]
- Tan F. Y., W. S. Hee, S. L. Hwee, K. Abdullah, L. Y. Tiem, M. Z. Matjafri, S. Lolli, B. Holben, and E. J. Welton Variation in daytime tropospheric aerosol via LIDAR and sunphotometer measurements in Penang, Malaysia *AIP Conference Proceedings* **1588 (1)**: 286-292 [10.1063/1.4866962]
- Eck T. F., B. N. Holben, J. S. Reid, A. Arola, R. A. Ferrare, C. A. Hostetler, S. N. Crumeyrolle, T. A. Berkoff, E. J. Welton, S. Lolli, A. I. Lyapustin, Y. Wang, J. S. Schafer, D. M. Giles, B. E. Anderson, K. L. Thornhill, P. Minnis, K. E. Pickering, C. P. Loughner, A. Smirnov, and A. Siniuk Observations of rapid aerosol optical depth enhancements in the vicinity of polluted cumulus clouds *Atmos. Chem. Phys.* **14** 11633-11656 [10.5194/acp-14-11633-2014]
- Aryal R. P., K. J. Voss, W. C. Keene, J. L. Moody, E. J. Welton, and B. N. Holben Comparison of surface and column measurements of aerosol scattering properties over the western North Atlantic Ocean at Bermuda *Atmos. Chem. Phys.* **14** 7617-7629 [10.5194/acp-14-7617-2014]

Matsui T., C. M. Ichoku, C. A. Randles, T. L. Yuan, A. M. Da Silva, P. R. Colarco, D. Kim, R. C. Levy, A. M. Sayer, M. Chin, D. Giles, B. N. Holben, E. J. Welton, T. F. Eck, and L. A. Remer Current and Future Perspectives of Aerosol Research at NASA Goddard Space Flight Center *Bulletin of the American Meteorological Society* early view [10.1175/BAMS-D-13-00153.1]

Welton E. J., and J. R. Campbell Evaluating Light Rain Drop Size Estimates from Multi-Wavelength Micropulse Lidar Network Profiling *Journal of Atmospheric and Oceanic Technology* **30** 2798-2807

Lolli S., E. J. Welton, and J. R. Campbell Evaluating Light Rain Drop Size Estimates from Multi-Wavelength Micropulse Lidar Network Profiling *Journal of Atmospheric and Oceanic Technology* **30** 2798-2807

Wang S., S. Tsay, N. Lin, S. Chang, C. Li, E. J. Welton, B. N. Holben, N. C. Hsu, W. K. Lau, S. Lolli, C. Kuo, H. Chia, C. Chiu, C. Lin, s. w. Bell, Q. Ji, R. A. Hansell, G. Sheu, K. Chi, and C. Peng Origin, transport, and vertical distribution of atmospheric pollutants over the northern South China Sea during the 7-SEAS/Dongsha Experiment *Atmospheric Environment* **78** 124-133 [10.1016/j.atmosenv.2012.11.013]

Reid J. S., E. J. Hyer, R. S. Johnson, B. N. Holben, R. J. Yokelson, J. Zhang, J. R. Campbell, S. A. Christopher, L. D. Girolamo, L. Giglio, R. E. Holz, C. Kearney, J. Miettinen, E. A. Reid, F. J. Turk, J. Wang, P. Xian, G. Zhao, R. Balasubramanian, B. N. Chew, S. Janjai, N. Lagrosas, P. Lestari, N. H. Lin, M. Mahmud, A. X. Nguyen, B. Norris, N. T. Oanh, M. Oo, S. V. Salinas, E. J. Welton, and S. C. Liew Observing and understanding the Southeast Asian aerosol system by remote sensing: An initial review and analysis for the Seven Southeast Asian Studies (7SEAS) program *Atmospheric Research* **122** 403-468 [10.1016/j.atmosres.2012.06.005]

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Huang J., N. C. Hsu, S. Tsay, B. N. Holben, . J. Welton, A. Smirnov, M. Jeong, R. A. Hansell, T. A. Berkoff, Z. Liu, G. Liu, J. R. Campbell, S. C. Liew, and J. E. Barnes Evaluations of cirrus contamination and screening in ground aerosol observations using collocated lidar systems *J. Geophys. Res.* **117 (D15)**: D15204 [10.1029/2012JD017757]

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