Laura Riihimaki, PhD

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EDUCATION

University of Oregon, Eugene, OR
Ph.D. in Physics, August 2008
Thesis: Evaluating Long-term Changes and their Causes in Surface Solar Irradiance in Oregon
Advisors: Frank Vignola and Gregory Bothun
Wheaton College, Wheaton, IL
B.S. in Physics, May 2001, *Magna Cum Laude*

APPOINTMENTS

Deputy Project Manager, Baseline Surface Radiation Network, 2020-present
Research Scientist, Cooperative Institute for Research in the Environmental Sciences (CIRES), NOAA ESRL Global Monitoring Division, Boulder, CO, 2019-present
Research Scientist, Atmospheric Sciences and Global Change Division, Pacific Northwest National Laboratory, Richland, WA, 2011-2019
Adjunct Instructor of Physics, Washington State University Tri-Cities, Richland, WA, 2012
Postdoctoral Research Associate, Atmospheric Sciences and Global Change Division, Pacific Northwest National Laboratory, Richland, WA, 2008-2011
Graduate Research Assistant, University of Oregon, Physics, Eugene, OR, 2004-2008

FUNDED PROJECTS

Co-Investigator, "Integrated Perspectives on Clouds, Precipitation, and the Surface Energy Budget in the Colorado Rocky Mountains using Observations from SAIL and SPLASH", US DOE ASR project, (2023-2026)
Principal Investigator, "Employing a NOAA climate measurement network to create products for evaluation and improvement of boundary layer height (BLH) and cloud interactions in climate models", NOAA Climate Project Office project, (2020-2023)
Co-Investigator, "Freezing Processes in Southern Ocean Mixed Phase Clouds", US DOE ASR project, (2019-2022)
ARM Aerial Facility Radiometer Mentor, Advise on instrumentation, procedures, and data processing of radiation measurements from aircraft (2019-present)
ARM SHIPRAD Mentor, Advise on instrumentation, procedures, and data processing of radiation measurements from ships (2019-present)
ARM Climate Research Facility Translator, Manage data product development and operations of over 20 operational products; (2013-2019)
Co-Investigator, "Development of the Next Weather Research and Forecasting Model – Improving Solar Forecasts," DOE Solar Energy Technologies Office Solar Forecasting 2 project (2018-2020)
Co-Principal Investigator, "Data Assessment and Assimilation for Atmospheric Radiation Measurement Data Using Dynamic Bayesian Networks," PNNL LDRD seed project (2018)
Co-Investigator, "Integrated Cloud, Land-Surface, and Aerosol System Study (ICLASS)," ASR SFA project renewal, (2017-2020)

*Co-Investigator, "*Use of Remote Sensing and In-Situ Observations to Develop and Evaluate Improved Representations of Convection and Clouds for the Accelerated Climate Model for Energy,*"* DOE Climate Model Development and Validation (CMDV) grant, (2016–2019)

Co-Investigator, "Macro-physical Properties of Shallow Cumulus from Integrated ARM Observations," ASR Data Products project, (2016-2018)

Principal Investigator, AML Radiometer Quickstarter Project, (2016)

Principal Investigator, "Identifying Cloud Phase from ARM Remote Sensors," PNNL LDRD project awarded through the PNNL Signature Discovery Initiative, (2014-2016)

A W A R D S

NOAA GML DEI Award for leadership of the GML DEI committee

CIRES Bronze Medal for extraordinary contributions to the year-long MOSAIC polar expedition (2022)

PNNL Outstanding Performance Award for organizing UW Instrument Short Course (2017)

PNNL EBSD BEST Successful Renewal Effort iCLASS proposal (2017)

PNNL EBSD BEST Collaboration Award: National Lab Science Day on Capitol Hill (2016)

PNNL EBSD BEST Major Proposal Award: CMDV-MCS proposal (2016)

PNNL Outstanding Performance Award for organizing Rad Jam Coding Event (2015)

Fitzner-Eberhardt Award for STEM Education and Outreach (2014)

PNNL Outstanding Performance Award for mentoring students (2010)

NSF GK-12 Fellowship, University of Oregon (2003-2008)

Inducted into Wheaton College Honor Society (2001)

Physics Merit Scholarship, Wheaton College, full tuition scholarship (1999-2000)

Robert C. Byrd Scholarship, academic achievement scholarship (1997-2001)

P U B L I C A T I O N S

Guiterrez-Loza, L., and coauthors (2024) The Need for a Community of Practices for Air-Sea Flux Observations, submitted to *Marine Technology Society Journal*, *58*(1-2), 20-25.

Balmes, K. A., Riihimaki, L. D., Wood, J., Flynn, C., Theisen, A., Ritsche, M., Ma, L., Hodges, G. B., and Herrera, C., (2024) Evaluation of the hyperspectral radiometer (HSR1) at the ARM SGP site, *Atmos. Meas. Tech.17*(12), 3783-3807, https://doi.org/10.5194/amt-17-3783-2024.

Riihimaki, L. D., and coauthors (2024), Ocean surface radiation measurement best practices. *Frontiers in Marine Science, 11*. Methods. https://www.frontiersin.org/articles/10.3389/fmars.2024.1359149

de Boer, G., and coauthors, (2023), Supporting Advancement in Weather and Water Prediction in the Upper Colorado River Basin: The SPLASH Campaign. *Bull. Amer. Meteor. Soc.*, **104**, E1853–E1874, https://doi.org/10.1175/BAMS-D-22-0147.1.

Cox, C.J., and coauthors, (2023), Continuous observations of the surface energy budget and meteorology over the Arctic sea ice during MOSAiC, *Scientific Data,* 10, 519, https://doi.org/10.1038/s41597-023-02415-5.

Balmes, K. A., Sedlar, J., Riihimaki, L. D., Olson, J. B., Turner, D. D., & Lantz, K. (2023). Regime-specific cloud vertical overlap characteristics from radar and lidar observations at the ARM sites. *Journal of Geophysical Research: Atmospheres*, *128*(6), e2022JD037772.

Oehri, J., and Coauthors, (2022), "Vegetation type is an important predictor of the arctic summer land surface energy budget." *Nature communications* 13.1, 6379, https://doi.org/10.1038/s41467-022-34049-3.

Duncan Jr, J.B., Bianco, L., Adler, B., Bell, T., Djalalova, I.V., Riihimaki, L., Sedlar, J., Smith, E.N., Turner, D.D., Wagner, T.J., Wilczak, J.M., (2022), Evaluating daytime planetary boundary-layer height estimations resolved by both active and passive remote sensing

instruments during the CHEESEHEAD19 field campaign. *Atmos. Meas. Tech.,* 15 (8), 2479-2502, doi: 10.5194/amt-15-2479-2022.

Sedlar, J., Riihimaki, L. D., Turner, D. D., Duncan, J., Adler, B., Bianco, L., ... & Hodges, G. B. (2022). Investigating the impacts of daytime boundary layer clouds on surface energy fluxes and boundary layer structure during CHEESEHEAD19. *Journal of Geophysical Research: Atmospheres*, *127*(5), e2021JD036060.

Riihimaki, LD, X Li, Z Hou, LK Berg (2021), Improving prediction of surface solar irradiance variability by integrating observed cloud characteristics and machine learning, Solar Energy, 225, 275-285, https://doi.org/10.1016/j.solener.2021.07.047.

Clayson, C. A., et al. (2021), Super Sites for Advancing Understanding of the Oceanic and Atmospheric Boundary Layers, Marine Technology Society Journal, 55(3), 144-145, doi: 10.4031/MTSJ.55.3.11.

Sedlar, J., L. D. Riihimaki, K. Lantz, and D. D. Turner (2021), Development of a random forest cloud regime classification model based on surface radiation and cloud products, Journal of Applied Meteorology and Climatology, doi: 10.1175/jamc-d-20-0153.1.

Kassianov, E., E. Cromwell, J. Monroe, L. D. Riihimaki, C. Flynn, J. Barnard, J. J. Michalsky, G. Hodges, Y. Shi, and J. M. Comstock (2021), Harmonized and high-quality datasets of aerosol optical depth at a US continental site, 1997–2018, *Scientific Data*, 8(1), 82, doi: 10.1038/s41597-021-00866-2.

Riihimaki, L. D., et al. (2021), The Shortwave Spectral Radiometer for Atmospheric Science: Capabilities and Applications from the ARM User Facility, Bulletin of the American Meteorological Society, 102(3), E539-E554, doi: 10.1175/bams-d-19-0227.1.

Butterworth, B. J., et al. (2021), Connecting Land–Atmosphere Interactions to Surface Heterogeneity in CHEESEHEAD19, Bulletin of the American Meteorological Society, 102(2), E421-E445, doi: 10.1175/bams-d-19-0346.1.

Clayson, C. A., and Coauthors (2021). Super Sites for Advancing Understanding of the Oceanic and Atmospheric Boundary Layers. *Marine Technology Society Journal*, *55*(3), 144-145, https://doi.org/10.4031/MTSJ.55.3.11.

Cronin M, L Riihimaki, E Thompson, M.T. Guerra. (September 2020). *Annex 10 Surface Radiation Working Group.* Evolving and Sustaining Ocean Best Practices Workshop IV. doi: https://doi.org/10.25607/OBP-1036.

Mei, F, J Fast, B Geerts, L Riihimaki, T Thornberry, S Springston, J Tomlinson, D Dexheimer, M Diao, A Bucholtz, C Flynn, T Campos, C Kuang, B Schmid. (July 2020). ARM Aerial Instrument Workshop Report, *U.S. Department of Energy Report Number: DOE/SC-ARM-20-010*.

Berg, L. K., et al. (2020). Fine-scale variability of observed and simulated surface albedo over the southern Great Plains. *Journal of Geophysical Research: Atmospheres*, 125, e2019JD030559. https://doi.org/10.1029/2019JD030559.

Riley, E. A., Kleiss, J. M., Riihimaki, L. D., Long, C. N., Berg, L. K., and Kassianov, E. (2020), Shallow Cumuli Cover and Its Uncertainties from Ground-based Lidar-Radar Data and Sky Images, Atmos. Meas. Tech., 13, 2099–2117, https://doi.org/10.5194/amt-13-2099-2020.

Tang, Q., et al. (2019), Regionally refined test bed in E3SM atmosphere model version 1 (EAMv1) and applications for high-resolution modeling. *Geosci. Model Dev., 12*(7), 2679-2706. doi:10.5194/gmd-12-2679-2019.

Lim, K-S, LD Riihimaki, Y Shi, D Flynn, J Kleiss, LK Berg, WI Gustafson Jr., Y Zhang, K Johnson, (2019), Long-term cloud type retrieval using a combination of active remote sensors and a total sky imager at the ARM SGP site, *J. Atmos. Oceanic Tech.*, 36, 2031-2043, https://doi.org/10.1175/JTECH-D-18-0215.1.

Riihimaki, LD, RA Houze Jr., LA McMurdie, and K Dorsey (2019), Training a new generation of data-savvy atmospheric researchers, *Eos, 100,* https://doi.org/10.1029/2019EO114793. Published on 30 January 2019.

Tang, Q, S Xie, Y Zhang, TJ Phillips, JA Santanello, DR Cook, LD Riihimaki, and KL Gaustad (2018), Heterogeneity in Warm-Season Land-Atmosphere Coupling Over the U.S. Southern Great Plains, *Journal of Geophysical Research: Atmospheres*, *123*(15), 7867-7882, doi:10.1029/2018JD028463.

Kleiss J, E Riley, CN Long, LD Riihimaki, LK Berg, V Morris, EI Kassianov (2018), Cloud Area Distributions of Shallow Cumuli: A New Method for Ground-Based Images. *Atmosphere* 9(7), 258, doi:10.3390/atmos9070258.

Riihimaki, LD, JC Comstock, S Collis, C Flynn, S Giangrande, J Monroe, C Sivaraman, S Xie (2018), *Translator Plan: A Coordinated Vision for Fiscal Years 2018-2020* (No. DOE/SC-ARM-17-039). DOE Office of Science Atmospheric Radiation Measurement (ARM) Program (United States), https://www.osti.gov/servlets/purl/1418461.

Riihimaki, L. D., J. M. Comstock, E. Luke, T. J. Thorsen, and Q. Fu (2017), A case study of microphysical structures and hydrometeor phase in convection using radar Doppler spectra at Darwin, Australia, *Geophysical Research Letters*, *44*(14), 7519-7527, doi:10.1002/2017GL074187.

Kassianov EI, JC Barnard, CJM Flynn, LD Riihimaki, LK Berg, and DA Rutan (2017), Areal-Averaged Spectral Surface Albedo in an Atlanic Coastal Area: Estimation from Ground-Based Transmission, *Atmosphere* 8(7):123. doi:10.3390/atmos8070123

Kassianov EI, MS Pekour, CJ Flynn, LK Berg, J Beranek, A Zelenyuk, C Zhao, LYR Leung, PL Ma, LD Riihimaki, JD Fast, JC Barnard, AG Hallar, I McCubbin, EW Eloranta, A McComiskey, and PJ Rasch (2017), Large Contribution of Coarse Mode to Aerosol Microphysical and Optical Properties: Evidence from Ground-based Observations of a Transpacific Dust Outbreak at a High-Elevation North American Site, *Journal of the Atmospheric Sciences,* 74(5):1431-1443. doi:10.1175/JAS-D-16-0256.1

Riihimaki, LD, JM Comstock, KK Anderson, A Holmes, E Luke (2016), A Path towards uncertainty assignment in an operational cloud phase algorithm from ARM vertically pointing active sensors, *Advances in Statistical Climatology, Meteorology and Oceanography*, 2, 49-62, doi:10.5194/ascmo-2-49-2016.

Lim, K-S, LD Riihimaki, JM Comstock, B Schmid, C Sivaraman, Y Shi, G McFarquhar (2016), Evaluation of long-term surface-retrieved cloud-droplet number concentration with in situ aircraft observations, *J. Geophys. Res.*, 121(5):2318-2331. doi:10.1002/2015JD024082.

Arkin, A, et al. (2016), Biological and Environmental Research Exascale Requirements Review. An Office of Science review sponsored jointly by Advanced Scientific Computing Research and Biological and Environmental Research, March 28-31, 2016, Rockville, Maryland. United States, doi:10.2172/1375720.

Berg, LK, LD Riihimaki, Y Qian, H Yan, M Huang (2015), The Low-Level Jet over the Southern Great Plains determined from observations and reanalyses and its impact on moisture transport, *J. Climate*, 28, 6682-6706, doi:10.1175/JCLI-D-14-00719.1.

Kassianov EI, JC Barnard, CJ Flynn, LD Riihimaki, J Michalsky, and GB Hodges (2014), Areal-averaged and spectrally-resolved surface albedo from ground-based transmission data alone: Toward an operational retrieval, *Atmosphere*, 5(3):597-621, doi:10.3390/atmos5030597.

Riihimaki, L., and C.N. Long (2014), Spatial variability of surface irradiance measurements at the Manus ARM site, *J. Geophys. Res.*, 119, 5475–5491, doi:10.1002/2013JD021187.

Riihimaki, L., S.A. McFarlane, and J. Comstock (2012), Climatology and formation of tropical mid-level clouds at the Darwin ARM site, *J. Climate*, 25, 6835-6850, doi:10.1175/JCLI-D-11-00599.1.

Riihimaki, L., S.A. McFarlane, C. Liang, S. Massie, N. Beagley, and T. Toth (2012), Comparison of methods to determine tropical tropopause layer cirrus formation mechanisms, *J. Geophys. Res., 117*, D06218, doi:10.1029/2011JD016832.

Riihimaki, L., and S.A. McFarlane (2010), Frequency and morphology of tropical tropopause layer cirrus from CALIPSO observations: Are isolated cirrus different from those connected to deep convection?, *J. Geophys. Res.*, *115*, D18201, doi:10.1029/2009JD013133.

Riihimaki, L., F. Vignola, and C.N. Long (2009), Analyzing Increasing Direct Normal Irradiance in Oregon for Changes Due to Aerosols, *J. Geophys. Res.*, *114*, D00D02, doi:10.1029/2008JD010970.

Riihimaki, L., and F. Vignola (2008), Establishing a Consistent Calibration Record for Eppley PSPs, proceedings of Solar 2008 Annual Conference, Am. Sol. Energy Soc., San Diego, Cal., 3-8 May. (peer-reviewed)

Lohmann, S., L. Riihimaki, F. Vignola, and R. Meyer (2007), Trends in direct normal irradiance in Oregon: Comparison of surface measurements and ISCCP-derived irradiance, *Geophys. Res. Lett.*, *34,* L02705, doi: 10.1029/2006GL027322.

Riihimaki, L., F. Vignola, S. Lohmann, R. Meyer, and R. Perez (2006), Long-term variability of global and beam irradiance in the Pacific Northwest, proceedings of Solar 2006 Annual Conference, Am. Sol. Energy Soc., Denver, Col., 9-11 Jul. (peer-reviewed)

Riihimaki, L., and F. Vignola (2005), Trends in direct normal solar irradiance in Oregon from 1979-2003, proceedings of ISES Solar World Congress, Am. Sol. Energy Soc., Orlando, Fla., 6-12 Aug. (peer-reviewed)

MEETINGS AND PRESENTATIONS (PAST 5 YEARS)

Speaker, Exploring the Potential of Commercial Spectral Shortwave Instrumentation in Ground-Based Networks, GEWEX Open Science Conference, Sapporo, 2024

Invited Speaker, BSRN Network Update, GDAP Panel Meeting, Sapporo, 2024

Speaker & meeting co-organizer, Ensuring Consistency for the NOAA Remote Observatory Stations: An Update on Operations at NOAA GML Polar Stations, 18th BSRN Scientific Review and Workshop in Tokyo, 2024

Speaker, Examining Spectral Albedo Measurements of Snow for Impacts of Aerosol Deposition at the SAIL and SPLASH campaigns, AGU Fall Meeting, 2023

Speaker, Ocean Radiation Measurement Best Practices for a Global Surface Radiation Network, OceanSites Annual Meeting, 2023

Speaker, An overview of the datasets collected by NOAA GML during SPLASH, S3 Workshop, 2023

Speaker, Signatures of dust on snow in spectral albedo, S3 Workshop, 2023

Speaker, GML Surface Radiation Measurements at SPLASH, NOAA SPLASH Science Day, 2023

Session Convener, Best Practices for Observing the Air-Sea Transition Zone, OBPS, 2023

Discussion Leader, Emerging Observational Techniques, Radiation and Climate Gordon Research Conference, 2023

Session Convener, Upgrading ARM's Radiometric Measurements for the Next Generation Radiative Effects, ARM/ASR PI meeting, 2023

Speaker, Using Radiative Flux Measurements from Climate Networks to Improve our Understanding of Radiative Energy Available for Plant Growth. *AMS 35th Conference on Agricultural and Forest Meteorology*, 2023

Invited Speaker, Exploring ARM's Shortwave Spectral Measurements to Quantify Cloud and Aerosol Radiative Effects, AGU Fall Meeting, 2022

Invited Speaker, Harmonizing Land and Ocean Surface Radiation Measurements for a More Unified Global Picture of the Surface Radiation Balance, AGU Fall Meeting, 2022

Invited Speaker, Surface Broadband Radiation Measurement Best Practices, OBPS, 2022

Speaker, Next Generation Surface-Based Ocean Radiation Measurement Best Practices for Improved Satellite Validation. *AMS Collective Madison Meeting*, 2022

Speaker, Update on Development of Ocean Radiometer Best Practices, BSRN Meeting, 2022

Invited Speaker, Seasonal Evolution of the Surface Radiative Budget at SPLASH, SAIL/SPLASH Biweekly Seminar, 2022

Session Convener, Observing Air-Sea Interactions Strategy (OASIS): Towards Best Practices in Radiation Measurement, OBPS, 2021

Convener, Shortwave Radiometer Breakout Session, DOE ARM/ASR Science Team Meeting, 2021

Co-convener, MOSAIC Field Campaign Breakout Session, DOE ARM/ASR Science Team Meeting, 2021

Invited Speaker, Atmospheric Measurements aboard research ships: Needs, opportunities and challenges, ARICE early career training workshop, 2021

Invited Panelist, OBPS 2020 Surface Radiation Working Group, 2020

Invited Speaker, Current AAF Radiometric Capabilities, ARM Aerial Instrumentation Workshop, 2020

Invited Speaker, Developing a Parameterization for Solar Variability in WRF-Solar Version 2, AGU Fall Meeting, 2019

Poster Presenter, Improved Accuracy in Shipborne Broadband Irradiance Measurements during MARCUS using New Tilt-Corrected SHIPRAD systems, AGU Fall Meeting, 2019

Speaker, Correcting MARCUS Broadband Radiometer data for Ship Motion, Southern Ocean Atmospheric Research (SOAR) Workshop, Hobart, Australia, 2019

Convener, SW Spectral Radiometer Breakout Session, 2019 ARM/ASR PI meeting, 2019

Speaker, Developing Solar Forecasting Model Diagnostics of Cloud Impacts on Solar Variability, NOAA GMD GMAC, Boulder, CO, 2019

Poster presenter, Using machine learning to identify mixed-phase conditions in cloud radar Doppler spectra, CIRES Rendezvous, 2019

Invited Presentation, Using multi-instrument observations of shallow cumulus as a tool for improving simulations of cloud radiative impacts. NOAA ESRL GMD seminar, 2019

Leader/Organizer, ARM SW Spectral Radiometer Strategy Review, Boulder, CO, 2019

PROFESSIONAL ACTIVITIES AND SERVICE

Scientific Lead of NOAA Baseline Observatories Radiation Network, 2020-present
Lead of BSRN Ocean Working Group, 2021-present
Deputy Project Manager of BSRN, 2020-present
DOE ARM AAF Radiometer Mentor, 2019-present
DOE ARM SPN1 Mentor, 2019-present
DOE ARM Infrastructure Science Team, 2017-2018
DOE ASR ARM Coordination Team, 2016-2018
Lead Translator, DOE ARM Climate Research Facility, 2016-2018
Organizer, PNNL ASGC Rad Jam, weekend science analysis jam, 2015
ARM Translator, DOE ARM Climate Research Facility, 2013-2019
DOE ASR/ARM Broadband Radiation Group, 2013-2018
Co-Leader, PNNL Atmospheric Sciences and Global Change Division Science Social seminar series, 2013-2016
ARM science outreach, Science demonstrations and activities at multiple outreach events annually at community and PNNL events, 2013-2018
Community speaker, Public presentations on climate science at multiple venues including Columbia Basin College Planetarium, Chiawana High School, Puget Sound Energy Wind Power, Richland Public Library, 2013-2018
DOE ASR Cloud Aerosol Precipitation Interactions Working Group Steering Committee, 2013-2015
Lead instructor, PNNL/ESD 123 immersive science training workshops for local K-12 teachers, 2013-2018
Instructor, course on Climate Change with the Kennewick Community Education Program, 2013
Organizing Committee Member, PNNL Postdoctoral Poster Session, 2010

Peer Reviewer, reviewed articles in J. Geophysical Research, Geophysical Research Letters, J. Climate, Solar Energy, Nature Communications, Geoscience and Remote Sensing Letters, Environmental Research Letters, Journal of Atmospheric and Ocean Technology, Atmospheric Measurement Techniques*, 2008-present*