

# Heather A. Holmes

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## RESEARCH INTERESTS

- Interdisciplinary research to investigate air pollution and extreme atmospheric events
- Investigations of atmospheric phenomena in complex terrain, e.g., cold air pools, heatwaves, wildfires
- Numerical modeling, satellite remote sensing, data science, and field experiments
- Environmental fluid dynamics, atmospheric turbulence, boundary layer meteorology, particulate dispersion and deposition, air quality, atmospheric chemistry, health effects of air pollution
- Overarching goal is to integrate scientific findings with sociological factors, i.e., public health and policy assessment, socioeconomic trends in air pollution exposure and epidemiologic studies

## EDUCATION

- Doctor of Philosophy in Mechanical Engineering** 12/2010  
University of Utah, Salt Lake City, UT  
*Area of Study:* Environmental Fluid Dynamics  
*Dissertation Title:* Investigation of Chemical Properties and Transport Phenomena Associated with Pollutants in the Atmospheric Boundary Layer
- Master of Science in Mechanical Engineering** 05/2007  
University of Utah, Salt Lake City, UT  
*Area of Study:* Fluid Mechanics  
*Thesis Title:* Time Scales in the Unstable Atmospheric Surface Layer
- Bachelor of Science in Mechanical Engineering** 12/2001  
Montana State University, Bozeman, MT  
*Passed Fundamentals of Engineering Exam*

## RESEARCH EXPERIENCE

- Associate Professor** 07/2020-Present  
Department of Chemical Engineering, University of Utah, Salt Lake City, UT
- Adjunct - Mechanical Engineering, Atmospheric Sciences, Civil and Environmental Engineering
  - Member - Center of Excellence for Exposure Health Informatics (CEEHI)
  - Affiliated - Global Change and Sustainability Center (GCSC)
- Fulbright Visiting Senior Scholar** 01/2023-04/2023  
Department of Mechanical Engineering, University of Melbourne, Melbourne, Australia
- Assistant Professor** 01/2014-06/2020  
Department of Physics, University of Nevada, Reno, NV
- Graduate Faculty - Atmospheric Sciences Program
  - Graduate Faculty - Environmental Sciences and Health Program
- Postdoctoral Research Assistant** 01/2012-11/2013  
Environmental Engineering, Georgia Institute of Technology, Atlanta, GA  
*Advisor:* Armistead Russell
- Visiting Postdoctoral Researcher** 11/2010-10/2011  
Meteorological Institute, University of Hamburg, Hamburg, Germany  
*Advisor:* Michael Schatzmann

**Graduate Research Assistant** 09/2006-10/2010  
Environmental Fluid Dynamics Laboratory, University of Utah, Salt Lake City, UT  
*PhD Advisor:* Eric Paradyjak

**Visiting Graduate Research Assistant** 04/2010-07/2010  
Environmental Health Center, Inha University Medical School, Incheon, South Korea  
*Advisor:* Byong Kwan Son

**Graduate Research Assistant** 07/2004-08/2006  
Physical Fluid Dynamics Laboratory, University of Utah, Salt Lake City, UT  
*MS Advisor:* M Dillon

## TEACHING EXPERIENCE

**Associate Professor** 07/2020-Present  
Department of Chemical Engineering, University of Utah, Salt Lake City, UT

- CH EN 1703 – Introduction to Chemical Engineering (F20, F21, F22, S25, S26)
- CH EN 5306/6306 – Applied Atmospheric Modeling (F21, S23, F24)
- CH EN 5305/6305 – Air Pollution Control Engineering (S24, F25)

**Assistant Professor** 01/2014-06/2020  
Atmospheric Sciences Program, Department of Physics, University of Nevada, Reno, NV

- ATMS317 - Intermediate Meteorology and Weather Forecasting (F15, F16, F17, F18, S19, S20)
- ATMS745 - Atmospheric Turbulence (S15, S17, S19)
- PHYS483 - Special Topics in Physics: Computational Skills for Big Data (S17)
- ATMS117 - Introduction to Meteorology (S14, S16, S18)
- ATMS790 - Atmospheric Sciences Graduate Seminar (S15, S16, S17)
- Numerical Modeling and High Performance Computing Workshop (Su14)

## INDUSTRY EXPERIENCE

**Co-Founder and Co-Chief Science Officer** 06/2025-Present  
Trace Air Quality, Salt Lake City, UT

- Raised \$1.25M seed funding to bring cutting-edge air quality forecasting to market
- Licensing two UU IP disclosures related to air quality and smoke forecasting

**Chemical Engineer** 04/2002-02/2004  
Bend Research, Inc., Bend, OR

## PEER REVIEWED PUBLICATIONS (60 total; Holmes \*graduate student/postdoc, \*\*undergraduate student)

1. P.S. Reuther, S.D. Faulstich\*, W.J. Metcalf, C.S. Riss, H.H. Chang, L.A. Darrow, B.M. Welch, H.A. Holmes, M.J. Strickland 2025: Associations between wildland fire smoke PM<sub>2.5</sub> and maternal blood pressure, *in review*.
2. B.C. Kelly, S.C. Brewer, J.D. Schwartz, R.M. Silver, H.A. Holmes, H.A. Hanson, J.A. Doherty, and M.P. Debbink 2025: Linking mixtures of air pollution exposures and preterm birth with a self-organizing map, *in review*.
3. J. Boomsma\* and H.A. Holmes 2025: Using atmospheric reanalysis products to characterize wintertime cold air pool events across the western U.S. from 2000-2022, *accepted*.
4. K. Kaur, J.R. Krall, C.E. Ivey, H.A. Holmes, and K.E. Kelly 2025: Long-term source apportionment at 12 sites in the western United States from 2000- 2020, *Atmospheric Pollution Research, in press*.
5. S.D. Faulstich\*, K. Kjome Fischer\*\*, M.J. Strickland, and H.A. Holmes 2025: The Impact of Fire Emission Inputs on Smoke Plume Dispersion Modeling Results. *Fire*, **8(8)**, 331.
6. S.D. Faulstich\*, M.J. Strickland, Y. Liu, S.M. Loria-Salazar, X. Sun, A. Cale, and H.A. Holmes 2024: Modeling Daily Plume Specific Smoke Concentrations for Health Effects Studies with Estimates of Fire Size, Plume Age, and Fuel Type, *ES&T Air*, **2(8)**, 1509–1523.

7. J. Lee, A. McGovern, H.A. Holmes and S.M. Loría-Salazar, 2023: Spatiotemporal Gap-Filling of NASA Satellite-Derived-AOD in North America Using the UNet3+ Machine Learning Architecture, *Earth and Space Science*, **12(7)**, e2025EA004338.
8. Y. Ji, X. Zhang, A.S. Lawal, H.A. Holmes, and C.E. Ivey 2025: Assessing the Impact of Wildfire Smoke Transport through Chemical Transport Modeling, Satellite Retrievals, and Ground-based Observations of Ozone in Rural Nevada, *ACS ES&T Air*, **2(7)**, 1237–1248.
9. C.S. Riss, S.D. Faulstich\*, P.S. Reuther, W.J. Metcalf, L.A. Darrow, H.A. Holmes, and M.J. Strickland. Associations between wildfire smoke characteristics and cardiorespiratory health in Reno, Nevada, *Environment International*, 109577.
10. S.D. Faulstich\*, M.J. Strickland, and H.A. Holmes 2025: Enhancing Fire Emissions Inventories for Acute Health Effects Studies: Integrating High Spatial and Temporal Resolution Data, *International Journal of Wildland Fire*, **34(2)**.
11. C.M. Phelan, A.S. Lawal, J. Boomsma\*, K. Kaur, K.E. Kelly, H.A. Holmes, and C.E. Ivey 2025: Addressing the Role of Chemical Mechanism Choice in Wintertime PM<sub>2.5</sub> Modeling for Inversion-Prone Areas, *ACS ES&T Air*, **2(2)**, 162-174.
12. A.J. Newman, C. Kalb, T.C. Chakraborty, A. Fitch, L.A. Darrow, J.L. Warren, M.J. Strickland, H.A. Holmes, A.J. Monaghan, and H.H. Chang 2024: The High-resolution Urban Meteorology for Impacts Dataset (HUMID) daily for the Conterminous United States, *Scientific Data*, **11(1)**, 1-16.
13. K. Kaur, J.R. Krall, C.E. Ivey, H.A. Holmes, and K.E. Kelly 2024: Impact of Chemical Speciation Network method changes on time series ion and carbon species concentrations, *Aerosol Science & Technology*, **58(11)**, 1318–1332.
14. L.A. Darrow, M. Huang, J.L. Warren, M.J. Strickland, H.A. Holmes, A.J. Newman, and H.H. Chang 2024: Preterm and early-term delivery following heatwaves in 50 U.S. metropolitan areas. *JAMA Network Open*, **7(5)**, e2412055-e2412055.
15. J. Huang\*, S.M. Loría-Salazar, M. Deng, J. Lee, and H.A. Holmes 2024: Assessment of smoke plume height products derived from multisource satellite observations using lidar-derived height metrics for wildfires in the western US, *Atmospheric Chemistry and Physics*, **24(6)**, 3673-3698.
16. D. Balouek-Thomert, I. Perez, S.D. Faulstich\*, H.A. Holmes, I. Altintas and M. Parashar 2023: Keynote Talk: Leveraging the Edge-Cloud Continuum to Manage the Impact of Wildfires on Air Quality. *IEEE International Conference on Pervasive Computing and Communications Workshops*, 27-31.
17. K. Chen\*, J. Boomsma\*, and H.A. Holmes 2023: A multiscale analysis of heatwaves and urban heat islands in the western US during the summer of 2021. *Scientific Reports*, **13(1)**, 9570.
18. G.A. Alexander, H.A. Holmes, X. Sun\*, D. Capputi, I. Faloon, and H.J. Oldroyd 2022: Simulating land-atmosphere coupling in the Central Valley, California: Investigating soil moisture impacts on boundary layer properties, *Agricultural and Forest Meteorology*, **317**, 108898.
19. S. Faulstich\*, A.G. Schissler, M.J. Strickland, and H.A. Holmes 2022: Statistical comparison and assessment of four fire emissions inventories for 2013 and a large wildfire in the western United States, *Fire*, **5(1)**, 27.
20. K. Chen\*, M. Huang, C. Coon\*\*, A.J. Newman, L.A. Darrow, M.J. Strickland, and H.A. Holmes 2022: Modeling heat-related exposures: A case study for the 2012 Chicago heatwave, *GeoHealth*, **6**, e2021GH000535.
21. X. Sun\*, C. Ivey, K. Baker, A. Nenes, N. Lareau, and H. Holmes 2021: Confronting Uncertainties of Simulated Air Pollution Concentrations during Persistent Cold Air Pool Events in the Salt Lake Valley, Utah, *Environmental Science and Technology*, **55**, 15072–15081.

22. S. Colgan\*, X. Sun\*, and H.A. Holmes 2021: A novel meteorological method to classify wintertime cold-air pool events, *Atmospheric Environment*, **261**, 118594.
23. A.G. Haller, et al. 2021: Coupled air quality and boundary-layer meteorology in western U.S. basins during winter: Design and rationale for a comprehensive study, *Bulletin of the American Meteorological Society*, **102**, E2012-E2033.
24. S.M. Loría-Salazar\*, A.M. Sayer, J. Barnes, J. Huang\*, C. Flynn, N. Lareau, J. Lee, A. Lyapustin, J. Redemann, E. Welton, J. Wilkins, and H.A. Holmes 2021: 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**, e2020JD034180.
25. M. Huang, M.J. Strickland, M. Richards, H.A. Holmes, A.J. Newman, J.V. Garn, Y. Liu, J.L. Warren, H.H. Chang, and L.A. Darrow 2021: Acute Associations between heatwaves and preterm and early-term birth in 50 US metropolitan areas: A matched case-control study. *Environmental Health*, **20**, 47.
26. J. Huang\*, W.P. Arnott, J.C. Barnard, and H.A. Holmes 2021: Theoretical uncertainty analysis of satellite retrieved aerosol optical depth associated with surface albedo and aerosol optical properties. *Remote Sensing*, **13**, 344.
27. X. Sun\*, H. Holmes, and H. Xiao 2020: Surface Turbulent Fluxes during Persistent Cold Air Pool Events in the Salt Lake Valley, Utah. Part II: Simulations. *Journal of Applied Meteorology and Climatology*, **59**, 1029-1050.
28. I.M. Errigo, B.W. Abbott, D.L. Mendoza, L. Mitchell, S.S. Sayedi, J. Glenn, K.E. Kelly, J.D. Beard, S. Bratsman, T. Carter, R.A. Chaney, A. Follett, A. Freeman, R.J. Frei, M. Greenhalgh, H.A. Holmes, P.D. Howe, J.D. Johnston, L. Lange, R. Martin, A. Stacey, T. Tran, and D. Wilson 2020: Human health and economic costs of air pollution in Utah: An expert assessment. *Atmosphere*, **11**, 1238.
29. X. Sun\* and H. Holmes 2019: Surface Turbulent Fluxes during Persistent Cold Air Pool Events in the Salt Lake Valley, Utah. Part I: Observations. *Journal of Applied Meteorology and Climatology*, **58**, 2553-2568.
30. M. Huang, C. Ivey\*, Y. Hu, H. Holmes, and M. Strickland 2019: Associations of PM<sub>2.5</sub> source concentrations with pediatric respiratory emergency department visits in the U.S. State of Georgia: a case-crossover study. *Environment International*, **133**, 105167.
31. K. Hepworth, C. Ivey\*, C. Canon, and H. Holmes: 2019: Improving Physics Undergraduates Visualization Skills for More Effective Learning and Science Communication. *Journal of Geoscience Education*, **68**, 168-183.
32. N.L. Murray, H. Holmes, Y. Liu, and H.H. Chang 2019: Bayesian Ensemble Approach to Combine PM<sub>2.5</sub> Estimates from Statistical Models using Satellite Imagery and Numerical Model Simulation. *Environmental Research*, **178**, 108601.
33. A. Pierce\*, S.M. Loría-Salazar\*, H. Holmes, and M. Gustin 2019: Investigating horizontal and vertical pollution gradients in the atmosphere associated with an urban location in complex terrain, Reno, Nevada, USA, *Atmospheric Environment*, **196**, 103-117.
34. C. Ivey\*, S. Balachandran, S. Colgan, Y. Hu, and H. Holmes 2019: Investigating Fine Particulate Matter Sources in Salt Lake City during Persistent Cold Air Pool Events, *Atmospheric Environment*, **213**, 568-578.
35. J.M. Boehmler, S.M. Loría-Salazar\*, C. Stevens, J.D. Long\*\*, A.C. Watts, H.A. Holmes, J.C. Barnard, and W.P. Arnott 2018: Development of a multispectral albedometer and deployment on an unmanned aircraft for evaluating satellite retrieved surface reflectance over Nevada's Black Rock Desert, *Sensors*, **18**, 3504.
36. X. Zhai, M. Friberg, H. Holmes, A. Russell, Y. Hu, and J. Mulholland 2018: Spatial PM<sub>2.5</sub> Mobile source impacts using a calibrated indicator method, *Journal Air & Waste Management Association*, **69**, 402-414.

37. C. Higgins, M. Wing, J. Kelley, C. Sayde, J. Burnett, and H. Holmes 2018: A high resolution measurement of the morning ABL transition using distributed temperature sensing and an unmanned aircraft system, *Environmental Fluid Mechanics*, **18**, 683-693.
38. X. Sun\*, H. Holmes, O. Osibanjo\*, Y. Sun, and C. Ivey\* 2017: Evaluation of Surface Fluxes in the WRF Model: Case Study for Irrigated Farmland in Rolling Terrain, *Atmosphere*, **8**, 197.
39. S.M. Loría-Salazar\*, A. Panorska, W. Arnott, J. Barnard, J. Boehmler, and H. Holmes 2017: Toward understanding atmospheric physics impacting the relationship between columnar AOD and surface  $PM_{2.5}$  concentrations for wildfire smoke plumes in complex terrain, *Atmospheric Environment*, **171**, 289-300.
40. C. Ivey\*, H. Holmes, G. Shi, S. Balachandran, Y. Hu, and A. Russell 2017: Development of  $PM_{2.5}$  source profiles using a hybrid chemical transport-receptor modeling approach, *Environmental Science and Technology*, **51**, 13788-13796.
41. M. Friberg, R. Kahn, H. Holmes, H. Chang, S. Sarnat, P. Tolbert, A. Russell and J. Mulholland 2017: Daily ambient air pollution metrics for five cities: Evaluation of data-fusion-based estimates and uncertainties, *Atmospheric Environment*, **158**, 36-50.
42. X. Zhai, J. Mulholland, A. Russell and H. Holmes 2017: Spatial and temporal source apportionment of  $PM_{2.5}$  in Georgia, 2002 to 2013, *Atmospheric Environment*, **161**, 112–121.
43. D. N. Medgyesi\*\*, H. A. Holmes and J. E. Angermann 2017: Investigation of Acute Pulmonary Deficits Associated with Biomass Fuel Cookstove Emissions in Rural Bangladesh, *Int. J. Environ. Res. Public Health*, **14(6)**, 641.
44. S.M. Loría-Salazar\*, H.A. Holmes, W. Arnott, J. Barnard and H. Moosmüller 2016: Evaluation of MODIS Column Aerosol Retrievals Using AERONET in Semi-Arid Nevada and California, U.S.A., during the Summer of 2012, *Atmospheric Environment*, **144**, 345-360.
45. M.S. Gustin, J. Huang, K. Heidicorn, A. Pierce, M. Miller, H.A. Holmes, S.M. Loría-Salazar\* 2016: Evidence for different reactive Hg sources and chemical compounds at adjacent valley and high elevation locations, *Environmental Science & Technology*, **50**, 12225-12231.
46. C. Ivey, H. Holmes, Y. Hu, J. Mulholland and A. Russell 2016: A method for quantifying bias in modeled concentrations and source impacts for secondary particulate matter, *Frontiers of Environmental Science and Engineering*, **10(5)**, 14.
47. J. Redman, H. Holmes, S. Balachandran, M. Maier, X. Zhai, C. Ivey, K. Digby, J. Mulholland and A. Russell 2016: Development and Evaluation of a Daily Temporal Interpolation Model for Fine Particulate Matter Species Concentrations and Source Apportionment, *Atmospheric Environment*, **140**, 529-538.
48. M. Friberg, X. Zhai, H. Holmes, H. Chang, M. Strickland, S. Sarnat, P. Tolbert, A. Russell and J. Mulholland 2016: Method for Fusing Observational Data and Chemical Transport Model Simulations to Estimate Spatiotemporally-Resolved Ambient Air Pollution, *Environmental Science and Technology*, **50**, 3695-3705.
49. H. Hao, H. Chang, H. Holmes, J. Mulholland, M. Klein, L. Darrow and M. Strickland 2015: Ambient Air Pollution and Preterm Birth in the U.S. State of Georgia. *Environmental Health Perspectives*, **124**, 875-880.
50. H. Holmes, J. Sriramasamudram, E. Pardyjak and C. D. Whiteman 2015: Turbulent fluxes and pollutant mixing during wintertime persistent cold air pools in the Salt Lake Valley, *Environmental Science and Technology*, **49**, 13206–13214.
51. C. Ivey, H. Holmes, Y. Hu, J. Mulholland, and A. Russell 2015: Development of  $PM_{2.5}$  Source Impact Spatial Fields Using a Hybrid Source Apportionment Air Quality Model, *Geoscientific Model Development*, **8**, 2153-2165.

52. L.R.F. Henneman, H. A Holmes, J. Mulholland and A.G. Russell 2014: Meteorological Detrending of Primary and Secondary Pollutant Concentrations: Method Application and Evaluation Using Long-Term (2000-2012) Data in Atlanta. *Atmospheric Environment*, **119**, 201-210.
53. Y. Hu, S. Balachandran, J. E. Pachon, J. Baek, C. Ivey, H. Holmes, M. T. Odman, J. A. Mulholland and A.G. Russell 2014: Fine Particulate Matter Source Apportionment Using a Hybrid Chemical Transport and Receptor Model Approach, *Atmospheric Chemistry & Physics*, **14 (11)**, 5415-5431.
54. H. Holmes and E. Pardyjak 2014: Investigation of time resolved atmospheric conditions and indoor/outdoor PM concentrations in homes with gas and biomass cook stoves in Nogales, Sonora, Mexico, *Journal Air & Waste Management Association*, **64(7)**, 758-773.
55. S. Balachandran, H. H. Chang, J. E. Pachon, H.A. Holmes, J. A. Mulholland and A. G. Russell 2013: Bayesian-based ensemble source apportionment of PM<sub>2.5</sub>, *Environmental Science and Technology* **47 (23)**, 13511-13518.
56. H. Holmes, E. Pardyjak, K. Perry and M. Abbott 2011: Gaseous dry deposition of atmospheric mercury: A comparison of two surface resistance models for deposition to semi-arid vegetation, *Journal of Geophysical Research – Atmospheres* **116 (D15)**, D14306.
57. H. Holmes, E. Pardyjak, S. Speckart and D. Alexander 2011: Comparison of indoor/outdoor carbon content and time resolved PM concentrations for gas and biomass cooking fuels in Nogales, Sonora, Mexico. *Atmospheric Environment* **45**, 7600-7611.
58. H. Holmes, E. Pardyjak, B. Tyler and R. Peterson 2009: Investigation of the time evolved spatial distribution of urban PM<sub>2.5</sub> concentrations and aerosol composition during episodic high PM events in Yuma, AZ. *Atmospheric Environment* **43**, 4348-4358.
59. M. Metzger and H. Holmes 2008: Times scales in the unstable atmospheric surface layer. *Boundary-Layer Meteorology* **126**, 29-50.
60. M. Metzger, B. McKeon and H. Holmes 2007: The near-neutral atmospheric surface layer: turbulence and non-stationarity. *Philosophical Transactions of the Royal Society London, Series A* **365**, 859-876.

#### **PUBLICATIONS IN PREPARATION** (draft available upon request)

1. J. Lee, S.M. Loría-Salazar, H.A. Holmes, C.E. Ivey, and H.H. Chang. Spatiotemporal estimates of surface PM<sub>2.5</sub> concentrations in the western U.S. using NASA MODIS retrievals and data assimilation techniques.
2. C.M. Phelan, A.S. Lawal, K. Kaur, J.R. Krall, K.E. Kelly, H.A. Holmes, and C.E. Ivey. Impact of Source Apportionment Methodologies during Extreme Wintertime Meteorological Conditions in the Western U.S.
3. S. Dahal\*, N. Sharma, S. Dey, S.A.A. Bokhari, and H.A. Holmes. Meteorological Modulation of Ambient Air Quality in Delhi and Lahore during the November 2024 Smog Event.
4. S. Dahal\*, D. Rupakheti, M. Rupakheti, S. Dey, and H.A. Holmes. Is South Asia prepared to cope with air pollution emergencies?

#### **FUNDING (IN-REVIEW)**

1. H. Holmes (PI) NSF TTP-P, AirNexus: From Data to Decisions - Enhancing Public Health by Developing Smarter Air Quality Alerts, \$2,000,000, 04/2026-03/2028, submitted September 2025.
2. M. Theise (PI), NSF IHBEM, Modeling Adaptive Human Behavior and Heat/PM<sub>2.5</sub>-Health Vulnerabilities in the Urban American West, \$997,613, 02/2026-01/2030, submitted July 2025.
3. J. Pearson (PI), NIH R01, BREATHE: Bridging Registry Evidence to Assess the Postoperative Health Effects of Air Pollution, \$3,756,414, 04/2026-03/2031, submitted June 2025.

**FUNDING (AWARDED)**

PI(s)	Years	Title	Agency	Total Award	Holmes Funding
H. Holmes (PI)	2025-2028	Leveraging Satellite Observations of Fire Radiative Power to Improve the EPA Wildland Fires Emissions Inventory (WFEI)	NASA - FireSense	\$538,856	\$218,779
D. Mallia (PI)	2025-2030	Weather Forecasting, Mission support, and Post-Deployment Science for the INSPYRE Field Campaign	NASA	\$391,788	\$126,280
H. Holmes	2024-2027	FireSense Team Member - Air Quality and Smoke Transport Modeling	NASA - FireSense	\$153,202	\$153,202
K. Kelly (PI), H. Holmes (Co-PI), S. Yeo (Co-PI)	2023-2026	CIVIC - FA Track A: Pilot Community Resilience through Engaging, Actionable, Timely, High-Resolution Air Quality Information (CREATE-AQI)	NSF	\$969,672	\$146,487
H. Holmes	2023	Improving Smoke Detection and Quantifying the Wildfire Smoke Impacts on Local Air Quality Using Modeling and Machine Learning Techniques	UDAQ	\$61,738	\$61,738
H. Holmes (PI)	2021-2027	A multicity study of wintertime inversions and acute cardiorespiratory health events in the western U.S.	NIH R01	\$2,601,942	\$665,220
H. Holmes	2020-2026	CAREER: Forecasting Impacts to Reduce Exposure to Smoke (FIRES) - Modeling wildfire smoke transport in the western U.S.	NSF	\$505,294	\$505,294
M. Strickland (PI)	2019-2026	Associations of smoke from wildfires and prescribed burns with cardiorespiratory health outcomes in Reno, NV	NIH R01	\$2,881,651	\$560,000
F. Yan (PI), L. Yang, H. Holmes, E. Smimi	2019-2021	BIGDATA: IA: Collaborative Research: Protecting yourself from wildfire smoke: Big data-driven adaptive air quality prediction method	NSF	\$983,012	\$209,269
L. Darrow (PI), H. Chang (PI)	2018-2023	Extreme heat events and pregnancy duration: a national study	NIH R01	\$1,114,781	\$119,266
Y. Liu (PI), H. Chang, M. Strickland, H. Holmes	2016-2019	Supporting Regional and National Health Surveillance with NASA Data	NASA - HAQAST	\$149,976	\$53,118
H. Holmes	2017	NASA Collaboration: Acquire Satellite Remote Sensing Data for Air Quality Modeling in the Western U.S.	Nevada NASA Space Grant Consortium	\$28,830	\$28,830
H. Holmes (PI), K. Hepworth, A. Panorska	2016-2017	Computational Skills for Big Data: Analysis, Statistics, and Visualization	Nevada NASA Space Grant Consortium	\$71,980	\$71,980
H. Holmes	2016	Community scale greenhouse gas emissions inventory for the City of Reno and Washoe County	City of Reno	\$7,499	\$7,499
H. Holmes	2014	Downscaler Georgia Tech	Sub-award: U.S. EPA CLARC	\$10,817	\$10,817

Career Total Amounts: Total Awards = \$10,471,038; Holmes PI = \$3,980,158; Holmes Lab = \$2,937,779

## **BOOK CHAPTERS** (7 total)

1. H.A. Holmes, S.D. Faulstich, J. Lee, C.S. Riss, S.M. Loria-Salazar, and M.J. Strickland 2025: Improved wildfire smoke exposure estimates for human health studies in the western United States. *In Air Pollution Modeling and its Application*. Springer International Publishing, *in press*.
2. H. Yu, A. Russell, J. Mulholland, C. Ivey, J. Bates, M. Friberg, R. Huang, J. Moutinho, and H. Holmes 2017: Air Quality Model-Based Methods for Estimating Human Exposures: A Review and Comparison. *In Air Pollution Modeling and its Application XXV* (pp. 495-501). Springer International Publishing.
3. C. Ivey, H. Holmes, Y. Hu, J. Mulholland and A. Russell 2015: Application of a Hybrid Chemical Transport-Receptor Model to Develop Region-Specific Source Profiles for PM<sub>2.5</sub> Sources and to Assess Source Impact Changes in the United States. *In Air Pollution Modeling and its Application XXIV* (pp. 489-496). Springer International Publishing.
4. H. Holmes, X. Zhai, J. Redman, K. Digby, C. Ivey, S. Balachandran, ... and H. Chang 2014: Improved Spatiotemporal Source-Based Air Pollutant Mixture Characterization for Health Studies. *In Air Pollution Modeling and its Application XXIII* (pp. 25-30). Springer International Publishing.
5. C. Ivey, H. Holmes, Y. Hu, J. Mulholland, and A. Russell 2014: Spatial and temporal extension of a novel hybrid source apportionment model. *In Air Pollution Modeling and its Application XXIII* (pp. 611-615). Springer International Publishing.
6. A. Russell, H. Holmes, M. Friberg, C. Ivey, Y. Hu, S. Balachandran, ... and Y. Liu 2014: Use of air quality modeling results in health effects research. *In Air Pollution Modeling and its Application XXIII* (pp. 1-5). Springer International Publishing.
7. S. Sororian, H. Holmes, M. Friberg, C. Ivey, Y. Hu, J. Mulholland, ... and M. Strickland 2014: Temporally and Spatially Resolved Air Pollution in Georgia Using Fused Ambient Monitor Data and Chemical Transport Model Results. *In Air Pollution Modeling and its Application XXIII* (pp. 301-306). Springer International Publishing.

## **CONFERENCE PRESENTATIONS** (July 2020 onward, 65 total)

1. K.E. Kelly, T. Mangin, R. Whitaker, M. Gestland, S. Yeo, N. Daher, L. Walker, K. Weenig, A. Maldonado, G. Castenada, B. Jackson, H. Holmes, N. Shepard, J. Joseph, T. Davis, A. Miller, D. Mallia, T. Wilmot 2025: Developing Guidelines to Protect Students from Poor Air Quality during Outdoor Activities. *Air Sensors International Conference*, Los Angeles, 4-8 May 2026, TBD presentation.
2. L. Maldonado, B. Kelly, M. Laury, L. Theilen, B. Silver, H.A. Holmes, J. Schwartz, and M. Debbink 2025: Wintertime Air Pollution and Preterm Birth Outcomes: Characterizing Exposure Windows Using Distributed Lag Modeling. *Society for Reproductive Investigation 73<sup>rd</sup> Annual Scientific Meeting*, San Juan, Puerto Rico, 24-28 March 2026, TBD presentation.
3. M.H. Laury, B.C. Kelly, L. Maldonado, L. Theilen, B. Silver, H.A. Holmes, J. Schwartz, and M.P. Debbink 2025: Association Between Wildfire Smoke Exposure and Preterm Birth. *Society for Reproductive Investigation 73<sup>rd</sup> Annual Scientific Meeting*, San Juan, Puerto Rico, 24-28 March 2026, TBD presentation.
4. H. Holmes, T. Wilmot, D. Mallia, and K. Kelly 2025: Improving Wildfire Smoke Forecasts for Air Quality Early Warning Systems. *AGU 58th Annual Fall Meeting*, New Orleans, 15-19 December 2025, oral presentation.
5. H. Holmes, S. Dahal, S. Faulstich, K. Kaur, J. Lee, C. Riss, S.M. Loria-Salazar, S. Karmakar, K. Kelly, and M. Strickland 2025: Envisioning a Multi-Approach Ensemble Method to Estimate Wildland Fire Smoke Exposure for the Contiguous United States. *AGU 58th Annual Fall Meeting*, New Orleans, 15-19 December 2025, oral presentation.
6. M. Zamzam, H. Holmes, and H. Oldroyd 2025: Improving turbulent flux estimates and similarity theory performance for stable atmospheric boundary layers. *AGU 58th Annual Fall Meeting*, New Orleans, 15-19 December 2025, oral presentation.

7. S. Dahal, N. Sharma, S. Dey, A. Syed, and H. Holmes 2025: Meteorological Influences on the November 2024 Smog Event in India and Pakistan. *AGU 58th Annual Fall Meeting*, New Orleans, 15-19 December 2025, poster presentation.
8. T. Wilmot, D. Mallia, and H. Holmes 2025: Developing regional-scale wildfire activity forecasts for air quality predictions. *AGU 58th Annual Fall Meeting*, New Orleans, 15-19 December 2025, oral presentation.
9. D. Mallia, T. Wilmot, H. Holmes, D. Peterson, J. Campbell, and E. Hyer 2025: Forecasting pyrocumulonimbus events for the upcoming 2026/2027 INSPYRE field campaign. *AGU 58th Annual Fall Meeting*, New Orleans, 15-19 December 2025, poster presentation.
10. J. Lee, S.M. Loría-Salazar, H.A. Holmes, and A. Sayer 2025: Enhancing Spatiotemporal Aerosol Optical Depth Data Continuity by Leveraging Geostationary ABI Aerosol Retrievals and Deep Learning Techniques. *AGU 58th Annual Fall Meeting*, New Orleans, 15-19 December 2025, poster presentation.
11. J. Lee, S.M. Loría-Salazar, and H.A. Holmes 2025: Application of Novel Gap-Filled Aerosol Optical Depth and Data Fusion Techniques for Enhanced Surface PM<sub>2.5</sub> Estimates. *AGU 58th Annual Fall Meeting*, New Orleans, 15-19 December 2025, poster presentation.
12. R. Kaphle, S. Dahal, U. Marasini, H. Cho, V.P. Pandey, and H. Holmes 2025: Evaluating Household Rainwater Harvesting Potential in Nepal. *AGU 58th Annual Fall Meeting*, New Orleans, 15-19 December 2025, poster presentation.
13. S. Byanjankar, S. Deshar, S. Lama., R. Pudasaini, P. Shrestha, Y. Pokhrel, S.S. Raut, MD A. Aalam, V.P. Pandey, H. Holmes, and S. Dahal 2025: Urban Encroachment Jeopardizes Traditional Stone Waterspouts in Kathmandu. *AGU 58th Annual Fall Meeting*, New Orleans, 15-19 December 2025, poster presentation.
14. H.A. Holmes 2025: Smoke Forecasting and Exposure Modeling to Understand and Protect Human Health, *Fire Science Workshop at the Tyndall Centre Our Critical Decade for Climate Action Conference*, Norwich, England, 11 September 2025, oral presentation.
15. H.A. Holmes, S.D. Faulstich, C.S. Riss, L.A. Darrow, P.S. Reuther, M.J. Strickland, W.J. Metcalf, and K. Kjome Fischer 2024: Improved smoke exposure modelling for an acute cardiorespiratory health study in Reno, Nevada. *AGU 57th Annual Fall Meeting*, Washington D.C., 9-13 December 2024, poster presentation.
16. A.G. Ponette-González, J. Brahney, Y. Cao, H.A. Holmes, and K.C. Weathers 2024: Wildfires Fertilize Lake and Landscape. *AGU 57th Annual Fall Meeting*, Washington D.C., 9-13 December 2024, poster presentation.
17. K. Kjome Fischer, S.D. Faulstich, and H.A. Holmes 2024: Evaluation of Fire Emissions Inventory Improvements to Simulate Smoke Concentrations in the Western U.S. *AGU 57th Annual Fall Meeting*, Washington D.C., 9-13 December 2024, poster presentation.
18. J. Huang, D.V. Mallia, and H.A. Holmes 2024: Evaluation of Three Plume Rise Algorithms Using Spaceborne and Aircraft Observations for Wildfires in the Western U.S. during August 2018. *AGU 57th Annual Fall Meeting*, Washington D.C., 9-13 December 2024, poster presentation.
19. C.S. Riss, S.D. Faulstich, P.S. Reuther, W.J. Metcalf, L.A. Darrow, H.A. Holmes, and M.J. Strickland 2024: Associations between wildfire smoke PM<sub>2.5</sub> concentrations and acute cardiorespiratory visits in Reno, Nevada, USA. *36th Annual Conference of the International Society for Environmental Epidemiology*, Santiago, Chile, 25-28 August 2024, poster presentation.
20. T.Y. Wilmot, H.A. Holmes, D.V. Mallia, K.E. Kelly, R.T. Whitaker 2024: Improving numerical air quality forecasts in the western United States with an emphasis on wildfire smoke. *Annual Community Modeling & Analysis System (CMAS) Conference*, Chapel Hill, NC, 21-23 October 2024, oral presentation.
21. H.A. Holmes, S.D. Faulstich, J. Lee, C.S. Riss, S.M. Loría-Salazar, and M.J. Strickland 2024: Improved wildfire smoke exposure estimates for human health studies in the western United States. *International Technical Meeting On Air Pollution Modeling And Its Application*, Copenhagen, Denmark, 14-18 October 2024, oral presentation.

22. B.C. Kelly, S.C. Brewer, J.D. Schwartz, H.A. Holmes HA, R.M. Silver and M.P Debbink 2024: Visualizing relationships between air pollution exposure and pregnancy outcomes. *71<sup>st</sup> Annual Meeting of the Society for Reproductive Investigation*, Vancouver, BC, 15 March 2024, poster presentation.
23. S.M. Loría-Salazar, J. Lee and H.A. Holmes 2023: Spatiotemporal estimates of surface PM<sub>2.5</sub> concentrations in the western U.S. using NASA retrievals, deep learning, and data assimilation techniques. *AGU 56th Annual Fall Meeting*, San Francisco, CA, 11-15 December 2023, poster presentation.
24. J. Lee, A. McGovern, H.A. Holmes and S.M. Loría-Salazar, 2023: Spatiotemporal Gap-Filling of NASA Satellite-Derived-AOD in North America Using the UNet3+ Machine Learning Architecture. *AGU 56th Annual Fall Meeting*, San Francisco, CA, 11-15 December 2023, poster presentation.
25. Lawal, C. Phelan, J. Boomsma, Y. Ji, N.T. Skipper, X. Sun, H.A. Holmes and C.E. Ivey 2023: Present-day and future impacts of meteorology and local emissions on elevated wintertime concentrations of particulate matter (PM<sub>2.5</sub>) in multiple western U.S. cities. *AGU 56th Annual Fall Meeting*, San Francisco, CA, 11-15 December 2023, poster presentation.
26. H.J. Oldroyd, H.A. Holmes, E.R. Pardyjak and S. Colgan 2023: Diablo Wind Impacts on Turbulence Fluxes. *Meteorology & Climate - Modeling for Air Quality Conference*, Davis, CA, 13-15 September 2023, oral presentation.
27. H.A. Holmes, J. Boomsma, R. Whitaker, K. Kaur, K.E. Kelly, W. Tao 2023: Meteorological impacts on the spatial distribution of air pollution in Salt Lake City. *Meteorology & Climate - Modeling for Air Quality Conference*, Davis, CA, 13-15 September 2023, poster presentation.
28. Lawal, C. Phelan, J. Boomsma, K. Kaur, K.E. Kelly, H.A. Holmes and C.E. Ivey 2023: Source Apportionment and Integrated Process Analyses to Probe CMAQ Model Biases during Wintertime PCAP Events. *Meteorology & Climate - Modeling for Air Quality Conference*, Davis, CA, 13-15 September 2023, poster presentation.
29. J. Huang, S.M. Loría-Salazar, M. Deng, J. Lee, and H.A. Holmes 2023: Towards Improved Understanding of Wildfire Smoke Plume Height (SPH) Estimation in Western U.S. Using Multisource Satellite Observations. *Meteorology & Climate - Modeling for Air Quality Conference*, Davis, CA, 13-15 September 2023, poster presentation.
30. S. Faulstich and H. Holmes 2023: Combining High Spatial Resolution Fire Information with Daily Fire Activity to Improve a Fire Emissions Estimates. *Meteorology & Climate - Modeling for Air Quality Conference*, Davis, CA, 13-15 September 2023, poster presentation.
31. J. Lee, H.A. Holmes and S.M. Loría-Salazar 2023: Spatiotemporal Gap-Filling of NASA Satellite-Derived-AOD in North America Using The UNet 3+ Machine Learning Architecture. *Meteorology & Climate - Modeling for Air Quality Conference*, Davis, CA, 13-15 September 2023, poster presentation.
32. S.M. Loría-Salazar, J. Lee, C.E. Ivey and H.A. Holmes 2023: Spatiotemporal estimates of surface PM<sub>2.5</sub> concentrations in the western U.S. using NASA MODIS and VIIRS retrievals and data assimilation techniques. *Meteorology & Climate - Modeling for Air Quality Conference*, Davis, CA, 13-15 September 2023, oral presentation.
33. B. Morra, B. A. Newingham, C. J. Williams, B. K. Howard, and H. A. Holmes 2023: Post Fire Erosion Team (PferT): Future research directions in water and wind erosion after wildfire. *2023 International Conference on Aeolian Research*, Las Cruces, NM, 9-14 July, poster presentation.
34. H. Holmes, K. Chen, J. Huang, S. Faulstich, J. Boomsma, J. Lee, S.M. Loría-Salazar, L. Darrow and M. Strickland 2022: Modeling spatiotemporal exposures of heat and wildfire smoke using atmospheric models and satellite remote sensing products. *AGU 55th Annual Fall Meeting*, Chicago, IL, 12-16 December 2022, oral presentation.
35. J. Huang, S.M. Loría-Salazar, M. Deng, J. Lee, and H.A. Holmes 2022: Development of Synergetic Satellite-Derived Wildfire Plume Height Products for the Western US. *AGU 55th Annual Fall Meeting*, Chicago, IL, 12-16 December 2022, poster presentation.

36. K. Chen and H. Holmes 2022: Leveraging retrospective simulations of wildfire emissions and transport to develop a wildfire smoke forecasting tool. *AGU 55th Annual Fall Meeting*, Chicago, IL, 12-16 December 2022, poster presentation.
37. S. Faulstich, M. Strickland and H. Holmes 2022: Integrating Fire Emissions Inventories and Atmospheric Dispersion Models to Improve Smoke Exposure Estimates. *AGU 55th Annual Fall Meeting*, Chicago, IL, 12-16 December 2022, poster presentation.
38. J. Boomsma and H.A. Holmes 2022: Investigating the Efficacy of Using Valley Heat Deficit to Quantify Wintertime Cold Air Pools in the Western U.S. *AGU 55th Annual Fall Meeting*, Chicago, IL, 12-16 December 2022, poster presentation.
39. S.M. Loría-Salazar, J. Lee, C.E. Ivey, H.A. Holmes and H.H. Chang 2022: Spatiotemporal estimates of surface PM<sub>2.5</sub> concentrations in the western US using NASA MODIS and VIIRS retrievals and data assimilation techniques. *AGU 55th Annual Fall Meeting*, Chicago, IL, 12-16 December 2022, oral presentation.
40. J. Lee, H.A. Holmes and S.M. Loría-Salazar 2022: Spatiotemporal Gap-Filling of NASA Satellite-Derived-AOD in the Western US using Machine Learning Techniques. *AGU 55th Annual Fall Meeting*, Chicago, IL, 12-16 December 2022, oral presentation.
41. J. Lee, H.A. Holmes, C.E. Ivey and S.M. Loría-Salazar 2022: Spatiotemporal Estimates of Surface PM<sub>2.5</sub> Concentrations in the Western US using NASA Aerosol and Fire Retrievals and Machine Learning Techniques. *AGU 55th Annual Fall Meeting*, Chicago, IL, 12-16 December 2022, poster presentation.
42. C. Phelan, A. Lawal, H.A. Holmes and C.E. Ivey 2022: Assessing CMAQ and WRF Performance for Aerosol Chemistry During Persistent Cold Air Pool (PCAP) Events. *AGU 55th Annual Fall Meeting*, Chicago, IL, 12-16 December 2022, oral presentation.
43. Y. Ji, A. Lawal, A. Zhang, H.A. Holmes and C.E. Ivey 2022: Ozone Enhancement from Wildfire Smoke in Rural Mountainous Terrain. *AGU 55th Annual Fall Meeting*, Chicago, IL, 12-16 December 2022, poster presentation.
44. A.J. Newman, C.P. Kalb, T. Chakraborty, H.A. Holmes, L. Darrow, J. Warren, M. Strickland, H.H. Chang and A. Monaghan 2022: Characteristics and example applications of a novel urban heat island focused gridded meteorology dataset over the contiguous United States. *AGU 55th Annual Fall Meeting*, Chicago, IL, 12-16 December 2022, poster presentation.
45. D. Lyford, M. Moody, H. Holmes and S.K. Krueger 2022: Fast Fire Simulations Over Idealized Terrain Using QES-Fire. *AGU 55th Annual Fall Meeting*, Chicago, IL, 12-16 December 2022, poster presentation.
46. Lawal, C. Phelan, K. Do, Y. Ji, N.T. Skipper, H. Shen, H.A. Holmes and C.E. Ivey 2022: Potential impact of future climate on winter time particulate matter in the western U.S. *21st Annual Community Modeling & Analysis System (CMAS) Conference*, Chapel Hill, NC, 17-19 October 2022, oral presentation.
47. Phelan, A. Lawal, H.A. Holmes and C.E. Ivey 2022: Assessing CMAQ Performance for Aerosol Chemistry During Persistent Cold Air Pool (PCAP) Events. *21st Annual Community Modeling & Analysis System (CMAS) Conference*, Chapel Hill, NC, 17-19 October 2022, poster presentation.
48. J. Huang, S.M. Loría-Salazar and H. Holmes 2022: Evaluation of wildfire smoke plume rise algorithms using spaceborne observations. *AMS 20<sup>th</sup> Conference on Mountain Meteorology*, Park City, UT & virtual, 27 June-1 July 2022, poster presentation.
49. K. Chen, J. Boomsma, and H. Holmes 2022: Modeling case study of the 2021 heatwave in the western United States. *AMS 20<sup>th</sup> Conference on Mountain Meteorology*, Park City, UT & virtual, 27 June-1 July 2022, poster presentation.
50. S. Faulstich and H. Holmes 2022: Dispersion modeling to estimate wildfire smoke transport over mountainous terrain in the western United States. *AMS 20<sup>th</sup> Conference on Mountain Meteorology*, Park City, UT & virtual, 27 June-1 July 2022, oral presentation.

51. J. Boomsma and H. Holmes 2022: Evaluating numerical models to quantify cold air pool strength in the western U.S. *AMS 20<sup>th</sup> Conference on Mountain Meteorology*, Park City, UT & virtual, 27 June-1 July 2022, poster presentation.
52. H.J. Oldroyd, H.A. Holmes, E.R. Pardyjak and S. Colgan 2021: Turbulence Characteristics during Diablo Wind Events. *AGU 54<sup>th</sup> Annual Fall Meeting*, New Orleans, LA & virtual, 13-17 December 2021, invited.
53. Newman, A. Monaghan, T. Chakraborty, H. Holmes, L. Darrow, J. Warren, M. Strickland and H. Chang 2021: Evaluation and bias correction of a novel high-resolution gridded meteorology dataset including urban heat islands over the contiguous United States. *AGU 54<sup>th</sup> Annual Fall Meeting*, New Orleans, LA & virtual, 13-17 December 2021, poster presentation.
54. S.M. Loría-Salazar, A.M. Sayer, J. Barnes, J. Huang, C. Flynn, N. Lareau, J. Lee, A. Lyapustin, J. Redemann, E. Welton, J. Wilkins and H.A. Holmes 2021: Assessment of Satellite-Derived Smoke Height Boundary Layer Ratio During Extreme Smoke Events in the Western U.S. *AGU 54<sup>th</sup> Annual Fall Meeting*, New Orleans, LA & virtual, 13-17 December 2021, poster presentation.
55. H. Holmes, J. Huang, K. Chen, and S. Faulstich 2021: Investigations of wildfire smoke plume transport in the western U.S. using satellite remote sensing and atmospheric models. *American Institute of Chemical Engineers Annual Meeting*, virtual, 18 November 2021, oral presentation.
56. J. Huang, K. Chen and H. Holmes 2021: Toward understanding aerosol vertical distribution and boundary layer dynamics during wildfire events. *20th Annual Community Modeling & Analysis System (CMAS) Conference*, virtual, 1-5 November 2021, poster presentation.
57. K. Chen, J. Huang, S. Faulstich and H. Holmes 2021: Simulating wildfire smoke transport in the western United States: Comparison of two fire emissions inventories. *20th Annual Community Modeling & Analysis System (CMAS) Conference*, virtual, 1-5 November 2021, poster presentation.
58. K. Chen, M. Huang, C. Coon, A. Newman, L. Darrow, M. Strickland and H. Holmes 2021: Estimating heat-related exposures: A case study of the 2012 Chicago heatwave. *20th Annual Community Modeling & Analysis System (CMAS) Conference*, virtual, 1-5 November 2021, oral presentation.
59. X. Sun, C. Ivey, K. Baker, A. Nenes, H. Xiao and H. Holmes 2021: Confronting the uncertainties in simulating elevated wintertime air pollution concentrations in mountainous regions. *Meteorology And Climate - Modeling for Air Quality Conference*, Davis, CA 17 September 2021, oral presentation.
60. A. Newman, A. Monaghan, H. Holmes, L. Darrow, J. Warren, M. Strickland and H. Chang 2021: A novel high-resolution long-term gridded meteorology dataset including urban heat islands over the contiguous United States for health studies. *101st Annual American Meteorological Society Meeting*, virtual, 10-15 January 2021.
61. S.M. Loría-Salazar, A.M. Sayer, C. Flynn, J. Lee, J. Huang, N. Lareau, J. Redemann, J.L. Wilkins and H.A. Holmes 2020: Improving Daily Surface Particulate Matter Estimates during Extreme Fire Events using a Novel NASA Satellite Plume Injection Height Algorithm. *AGU 53rd Annual Fall Meeting*, virtual, 1-17 December 2020.
62. A. Newman, A. Monaghan, H. Holmes, H. Chang, L. Darrow, J. Warren and M. Strickland 2020: A novel high-resolution long-term gridded meteorology dataset including urban heat islands over the contiguous United States for health studies. *AGU 53rd Annual Fall Meeting*, virtual, 1-17 December 2020.
63. S. Faulstich, X. Sun, A. G. Schissler, M. J. Strickland and H. A. Holmes 2020: Evaluating Fire Emissions Inventories in the Western U.S. With the Development of a Bayesian Model. *19th Annual Community Modeling and Analysis System (CMAS) Conference*, virtual, 26-30 October 2020, oral presentation.
64. J. Huang, W. P. Arnott, J. C. Barnard and H.A. Holmes 2020: Toward understanding the physical processes impacting uncertainties in satellite retrieved aerosol optical depth. *19th Annual Community Modeling and Analysis System (CMAS) Conference*, virtual, 26-30 October 2020, oral presentation.

65. M. Huang, M.J. Strickland, H.A. Holmes, H.H. Chang and L.A. Darrow 2020: The Acute Effect of Heatwaves on Preterm and Early-term Birth in 53 US Metropolitan Areas in the 1980s: A Matched Case-Control Study. *32<sup>nd</sup> Conference of the International Society for Environmental Epidemiology (ISEE)*, virtual, 24-27 August 2020.

#### **PUBLIC REPORTS (6 total)**

1. K. Chen, J. Huang and H. Holmes 2023: Improving Smoke Detection and Quantifying the Wildfire Smoke Impacts on Local Air Quality Using Modeling and Machine Learning Techniques. *Utah Division of Air Quality Final Report*.
2. H. Holmes and H. Jung 2016: Community Scale Greenhouse Gas Emissions Inventory for the City of Reno and Washoe County for 2014. *City of Reno and Washoe County Final Report*.
3. L.-W. A. Chen, A. Y.-C. Tai, X. Wang, H. Holmes, J. C. Chow and J. G. Watson 2016: Evaluating atmospheric deposition of particulate matter to the Lake Tahoe Basin. *Southern Nevada Public Land Management Act (SNPLMA P094, Round 12) Final Report*.
4. H. Holmes 2011: Quality assurance of wind energy assessment models. *WAUDIT Guidance Report WP6, D24, Oct 2011*.
5. E. Pardyjak, H. Holmes and S. Speckart 2010: An Investigation of the Relationship Between Indoor and Outdoor Air Quality in Nogales, Sonora, Mexico. *SCERP Final Report, A-08-05*.
6. E. Pardyjak, S. Speckart and H. Holmes 2008: High PM Episodes in U.S.-Mexico Border Cities. *SCERP Final Report, A-06-03*.

#### **INVITED TALKS (23 total)**

1. H. Holmes "Air Quality and Wildfire Smoke Forecasting for the state of Utah", NOAA NESDIS User Engagement Speaker Series, 20 November 2024.
2. H. Holmes "Modeling Air Quality and Wildfire Smoke Exposure in the Western United States", Australian Bureau of Meteorology Seminar, 08 March 2023.
3. H. Holmes "Modeling Air Quality and Wildfire Smoke Exposure in the Western United States", University of New South Wales (Australia), Climate Change Research Centre Seminar, 15 March 2023.
4. H. Holmes "Modeling Air Quality and Wildfire Smoke Exposure in the Western United States", University of Wollongong (Australia), Centre for Atmospheric Chemistry Seminar, 20 March 2023.
5. H. Holmes "Research Needs for Modeling Meteorology and Air Quality in Mountainous Region", CRC Air Quality Research Needs Workshop (AQRN), Davis, CA, 8 November 2022.
6. H. Holmes "Wildfire Smoke and Air Quality in the Western U.S.", University of Utah, Global Change and Sustainability Center Seminar, 18 January 2022.
7. H. Holmes "Wildfire and Air Quality Virtual Panel", MIT Club of Northern California, 10 November 2021.
8. H. Holmes "Modeling the spatial distribution of air pollution concentrations in the western U.S.", University of Cincinnati, Environmental Engineering Graduate Seminar, 5 February 2021. (*virtual*)
9. H. Holmes "Chemical transport and dispersion models for exposure assessment", Health Effect Institute (HEI), Virtual Workshop on Non-Tailpipe PM Emissions and Exposure, 13 November 2020. (*virtual*)
10. H. Holmes "Modeling the spatial distribution of air pollution concentrations in the western U.S.", University of Utah, Atmospheric Sciences Graduate Seminar, 4 November 2020. (*virtual*)
11. H. Holmes "Data Science Considerations for Atmospheric Processes in the Western U.S.", Indiana University Bloomington, Information and Library Science Graduate Course, 29 April 2020. (*virtual*)

12. H. Holmes “Air quality and atmospheric turbulence during wintertime temperature inversions”, University of California, Riverside, Chemical and Environmental Engineering Seminar, 13 March 2020. (*postponed*)
13. H. Holmes and X. Sun “Turbulent Fluxes and Air Pollution in Cold Air Pool Events”, AQUARIUS (Air Quality in the Western US) Workshop, Salt Lake City, UT, 26 September 2019.
14. H. Holmes “Air quality, winds, and atmospheric physics in the western U.S.”, Washoe County Parks & Open Space, Galena Creek Visitor Center Public Talk, 3 November 2018.
15. H. Holmes “Atmospheric Turbulence During Wintertime in the Salt Lake Valley”, University of California, Davis, Atmospheric Science Graduate Group Seminar, 01 November 2017.
16. H. Holmes, X. Sun, C. Ivey, and M. Trail “Turbulent Fluxes and Air Pollution Concentrations During Persistent Cold Air Pools”, Meteorology & Climate-Modeling for Air Quality Conference, Davis, CA, 13 Sep 2017.
17. H. Holmes “Turbulent Fluxes During Wintertime in Complex Terrain”, San Jose State University, Department of Meteorology and Climate Science Seminar, 07 September 2017.
18. H. Holmes “Modeling and Observations of Turbulent Fluxes During Wintertime in Complex Terrain”, NASA Goddard Space Flight Center, Climate and Radiation Laboratory Seminar, 24 August 2017.
19. H. Holmes “Air Pollution from Biomass Burning: Experiments, satellites, and modeling”, University of Nevada, Reno Geography Department Colloquium, 12 April 2017.
20. H. Holmes “How do we determine if air pollution and wildfire smoke is impacting our health?”, Washoe County Parks & Open Space, Galena Creek Visitor Center Public Talk, 3 April 2016.
21. H. Holmes. “Air Pollution and Human Health”, University of Nevada, Reno Environmental Science and Health Graduate Student Seminar, 23 September 2015.
22. H. Holmes “Model evaluation methodology for wind energy applications”, École Polytechnique Fédérale de Lausanne Environmental Fluid Mechanics and Wind Engineering Graduate Student Seminar, 12 Sep 2011.
23. H. Holmes “Quality Assurance of Wind Resource Assessment Models Part 1: Background Information”, WAUDIT “Standardization” Workshop, University of Hamburg, 19 May 2011.

## HONORS AND AWARDS

University of Utah Responsible AI Initiative Faculty Fellow, 2026-2028  
 University of Utah Startup of the Year (awarded to Trace Air Quality), 2025  
 Story Exchange Women in Science Incentive Prize Winner, 2024  
 Top 15% Undergraduate Instructors, University of Utah Price College of Engineering, Fall 2022  
 Fulbright Future Scholarship (Funded by The Kinghorn Foundation), Australia, 2021  
 National Science Foundation CAREER Award, 2020  
 AMS Editor’s Award, Bulletin of the American Meteorological Society, 2019  
 University of Nevada, Reno Westfall Scholar (Atmospheric Sciences Undergraduate) Mentor Award, 2018  
 University of Nevada, Reno Graduate Student Association Vada Trimble Outstanding Mentor Award, 2017  
 University of Nevada, Reno Westfall Scholar (Physics Undergraduate) Mentor Award, 2017  
 Best Papers of *Frontiers of Environmental Science and Engineering* in 2016 (for Ivey et al. *FESE* 10(5) 14)  
 NextProf Engineering Future Faculty Workshop, Ann Arbor, Michigan, 2013  
 AWMA Great Basin Chapter Scholarship (PhD), 2009  
 Oral Paper 2<sup>nd</sup> Place, AMS 7<sup>th</sup> Urban Environment Symposium, 2007  
 Golden Key National Honor Society, 2007  
 Phi Kappa Phi Honor Society, 2005  
 AWMA Great Basin Chapter Scholarship (MS), 2005

## JOURNAL REVIEWER

Bulletin of the American Meteorological Society, Proceedings of the National Academy of Sciences,  
 Atmospheric Chemistry and Physics, Journal of Atmospheric Sciences, Atmospheric Environment, ACS

ES&T Air, ACS ES&T Engineering, Environmental Science & Technology, Science of the Total Environment, Monthly Weather Review, Journal of Applied Meteorology and Climatology, Air Quality Atmosphere and Health, Atmosphere, Journal of the Air and Waste Management Association, Atmospheric Pollution Research, Environmental Pollution, Environment International, Environmental Fluid Mechanics, Scientific Reports, Meteorologische Zeitschrift

## **PROPOSAL REVIEWER**

NSF Environmental Engineering, NSF Geoinformatics, NSF Physical and Dynamic Meteorology, NASA Tropospheric Composition, NASA FireSense, EPA Science to Achieve Results (STAR), Fulbright U.S. Scholar Environmental Engineering, Health Effects Institute-Energy, Health Effects Institute (Chair of External Review Panel - 2022, 2025)

## **PROFESSIONAL ASSOCIATIONS**

Air and Waste Management Association (AWMA), American Meteorological Society (AMS), American Association for the Advancement of Science (AAAS), American Geophysical Union (AGU)

## **SERVICE**

### **External Service**

NASA FireSense Implementation Team Air Quality Working Group co-Lead: 2025-Present  
American Geophysical Union (AGU) GeoHealth Cross-organization Network Committee: 2025-Present  
American Meteorological Society (AMS) Committee on Mountain Meteorology: 2024-Present  
Friends of Great Salt Lake Board Member: 2023-Present  
Health Effects Institute (HEI) Research Committee: 2021-Present  
NASA PACE Early Adopters Program: 2020-Present  
NOAA Pathfinders Initiative (Early Adopters Program): 2022-2025  
State of Utah Air Quality Policy Advisory Board: 2022-2024  
Conference Co-chair, AMS 22<sup>nd</sup> Conference on Mountain Meteorology: 2026  
Technical Program Committee, MAC-MAQ Conference: 2023  
Workshop Co-chair, HEI Health Applications for Satellite-Derived Air Quality: 2022  
Session co-chair AGU Annual Meeting, GeoHealth Extreme Events and Health Session: 2024  
Early Career Board, ACS ES&T Engineering: 2020-2023  
AWMA Eastern Sierra Chapter Board Member: 2017-2020  
AWMA Eastern Sierra Chapter Scholarship Committee: 2016-2020  
Session co-chair AMS Annual Meeting, Complex Terrain Meteorology Session: 2020  
Guest Editor, Atmosphere Special Issue "Meteorological Phenomena Driving Extreme Air Pollution" 2020  
Session Co-chair AGU Annual Meeting, Complex Terrain Meteorology Session: 2019  
Session Co-chair AGU Annual Meeting, GeoHealth Earth System Interactions Session: 2019  
Session Co-chair TEAMx workshop (Italy) for modeling stable boundary layers in complex terrain: 2019  
Session Co-chair AMS Annual Meeting, Natural Aerosols Session: 2018, 2019  
Session Co-chair MAC-MAQ Model Evaluation Using Field Campaign Observations: September 2017  
Session Co-chair 22<sup>nd</sup> AMS Boundary Layer Turbulence Meeting: June 2016

### **Internal Service**

University of Utah (UU) Chemical Engineering Graduate Committee (Member): 2021-Present  
UU Chemical Engineering PhD Qualifying Exam Coordinator: 2025-Present  
UU Chemical Engineering Graduate Student Recruiting Committee: 2025-Present  
UU Chemical Engineering AI/ML Integration Committee (Member): 2025-Present  
UU Academic Senate (Senator): 2022-2025  
UU One-U Responsible AI Initiative (RAI) Faculty Engagement Committee: 2024-2025  
UU One-U Responsible AI Initiative (RAI) Environment Working Group: 2024  
UU Chemical Engineering EDI Committee (Member): 2022-2024  
UU Chemical Engineering Faculty Search Committee (Chair): 2022  
DRI/UNR Atmospheric Sciences Graduate Admissions Committee (Member): 2014-2020  
UNR Department of Physics Personnel Committee (Member): 2016-2019  
UNR High Performance Computing for Research Advisory Board (Member): 2015-2018

## **ADVISING** (\*Indicates fellowship or student funding award)

### **Postdoc Advising**

Srabani Karmakar (August 2025-Present)  
Taylor (Kai) Wilmot (co-Advise with Derek Mallia, December 2023-May 2025)  
Kaiyu Chen (February 2021-November 2023)  
Xia Sun (UNR July 2019-November 2019)  
Cesunica Ivey (UNR August 2016-December 2017)  
Jiaoyan Huang (UNR co-Advise with Mae Gustin, January 2014-December 2015)

### **PhD Student Committee Chair**

Mohamed Zamzam (PhD, Chemical Engineering, started August 2024)  
Sishir Dahal\* (PhD, Civil and Environmental Engineering, expected August 2027)  
\*UU GCSC/Wilkes Graduate Fellowship (2024-2025)  
Sam Faulstich\* (PhD, Chemical Engineering July 2025)  
\*NNSA Graduate Fellowship Program (2024-2025)  
Jingting Huang (PhD, Chemical Engineering Jan 2024)  
Jackson Yip (PhD, Chemical Engineering 2022-2023, *student left University of Utah*)  
Wan Luan Lee (PhD, Chemical Engineering 2021, *student changed to Computer Engineering*)  
Xia Sun (PhD, UNR Atmospheric Sciences May 2019)  
S. Marcela Loría-Salazar\* (PhD, UNR Atmospheric Sciences August 2018)  
\*NASA Earth and Space Science Fellowship (NESSF) Program (2016-2018)

### **MS Student Committee Chair** (*research based, resulting in thesis or publication*)

Kyler Pak (BS/MS, Chemical Engineering, expected May 2027)  
Jacob Boomsma (MS, Atmospheric Sciences August 2023)  
Sam Faulstich (MS, UNR Atmospheric Sciences August 2021)  
Sean Colgan (MS, UNR Atmospheric Sciences May 2020)  
Jingting Huang (MS, UNR Atmospheric Sciences May 2020)  
Olabosipo Osibanjo (MS, UNR Atmospheric Sciences August 2016)

### **Undergraduate Student Advising** (*research based*)

Kyler Pak\* (Chemical Engineering – Undergraduate Wilkes Scholars Program Advisor, 2024-2026)  
Klara Fischer\* (NSF REALM REU Summer 2024)  
Tobias Armstrong\* (Data Science - Undergraduate Wilkes Scholars Program Advisor, 2024-2025)  
Talon Townsend\* (Chemical Engineering – Undergraduate Wilkes Scholars Program Advisor, 2024)  
Andrew Ledwith (Chemical Engineering – Undergraduate Research Advisor, 2024)  
Maxim Balitskiy (Chemical Engineering – Undergraduate Research Advisor, 2024)  
Todd Clark\* (Chemical Engineering – Undergraduate Wilkes Scholars Program Advisor, 2022)  
Derk Lyford\* (NSF REALM REU Summer 2022)  
Colton Coon (Chemical Engineering – Undergraduate Research Advisor, 2021)  
Ohidul Mojumder (UNR Physics – Senior Thesis Advisor, 2019-2020)  
James Long (UNR Psychology – Undergraduate Research Advisor, 2018-2019)  
Stormi Noll (UNR Atmospheric Sciences - Senior Thesis Advisor, 2018)  
John Mendelsohn (UNR Physics – Senior Thesis Advisor, 2018)  
G. Aaron Alexander\* (UNR Physics and Atmospheric Sciences – Senior Thesis Advisor, 2017)  
\*UNR General Undergraduate Research Award & EPSCoR Undergraduate Research Award (2016-2017)  
Haley Jung (UNR Physics - Senior Thesis Advisor, 2016)  
Jordan Parks (UNR Atmospheric Sciences – Undergraduate Research Advisor, 2014-2016)  
Jayne Boehmler (UNR Atmospheric Sciences – co-Advise with Pat Arnott, 2015-2016)  
Danielle Medgyesi\* (UNR Health Sciences - co-Advise with Jeff Angermann, 2014-2015)  
\*UNR General Undergraduate Research Award & EPSCoR Undergraduate Research Award (2014-2015)  
Addison Liming\* (UNR Physics & Atmospheric Sciences – Undergraduate Research Advisor, 2014-2015)  
\*UNR General Undergraduate Research Award (2014-2015)

### **Undergraduate Capstone Team Advising**

Lev Sparkman, Kyler Pak, and Christian Buxton “Machine Learning to Improve Air Quality and Wildfire Smoke Forecasting”, 2025-2026.

Zoe Fehlau and Cleo Hancock “Applications of Machine Learning for Wildfire Smoke Identification”, 2021-2022.

Paxton Gray, Dax Fulton, and Taylor Hobbs “Statistical Analysis and Differentiation of Wildfire Smoke Pollution Impacts for Federal Exceptional Event Reporting”, 2021-2022.

### **Graduate Student Committee Member In-progress**

*\*At University of Utah unless specified otherwise*

Tristalee Mangin (PhD, Chemical Engineering - Advisor: Kerry Kelly)  
Zheyuan Pei (PhD, Chemical Engineering - Advisor: Kerry Kelly)  
Calvin Riss (PhD, UNR Epidemiology - Advisor: Matthew Strickland)  
Jeffrey Lee (PhD, University of Oklahoma Meteorology - Advisor: S. Marcela Loria-Salazar)  
Yarong Cao (PhD, Metropolitan Planning, Policy, and Design - Advisor: Alexandra Ponette-González)  
Vanessa Sun (PhD, Atmospheric Sciences – Advisor: Jessica Haskins)

### **Graduate Student Committee Member Completed**

*\*Completed at University of Utah unless specified otherwise*

Matthew R.T. Williams (PhD, Chemical Engineering - Advisor: Kody Powell, August 2025)  
Elaheh Safaeikouchaksaraei (PhD, Chemical Engineering - Advisor: Kerry Kelly, May 2024)  
Reuben Attah (PhD, Chemical Engineering – Advisor: Kerry Kelly, February 2024)  
Hayden Hedworth (PhD, Chemical Engineering – Advisor: Tony Saad, December 2023)  
Sarah Silcox (MS, Chemical Engineering - Advisor: Kerry Kelly, December 2022)  
Taylor (Kai) Wilmot (PhD, Atmospheric Sciences - Advisor: John Lin, August 2022)  
Mengjiao Huang (PhD, UNR Epidemiology - Advisors: Strickland and Darrow, May 2021)  
Samantha Caputi (PhD, UC-Davis Atmospheric Science – Advisor: Ian Faloon, Spring 2020)  
Addie Luippold (MS, UNR Environmental Science - Advisor: Mae Gustin, May 2020)  
Julia Duncan (PhD, UNR Chemistry – Advisor: Laina Geary, May 2020)  
Suyesh Koyu (PhD, UNR Physics – Advisor: Timur Tscherbul, August 2020)  
Marco Giordano (PhD, UNR Atmospheric Sciences – Advisor: Eric Wilcox, December 2019)  
G. Aaron Alexander (PhD, UC-Davis Civil & Env Eng- Advisor: Holly Oldroyd, on committee until 2019)  
Johanna Heyer (PhD, UC-Davis Civil & Env Eng - Advisor: Deb Niemeier, on committee until 2019)  
Marshall Liddle (PhD, UNR Atmospheric Sciences – Advisor: John Lewis, on committee until 2019)  
Joao Paulo Braz (PhD, UNR Mechanical Engineering – Advisor: E. Wang & J. LaCombe, Spring 2019)  
Lan Gao (PhD, UNR Atmospheric Sciences – Advisor: Eric Wilcox, on committee until 2018)  
Ashley Pierce (PhD, UNR Environmental Science –Advisor: Mae Gustin, Fall 2017)  
Xinxin Zhai (PhD, Georgia Tech Environmental Engineering - Advisor: James Mulholland, Fall 2017)  
Kacie Shroud (MS, UNR Atmospheric Sciences – Advisor: Michael Kaplan, Fall 2017)  
Keith Heidecorn (MS, UNR Environmental Science – Advisor: Mae Gustin, August 2015)  
Sandra Theiss (PhD, UNR Atmospheric Sciences – Advisor: Alan Gertler, August 2015)  
Ya-Chun "Anna" Tai (MS, UNR Atmospheric Sciences - Advisor: Antony Chen, August 2015)

### **International External Thesis Reviewer**

Miranda Doris (PhD, U. Toronto Civil & Mineral Engineering - Advisor: M. Hatzopoulou, August 2025)