

Derek V. Mallia, Ph.D.
Curriculum Vitae

University of Utah, Department of Atmospheric Sciences, Salt Lake City, UT

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Research Statement:

Topics that I am most interested in have strong linkages to climate change and involve exchanges between the atmosphere and land surface. My most recent research has primarily focused on using atmospheric models to elucidate key processes that drive wildfire behavior and smoke dispersion, and wind-blown dust. I am also interested in combining atmospheric models with statistical methods to identify major sources of atmospheric pollutants and greenhouse gases in urban settings. I also have a general interest in using atmospheric models developed for research and repurposing them for forecasting applications.

Education:

University of Utah	Ph.D. (Atmospheric Sciences)	2018	Salt Lake City, UT
Plymouth State University	M.S. (Applied Meteorology)	2012	Plymouth, NH
University at Albany	B.S. (Atmospheric Sciences)	2010	Albany, NY

Employment:

Research Assistant Professor, University of Utah, Salt Lake City, UT, 2020 ~.

Adjunct Faculty, Salt Lake Community College, Salt Lake City, UT, 2013 ~.

Postdoctoral Research Associate, University of Utah, Salt Lake City, UT, 2018 – 2020.

Graduate Research Assistant, University of Utah, Salt Lake City, UT, 2012 – 2017.

Graduate Research Assistant, Plymouth State University, Plymouth, NH, 2010 – 2012.

Student Intern, National Weather Service, Albany, NY, 2008 – 2010.

Publications:

Peer Reviewed Articles:

Wilmot, K., **D. V. Mallia**, A. G. Haller, and J. C. Lin: Wildfire activity is driving summertime air quality degradation across the Western US: A model-based attribution to smoke source regions. *Environ. Res. Lett.*, 17, 114014, 2022.

Mallia, D. V., and A. K. Kochanski: A review of different modeling approaches used to simulate smoke transport and dispersion. *Fire, Smoke and Health: tracking the modeling chain from flames to health and wellbeing*. American Geophysical Union, edited by T. Loboda, N. French, and R. Puet., DOI: <https://doi.org/10.1002/essoar.10512025.1>, 2022.

Wilmot, K., **D. V. Mallia**, A. G. Haller, and J. C. Lin: Wildfire plumes in the Western US are reaching greater heights and injecting more aerosols aloft under a changing climate. *Scientific Reports*, 12, 12400, 2022.

Sim, S., H. Lee, Haeyoung, E. Oh, S., Kim, P. Ciais, S. Piao, J. C. Lin, **D. V. Mallia**, S. Lee, Y. Kim, H. Park, and S. Jeong: Short-term reduction of regional enhancement of atmospheric CO₂ in China during the

first COVID-19 pandemic period. *Environ. Res. Lett.*, 17, 024036, 2022.

Moody, M., J. Gibbs, S. Krueger, **D. V. Mallia**, E. Pardyjak, A. K. Kochanski, B. Bailey, and R. Stoll: QES-Fire: a dynamically-coupled fast-response wildfire model. *Int. J. Wildland Fire*, 31(3), 306–325, 2022.

Haller, A.G. **et al.**: Coupled air quality and boundary-layer meteorology in western U.S. basins during winter: Design and rationale for a comprehensive study. *BAMS*, 102(10), 2012–2023, 2021.

Kochanski, A. K., F. Herron-Thorpe, **D. V. Mallia**, J. Mandel and J. K. Vaughan: Integration of a coupled fire-atmosphere model into a regional air quality forecasting system for wildfire events. *Front. For. Glob. Change*, 4:728726, 2021.

Farguell, A., J. Mandel, J. Haley, **D. V. Mallia**, A. K. Kochanski, and K. Hilburn: Machine learning estimation of fire arrival time from level-2 active fire satellite data. *Remote Sensing*, 13(11), 2203, 2021.

Wilmot, K. T., A. G. Haller, J. C. Lin, and **D. V. Mallia**: Expanding number of western US urban centers face declining summertime air quality due to enhanced wildland fire activity. *Environ. Res. Lett.*, 16, 054036, 2021.

Herrera, S. A., G. S. Diskin, C. Harward, G. Sachse, S. F. J. De Wekker, M. Yang, Y. Choi, A. Wisthaler, **D. V. Mallia**, and S. E. Pusede: Wintertime nitrous oxide emissions in the San Joaquin Valley of California estimated from aircraft observations. *Environ. Sci. Technol.*, 55, 8, 4462–4473, 2021.

Mallia, D. V., L. Mitchell, L. Kunik, B. Fasoli, R. Bares, D. Mendoza, K. Gurney, and J. C. Lin: Constraining urban CO₂ emissions using mobile observations derived from a novel light-rail public transit platform. *Environ. Sci. Technol.*, 54, 24, 15613–15621, 2020.

Mallia, D. V., A. Kochanski, K. E. Kelly, R. Whitaker, W. Xing, L. Mitchell, A. Jacques, A. Farguell, J. Mandel, P.-E. Gaillardon, T. Becnel, and S. Krueger: Evaluating wildfire smoke transport within a coupled fire-atmosphere model using a high-density observation network for an episodic smoke event along Utah's Wasatch Front. *J. Geophys. Res.*, 125, e2020JD032712, 2020.

Mallia, D. V., A. Kochanski, S. Urbanski, J. Mandel, A. Farguell, and S. Krueger: Incorporating a canopy parameterization within a coupled fire-atmosphere model to improve a smoke simulation for a prescribed burn. *Atmosphere*, 11(8), 832, 2020.

Kunik, L., **D. V. Mallia**, K. R. Gurney, D. L. Mendoza, T. Oda, and J. C. Lin: Bayesian inverse estimation of urban CO₂ emissions: Results from a synthetic-data simulation over Salt Lake City, UT. *Elementa*, 7(1), 36, 2019.

Kochanski, A., **D. V. Mallia**, M. Fearon, T. Brown, A. H. Souri, and J. Mandel: Modeling wildfire smoke feedback mechanisms using a coupled fire-atmosphere model with a radiatively active aerosol scheme. *J. Geophys. Res.*, 124(16), 9099–9116, 2019.

Hernandez, A. J., L. A., Rincon, D. Wu, **D. V. Mallia**, J. C. Lin, and R. Jimenez: Transboundary transport of biomass burning aerosols and photochemical pollution in the Orinoco River Basin. *Atmos. Environ.*, 205, 1–8, 2019.

Skiles, S. M., **D. V. Mallia**, A. G. Hallar, J. C. Lin, A. Lambert, R. Peterson, and S. Clark: Implications of a shrinking Great Salt Lake for dust on snow deposition in the Wasatch Mountains, UT: A source to sink case

study from the April 13th, 2017 dust event. *Environ. Res. Lett.*, 13, 124031, 2018.

Mallia, D. V., A. Kochanski, S. Urbanski, and J. C. Lin: Optimizing smoke and plume rise modeling approaches at local scales. *Atmosphere*, 9, 116, 2018.

Mitchell, L. E., J. C. Lin, D. R. Bowling, D. E. Pataki, C. Strong, A. J. Schauer, R. Bares, S. E. Bush, B. B. Stephens, D. Mendoza, **D. V. Mallia**, L. Holland, K. R. Gurney, and J. R. Ehleringer: Long-term urban carbon dioxide observations reveal spatial and temporal dynamics related to urban characteristics and growth. *Proc. Natl. Acad. Sci. U.S.A.*, 114, 2912–2917, 2018.

Davison, J. H., H-T. Hwang, E. A. Sudicky, **D. V. Mallia**, and J. C. Lin: Full coupling between the atmosphere, surface, and subsurface for an integrated hydrologic simulation. *J. Adv. Model. Earth Syst.*, 10, 43–53, 2018.

Foster, C. S., E. T. Crosman, L. Holland, **D. V. Mallia**, B. Fasoli, R. Bares, J. Horel, and J. C. Lin: Confirmation of elevated methane emissions in Utah's Uintah Basin with ground-based observations and a high-resolution transport model. *J. Geophys. Res.*, 23, 13026–13044, 2017.

Mallia, D. V., A. Kochanski, C. Pennell, W. Oswald, and J. C. Lin: Wind-blown dust modeling using a backward Lagrangian particle dispersion model. *J. Appl. Meteor. Climate.*, 56, 2845–2867, 2017.

Lin, J. C., **D. V. Mallia**, D. Wu, and B. Stephens: How can mountaintop CO₂ observations be used to constrain regional carbon fluxes? *Atmos. Chem. Phys.*, 17, 5561–5581, 2017.

Mallia, D. V., J. C. Lin, S. Urbanski, J. Ehleringer, and T. Nehrkorn: Impacts of upwind wildfire emissions on CO₂, CO, and PM_{2.5} concentrations in Salt Lake City, Utah. *J. Geophys. Res.*, 120(1), 147–166, 2015.

Good S. P., **D. V. Mallia**, E. H. Denis, K. H. Freeman, X. Feng, S. Li, N. Zegre, J. C. Lin, and G. J. Bowen: High frequency trends in the isotopic composition of Superstorm Sandy. *Learning from the Impacts of Superstorm Sandy*. Elsevier, edited by J. B. Bennington and E. C. Farmer, <https://doi.org/10.1016/B978-0-12-801520-9.00004-3>, 2014.

Good S. P., **D. V. Mallia**, G. Bowen, and J. C. Lin: Stable isotope analysis of precipitation samples obtained via crowdsourcing reveals the spatiotemporal evolution of Superstorm Sandy. *PLoS One*, 9, e91117, 2014.

Peer Reviewed Conference Proceedings:

Mandel, J., M. Vejmělka, A. K. Kochanski, A. Farguella, J. D. Haley, **D. V. Mallia**, and K. Hilburn: An interactive data-driven HPC system for forecasting weather, wildland fire, and smoke. *Proceedings of UrgentHPC: The first international workshop on HPC for urgent decision making*, doi:10.1109/UrgentHPC49580.2019.00010, 2019.

Kochanski, A. K., **D. V. Mallia**, M. G. Fearon, T. Brown, J. Mandel, and J. K. Vaughan: Do we need weather prediction models to account for local weather modifications by wildland fires? *Advances in Forest Fire Research*. University of Coimbra, edited by D. X. Viegas, https://doi.org/10.14195/978-989-26-16-506_108, 2018.

Other publications:

Mallia, D. V.: Western US wildfires in an increasingly warming climate. *Physics Today – Research and Technology*, doi:10.1063/PT.5.4021. May 25th, 2016.

In Preparation/Submitted:

Munroe, J. S., E. J. Soderstrom, C. L. Kluetmeier, M. J. Tappa, **D. V. Mallia**, and A. M. Bauer, Local sources control dust in the mountain critical zone of the Great Basin and Rocky Mountains, USA. *Environ. Res. Lett.*, In Prep.

Lang, O. I., S. M. Skiles, and **Mallia, D. V.**, The shrinking Great Salt Lake contributes to record high dust-on-snow deposition in the Wasatch Mountains. *Environ. Res. Lett.*, In Prep.

Mallia, D. V., L. E. Mitchell, A. E. G. Vidal, D. Wu, L. Kunik, and J. C. Lin, Can we detect urban-scale CO₂ emission changes within medium-sized cities? *J. Geophys. Res.*, In Review.

Roten, D., E. Kort, T. Oda, L. Kunik, D. Wu, D. V. Mallia, J. C. Lin: The information content of dense carbon dioxide measurements from space: A high-resolution inversion approach with synthetic data from the OCO-3 instrument. *Atmos. Chem. Phys.*, In Review.

Select Conference Presentations:

The past, present, and the future of wildfire smoke across the Intermountain West. *39th Annual Utah Conference on Safety and Industrial Hygiene*, University of Utah, UT, October 2022.

Quantifying the Impacts of the COVID-19 Lockdown on Urban Emissions across the Salt Lake Valley. *NOAA GML Global Monitoring Annual Conference 2022*, Online, May 2022.

Using a coupled fire-atmosphere model to simulate smoke impacts on urban air quality, *Air Quality: Air Quality: Science for Solutions 2022*, April 2022.

The importance of resolving small-scale processes and their impacts on large-scale smoke plume dynamics. *13th Fire and Forest Meteorology Virtual Symposium*, Online, May 2021.

Evaluating wildfire smoke transport within a coupled fire-atmosphere model (WRF-SFIRE). *2nd SJSU Fire Weather Research Workshop*, Online, April 2021.

Improving wildfire smoke forecasts through the implementation of a canopy model parameterization. *Air Quality: Air Quality: Science for Solutions 2021*, Online, April 2021.

Evaluating wildfire smoke transport within a coupled fire-atmosphere model using a high-density observation network. *3rd International Smoke Symposium*, Online, April 2020.

Validating wildfire smoke transport within a coupled fire-atmosphere model using a novel high-density instrumentation network. *AGU Fall Meeting 2019*, San Francisco, CA, December 2019.

Can coupled fire-atmosphere models predict smoke-induced inversions from wildfires? *Joint WRF and MPAS User's Workshop 2019*, Boulder, CO, June 2019.

Does wildfire smoke impact local inversions? *12th Symposium on Fire and Forest Meteorology*, Boise, ID., May 2018

Optimizing smoke and plume rise modeling approaches at local scales, *12th Symposium on Fire and Forest Meteorology*, Boise, ID, May 2018.

Innovative approaches for modeling smoke impacts from prescribed burns and wildfires, *Conference on Fire Prediction Across Scales*, New York, NY, October 2017.

Modeling the impacts of a desiccating Great Salt Lake on future air quality along the Wasatch Front, *2017 iUtah Annual Symposium*, Logan, UT, July 2017.

Wind-blown dust modeling using a backward Lagrangian particle dispersion model, *Air Quality: Science for Solutions 2017*, Salt Lake City, UT, March 2017.

Integrating wildfire plume rises within atmospheric transport models, *AGU Fall meeting*, San Francisco, CA, December 2016.

Wind-blown dust forecasting using a backward Lagrangian particle dispersion model, *3rd Conference on Atmospheric Biogeosciences*, Salt Lake City, UT, June 2016.

How can mountaintop CO₂ observations be used to constrain regional carbon fluxes?, *32nd Conference on Agricultural and Forest Meteorology*, Salt Lake City, UT, June 2016.

Identifying and Quantifying the Impact of Wildfires on Utah's Air Quality, *11th Symposium on Fire and Forest Meteorology*, Minneapolis, MN, May 2015.

Impacts of upstream wildfire emissions on CO₂, CO, and PM_{2.5} concentrations in Salt Lake City, *16th Conference on Mountain Meteorology*, San Diego, CO, August 2014.

The sensitivity of a 6- and 12-hour WRF forecast for the Presidential Mountain Range to model input, *11th Annual AMS Student Conference*, New Orleans, LA, January 2012.

A case study of two extratropical transitions during the 2010 Atlantic Basin Hurricane Season utilizing potential vorticity thinking, *36th Annual Northeastern Storms Conference*, Taunton, MA, March 2011.

Flash flood events associated with Northeastern Cutoff Cyclones. *NWS Eastern Region Flash Flood Conference*, Wilkes-Barre, PA, June 2010.

Invited Presentations and Seminars:

Massachusetts Institute of Technology - Wildfire and Air Quality Virtual Panel: Simulating wildfire smoke using a high-resolution weather model. November 10th, 2021, Online.

18th Annual Climate Prediction Applications Science Workshop: Air quality research and applications: urban greenhouse gases. April 20th, 2021, Online.

University of Utah, Seminar: Modeling wildfire smoke across the Intermountain West. March 21st, 2021, Online.

Weber State University, Geoscience and Society Seminar Series: Climate change, wildfires, air quality, and the Intermountain West. March 26th, 2021, Online.

University of Toronto, Seminar: Modeling wildfire smoke across North America in a new wildfire regime. November 23rd, 2020, Online.

NOAA Air Resources Laboratory, 2020 HYSPLIT Workshop: STILT Demonstration. June 25th, 2020, Online.

University of California Santa Barbara, EXFHIRE Workshop: Forecasting wildfires using a coupled fire-atmosphere weather prediction model. October 24th, 2019, Santa Barbara, CA.

Boston University, CO₂ USA Workshop: Mobile measurements and analyses of data from light rail and Google Street View Cars. October 8th, 2019, Boston, MA.

Seoul National University, Seminar: Constraining urban CO₂ emissions using a light-rail public transit platform. August 19th, 2019, Seoul, South Korea.

AMS/NWS Utah Chapter: Can we forecast the effects of smoke shading? October 4th, 2018, Salt Lake City, UT.

U.S. Forest Service: Integrating wildfire plume rises within atmospheric transport models. October 12th, 2016, Missoula, MT.

Grants:

Co-Investigator, National Science Foundation, “Community Resilience through Engaging, Actionable, Timely, High-Resolution Air Quality Information (CREATE-AQI)”, Award amount: \$49,994.

Co-Investigator, University of Utah, “Quantifying the carbon and air quality footprint of the University of Utah using TRAX-mounted instrumentation, traffic, and tap-on/tap-off ridership data.”, Award amount: \$69,320.

Principal Investigator, NOAA Climate Program Office: “*Tracking Impacts of COVID-19 Lockdowns & Recovery on Urban Atmospheric Composition at Neighborhood Scales with Public-Transit Based Measurements*”, Award amount: \$399,904.

Institutional Principal Investigator, Utah Division of Air Quality Grant: “*Quantitative Attribution of Wildfires on Summertime Ozone Concentrations along the Wasatch Front*”, Award amount: \$79,768.

Awards:

The Edward J. Zipser Outstanding Graduate Student Award, 2018.

The Columbia Initiative on Extreme Weather and Climate Travel Award, 2017.

Friends of Great Salt Lake Doyle W. Stephens Scholarship, 2016.

Global Change and Sustainability Center’s Travel Award, 2014 & 2016.

Global Change and Sustainability Center’s Graduate Fellowship, 2012 - 2013

Unidata User’s Workshop Travel Award (NCAR), 2012.

NASA EPSCoR Fellowship, 2010 - 2011.

Teaching:

Atmos 5010: Weather Forecasting, University of Utah

Atmos 1010: Severe and Unusual Weather, University of Utah

Atmos 5210: Synoptic Meteorology II, University of Utah

Atmos 5340: Environmental Programming and Statistics, University of Utah

ATMO 1010: Severe and Hazardous Weather, Salt Lake Community College

Professional Affiliations:

International Association of Wildland Fire
 American Geophysical Union
 American Meteorological Society
 The Global Change & Sustainability Center

Extracurricular Activities:*Journal Reviewer*

Atmosphere
 Journal of Applied Meteorology and Climatology
 Environmental Science and Pollution Research
 Environmental Science and Technology
 Weather Analysis and Forecasting
 International Journal of Wildland Fire
 Atmospheric Chemistry and Physics

Mentoring

Kai Wilmot, University of Utah – Ph.D. Committee
 Kimberly Bestul, University of Utah – Masters Committee
 Jingting Huang, University of Utah – Ph.D. Committee
 Brittany Whitlam – Experimental Learning Mentorship Program at the University of Utah
 Mentor for Research Experience in ALpine Meteorology (REALM) program

Public Outreach:

My research has been featured on many international and local news outlets such as The Guardian, the LA Times, PBS, KSL, Fox 13, KUTV, KCPW, the Daily Utah Chronical, and the Standard.

Guest speaker for Citizens Climate Lobby's monthly meeting on climate change and wildfires, November 19th, 2019.

Visited the Weilenmann School of Discovery in Park City to teach 6th graders about Fire Weather, March 29th, 2018.

Technical Skills:

Programming languages: *R, Python, MATLAB, Fortran, Shell, NCL, Perl and html*
 Operating systems: *Linux, Mac OS, and Windows*
 Modeling experience: *WRF-ARW, WRF-CHEM, WRF-SFIRE, HYSPLIT, STILT, and Freitas plume rise model.*
 Other: *Experience with high-performance computing and maintaining code via GitHub.*