

Crystal D. McClure, PhD

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Atmospheric scientist and wildfire expert with over 15 years of experience in scientific research and project management. Adept at analyzing complex data and developing innovative solutions to address environmental challenges. Detail-oriented and highly collaborative, thriving in team settings and effectively communicating scientific findings to diverse audiences. Committed to advancing knowledge in atmospheric chemistry and the wildfire science space.

Education

- Ph.D., Atmospheric Science, University of Washington, Seattle, WA May 2018
Dissertation: Tracing Biomass Burning in the Northwest U.S.
Advisor: Dr. Daniel A. Jaffe
- M.S., Atmospheric Science, University of Washington, Seattle, WA August 2014
Thesis: Evaluation of the KCl Denuder Method for Gaseous Oxidized Mercury using HgBr₂ at an In-Service AMNet Site
Advisor: Dr. Daniel A. Jaffe
- B.S., Meteorology, Texas A&M University, College Station, TX May 2011
Thesis: Examination of Changes in Hygroscopicity and CCN Activation during Particle Growth Events
Advisor: Dr. Donald R. Collins

Research and Professional Experience

Principal Scientist

Atmospheric Interdisciplinary Research Institute
May 2026 – Present

- Develop unique analyses and software to advance wildland fire science.
- Perform air quality measurements and analysis for state, local, and federal agencies.
- Author technical reports and journal articles.
- Program development and project management.

Senior Atmospheric Data Scientist & Project Manager, Data Science Department

Sonoma Technology, Inc | Spheros Environmental
February 2019 – May 2026

- Built and published the Firelytics algorithm to ingest satellite and agency fire data creating high-resolution spatiotemporal historical and near real-time wildfire datasets. Deployed Firelytics as a historical data exploration dashboard and near-real-time data as a cloud-based API service.
- Created and managed large data visualization dashboards for the Environmental Protection Agency.
- Performed complex data and wildfire analyses in support of 20 Exceptional Events Demonstrations and created a machine learning tool to identify wildfire-influenced events.
- Oversaw project teams ranging from 2 to 25 contributors and external collaborators.
- Built instrumentation to sample Volatile Organic Compounds. Validated and analyzed these data to identify wildfire impacts.
- Managed \$15M in projects over the course of 7 years for private, local, state, and federal clients.

Postdoctoral Research Associate, Department of Civil and Environmental Engineering
University of California Davis, Davis, CA
July 2018 – December 2018

Developed instrumentation to study the effects of water uptake on biomass burning aerosol optical properties.
Investigated the use of organic aerosol to black carbon concentration ratios as a metric for distinguishing physical, chemical, and optical properties of biomass burning aerosol.

Pre-Doctoral Research Associate, Department of Atmospheric Science
University of Washington, Seattle, WA
September 2014 – May 2018

Investigated the increase of fine particulate matter (PM_{2.5}) during wildfire season in the Northwestern US. Determined that while annual PM_{2.5} is decreasing due to anthropogenic clean-up, policy-relevant, 98th quantile PM_{2.5} is increasing dramatically in the Northwest.

Conducted a field campaign to collect peroxyacetyl nitrate (PAN) information in urban area (Boise, ID) under the influence of wildfires. Investigation of PAN was used to determine enhancements of ozone during wildfire events.

Designed, constructed, and tested a cost-effective and efficient system for ambient sampling of VOCs. Examined VOCs, in particular Acetonitrile, as tracers for biomass burning via TD-GC-MS methodology.

Data mined and studied CO₂ events at the Mount Bachelor Observatory. Studied boundary layer and free tropospheric variations in CO₂.

NSF EAPSI Research Fellow, School of Environment
Tsinghua University, Beijing, China
June 2014 – August 2014

Principal Investigator studying Gaseous Oxidized Mercury (GOM) in power plant flue gas near Beijing, China. Performed laboratory simulations of power plant emissions using a drop-tube furnace located at Tsinghua University. Sampled GOM from power plants around Beijing.

Graduate Research Associate, Department of Atmospheric Science
University of Washington, Seattle, WA
September 2011 – June 2014

Developed and implemented an oxidized mercury calibration system to quantify EPA-standard Tekran Speciation System measurements at an AMNet site in Birmingham, AL. Constructed a stable Gaseous Oxidized Mercury Permeation Source. Quantified mercury compounds from ambient atmospheric measurements. Developed a cryo-GC-MS method to detect oxidized mercury species.

Undergraduate Research Associate, Department of Atmospheric Sciences
Texas A&M University, College Station, TX
December 2008 – May 2011

Customized and implemented an existing DMT Cloud Condensation Nuclei Counter (CCNc) for more efficient sampling and hygroscopicity studies (κ parameter). Qualified nucleation precursors (i.e. Hydroxyl radical/Ozone during the day and Nitrate radical at night) and their hygroscopicity properties. Assisted in the installation and operation of various instruments to track particle nucleation events in the Bryan-College Station area.

Example Technical Projects

Client: Clark County Department of Environment and Sustainability

Reviewed, analyzed, and created exceptional event, atypical event, and 179B documentation for wildfire, stratospheric intrusion, and internationally influenced dates.

Provided guidance and worked with EPA and the county to ensure all requirements were met.

Organized large teams to review potential dates, analyze large-scale data, and provide documentation necessary for approval.

Built and assisted in the deployment of VOC samplers during wildfire/ozone season in Clark County to provide additional weight of evidence for potential wildfire-influenced events.

EPA Data Quality Dashboards

2019-2026

Client: EPA OAQPS

Created data pipelines and dashboards to review the data quality for pollutant information submitted to the EPA AQS system.

Automated and standardized scripts and processes to more efficiently create new data dashboards.

Senior reviewer for network-specific dashboards and organized the data science team in creating dashboards.

Firelytics Projects

2020-2026

Clients: PG&E, Southern California Edison, Xcel Energy, PacifiCorp, NASA

Created software to ingest satellite imagery of fires from polar and geostationary satellites, combined with agency information, and created a comprehensive database of wildland fire information for research and fire potential index model training.

Final fire level data down to hourly fire growth information were available via the combined wildland fire database. Near-real-time fire information was also available via API.

Coordinated the fire and smoke team to create persistence hotspot masks and update the code base. Senior reviewed outputs for delivery to clients.

Awards

Spheros Environmental E2PIC Award: Professional Integrity – peer nominated 2025

Spheros Environmental E2PIC Guardian Award: Professional Integrity – peer nominated 2024

Sonoma Technology “You Make a Difference Award” - peer nominated and selected 2020

Select Publications and Presentations

McClure C.D., Anderson A.F., Gostic C.L., King D.H., and Pavlovic N.R. (2026) Automated screening method identifies recent probable wildland fire exceptional events for ozone and PM2.5 across CONUS – Part 1. *Journal of the Air & Waste Management Association*, doi: 10.1080/10962247.2026.2639376.

Kramer S.J., Huang S., **McClure C.D.**, Chaveste M.R., and Lurmann F. (2023) Projected smoke impacts from increased prescribed fire activity in California’s high wildfire risk landscape. *Atmospheric Environment*, doi: 10.1016/j.atmosenv.2023.119993.

McClure C.D., Pavlovic N.R., Huang S., Chaveste M., and Wang N. (2023) Consistent, high-accuracy mapping of daily and sub-daily wildfire growth with satellite observations. *International Journal of Wildland Fire*, 32(4), doi: 10.1071/WF22048.

McClure C.D., Lim C.Y., Hagan D.H., Kroll J.H., and Cappa C.D. (2020) Biomass-burning-derived particles from a wide variety of fuels – Part 1: properties of primary particles. *Atmos. Chem. Phys.*, 20(3), 1531- 1547, doi: 10.5194/acp-20-1531-2020.

McClure C.D. and Jaffe D.A. (2018) Investigation of high ozone events due to wildfire smoke in an urban area. *Atmospheric Environment*, 194, 146-157, doi: 10.1016/j.atmosenv.2018.09.021.

McClure C.D. and Jaffe D.A. (2018) US particulate matter air quality improves except in wildfire-prone areas. *Proceedings of the National Academy of Sciences*, 115(31), 7901-7906, doi: 10.1073/pnas.1804353115.