Dr. Patrick R. Veres | Curriculum Vitae

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National Center for Atmospheric Research (NCAR) – Earth Observing Laboratory (EOL)
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Professional Appointments

Research Scientist, RSIG Group lead NCAR EOL RAF RAF Science and Instrumentation Group	April 2023 – present Boulder, CO
Research Chemist NOAA ESRL/Chemical Sciences Laboratory (CSL) Boulder, CO Tropospheric Chemistry Group	Feb. 2018 – March 2023
Research Scientist NOAA ESRL/CSD & CIRES Tropospheric Chemistry Group	Jan. 2013 – Feb. 2018 Boulder, CO
Postdoctoral Research Max-Planck-Institute for Chemistry Post-Doctoral Advisor: Jonathan Williams	Jan. 2011 – Jan. 2013 Mainz, Germany

Relevant Job Highlights

Project PI and science lead for the Atmospheric Emissions and Reactions Observed from Megacities to Marine Areas project (AEROMMA, 2019 – present)

- Project PI and marine science lead for the AEROMMA field project. The marine component of this project was designed to expand on my own recent research that led to the discovery of a previously unknown atmospheric species, hydroperoxymethyl thioformate, formed from the oxidation of dimethyl sulfide (see Relevant Research

Highlights below). This primary goal of the AEROMMA marine research is to improve our understanding of the marine sulfur cycle and its impacts on new particles and clouds formation in remote regions.
URL: https://csl.noaa.gov/projects/aeromma/

- Responsibilities include identification of scientific goals, instrument payload and flight planning, logistical and fiscal planning, and coordinating with external and internal stakeholders.

NOAA CSL point of contact with the NOAA Aircraft Operations Center (2018 – 2023)

- Primary point of contact for the NOAA Aircraft Operations Center (AOC), with responsibilities that include attending annual stakeholder meetings, preparing, and submitting aircraft and research vessel requests/proposals, and scheduling and facilitating discussions with NOAA AOC on long-term scientific and airborne instrumentation planning for the NOAA WP-3D, G550, and Twin Otter aircraft platforms.

Instrument team lead for ongoing instrument development and deployment (2015 – 2023)

- Principle investigator leading a team charged with the design, development, and deployment of a Time-of-Flight Chemical Ionization Mass Spectrometer for operation in the stratosphere onboard research aircraft. URL: https://csl.noaa.gov/groups/csl7/instruments/strat-cims/
  - Project proposer and group lead of a team of four research scientists. Responsibilities include project planning, budgeting, hiring, and acting science supervisor for the research team.
  - Lead scientist directing the design, engineering, and implementation of modifications to a commercial instrument to allow for operation at the extreme ambient conditions found in the stratosphere aboard the NASA WB-57 research aircraft.
  - This instrument was successfully deployed during the NOAA Stratospheric Aerosol processes, Budget, and Radiative Effects (SABRE) project in 2022 with future deployments planned for the coming years.

- Principle investigator leading a team to design, develop and deploy an iodide ion Time-of-Flight Chemical Ionization Mass Spectrometer for operation in the troposphere onboard research aircraft. URL: https://csl.noaa.gov/groups/csl7/instruments/itofcims.html
  - Project PI and group lead of a team including one additional research scientist and one graduate student. Responsibilities include planning, budgeting, and serving as science supervisor for the research team.
  - Lead scientist directing the design, engineering, and implementation of customizations to a commercial instrument for installation and operation on the NASA DC-8 research aircraft.

- This instrument was successfully deployed during the NASA Atmospheric Tomography Mission (ATom, 2017/2018) and the joint NOAA/NASA mission Fire Influence on Regional to Global Environments and Air Quality (FIREX-AQ, 2019).

Research Highlight

During the Atmospheric Tomography Mission (ATom, 2017-2018), improvements made by my team to our custom airborne mass spectrometer made it possible to detect and unambiguously identify a new atmospheric species we named hydroperoxymethyl thioformate (HPMTF). The observation of this molecule in the atmosphere validated previous theory that had been dismissed due to a lack of evidence. This work has redefined the dimethyl sulfide (DMS) oxidation scheme and incentivized a reevaluation of a chemical cycle that had been considered well understood for decades. The significance of this work as it relates to marine cloud formation and broader climate implications is still under investigation and is the focus of many ongoing studies, including as a focal point of the NOAA AEROMMA field study.

Media Coverage (links to external articles):

New chemical discovered during historic airborne research mission
Ocean life helps produce clouds, but existing ones keep new ones at bay

Related Publications:

Veres, P. R. et al. (2020). Global airborne sampling reveals a previously unobserved dimethyl sulfide oxidation mechanism in the marine atmosphere. Proceedings of the National Academy of Sciences, 117(9), 4505–4510. https://doi.org/10.1073/pnas.1919344117

Novak, G. A. et al. (2021). Rapid cloud removal of dimethyl sulfide oxidation products limits SO_2 and cloud condensation nuclei production in the marine atmosphere. Proceedings of the National Academy of Sciences, 118(42). https://doi.org/10.1073/pnas.2110472118

Education

Ph.D. Atmospheric Chemistry — 2005 – Jan. 2011
University of Colorado — Boulder, CO
Thesis Advisor: Ray Fall
NOAA Research Advisor: Joost de Gouw
Thesis Title: Development and Use of Negative-Ion Proton-Transfer Chemical-Ionization Mass Spectrometry for the Measurement of Gas-Phase Acids.

B.S. Chemistry, magna cum laude with Honors and Distinction 2001 – 2005
The Ohio State University Columbus, OH
Thesis Advisor: Heather Allen
Thesis Title: FTIR Analysis of Particulate Matter Collected on Teflon Filters in Columbus, OH

Field Project Deployments

Aircraft Deployments:

Stratospheric Aerosol processes, Budget, and Radiative Effects (SABRE, 2022-present)

- Principle investigator leading a team to design, develop and deploy a Time-of-Flight Chemical Ionization Mass Spectrometer for operation aboard the NASA WB-57 aircraft. The focus of this ongoing work is to better understand heterogeneous chemistry in the stratosphere and its impact on reactive halogen species.
  URL: https://csl.noaa.gov/projects/sabre/

Fire Influence on Regional to Global Environments and Air Quality (FIREX-AQ, 2019)

- Installation and deployment of an Iodide Ion Time-of-Flight Chemical Ionization Mass Spectrometer aboard the NASA DC-8 for the measurement of organic and inorganic gases in wildfire and agricultural burning across the US.
  URL: https://csl.noaa.gov/projects/firex-aq

Atmospheric Tomography Mission (ATom, 2017-2018)

- Instrument development and deployment of an Iodide Ion Time-of-Flight Chemical Ionization Mass Spectrometer on the NASA DC-8 research aircraft for the measurement of halogens species and trace gases on a global-scale, profiling continuously from 0.2 km to 14 km altitude.
  URL: https://espo.nasa.gov/atom

Studying the Atmospheric Effects of Changing Energy Use in the U.S. at the Nexus of Air Quality and Climate Change (SONGNEX, 2015)

- Deployment of a Thermal Dissociation Chemical Ionization Mass Spectrometer on the NOAA WP-3D aircraft for the measurement of peroxyacyl nitrates (PANs) from several tight oil and shale gas basins in the western U.S.
  URL: https://csl.noaa.gov/projects/songnex/

Wintertime Investigation of Transport, Emission, and Reactivity (WINTER, 2015)

- Instrument development and deployment of an Acetate Ion Time-of-Flight Chemical Ionization Mass Spectrometer on the NCAR C-130 aircraft for the measurement of organic acids in the Eastern US during wintertime.
  URL: https://www.eol.ucar.edu/field_projects/winter

Southeast Atmosphere Study / Southeast Nexus (SAS/SENEX, 2013)

- Deployment of a Thermal Dissociation Chemical Ionization Mass Spectrometer on the NOAA WP-3D aircraft for the measurement of peroxyacyl nitrates (PANs) across the Southeastern US aboard the NOAA P3 aircraft.
  URL: http://www.esrl.noaa.gov/csd/projects/senex

Aerosol, Radiation, and Cloud Processes affecting Arctic Climate (ARCPAC, 2008)

- Laboratory instrument conversion and method development for an airborne field deployment of a Particle-into-Liquid Sampler (PILS) on the NOAA WP-3D aircraft for the measurement of aerosol composition in the Arctic region.
  URL: http://www.esrl.noaa.gov/csd/projects/arcpac

Ground Based Measurements:

Southwest Urban NO_x and VOC Experiment (SUNVEx 2021)

- Primary investigator and advisor to the field team responsible for the deployment and operation of an Iodide Ion Chemical Ionization Time of Flight Mass Spectrometer during the 2021 deployment. The focus of this study was to better understand ozone formation and its sensitivity to NO_x and VOCs.
  URL: https://csl.noaa.gov/projects/sunvex/

Uintah Basin Winter Ozone Study (UBWOS, 2013/2014)

- Primary investigator responsible for the deployment and operation of an Iodide Ion Chemical Ionization Quadrupole Mass Spectrometer (reactive nitrogen gases), UV Florescence spectrometer (gaseous SO_2), and UV absorbance spectrometer (gaseous O_3) during the 2014 deployment. Co-investigator responsible for the operation of the Proton-Transfer-Reaction Time-of-Flight Mass Spectrometer (volatile organic compounds) during the 2013 deployment. The focus of this study was to better understand the sources and atmospheric fate of pollutants observed in the Uintah basin and the relation to oil and gas operations in the region.
  URL: http://www.esrl.noaa.gov/csd/groups/csd7/measurements/2013ubwos

California Nexus (CalNex, 2010)

- Principle investigator responsible for the laboratory method development from proof of concept to instrument design and construction, and the first field deployment of an Acetate Ion Time-of-Flight Chemical Ionization Mass Spectrometer for the measurement of organic and inorganic acids in the California basin during summertime pollution events.
  URL: http://www.esrl.noaa.gov/csd/projects/calnex/

Particles and Radicals: Diel observations of the impact of urban and biogenic Emissions (PARADE, 2011)

- Co-investigator responsible for the preparation, deployment, and operation of a Proton-Transfer-Reaction Time-of-Flight Mass Spectrometer (volatile organic compounds) at a heavily instrumented semi-rural site

(Taunus Observatory, summit of the Kleiner Feldberg, Germany). This study was constructed to examine the effects of biogenic and anthropogenic emissions of radical chemistry and impacts on the formation, growth, and composition of atmospheric aerosols.
URL: http://parade2011.mpich.de

Smoke Understanding through Regional Fire Simulations (SMURFS, 2009)

- Deployment of a Proton-Transfer-Reaction Time-of-Flight Mass Spectrometer at the Fire Sciences Laboratory in Missoula, MT for the observation of organic gases emitted from biomass burning and secondary oxidation products formed from subsequent OH and O_3 oxidation reactions.
  URL: http://chem.atmos.colostate.edu/FLAME

Aspen Free-Air CO_2 Enhancement (FACE) Experiment (2006)

- PI on the deployment of a Proton-Transfer-Reaction Time-of-Flight Mass Spectrometer in Rhinelander, Wisconsin at the Aspen FACE site. The goal of this project was to understand the impact of varying ambient conditions of CO_2 and O_3 on leaf level emissions of volatile organic compounds (VOCs).

International Consortium for Atmospheric Research on Transport and Transformation (ICARTT, 2004)

- Undergraduate researcher responsible for the upkeep and operation of a gas-chromatography mass spectrometer (GC-MS) at the Thompson farm field site (43.11 N, -70.95 W) and the collection and off line analysis of gas samples from the Appledore Island field site (42.99 N, -69.34 W) during the ICARTT field study. The focus of this work was to better understand the transformation of volatile organic compounds (VOCs) during transport in US continental outflow.

Chamber Studies:

Firelab at Missoula Experiment (FLAME IV, 2012)

- Deployment of a Proton-Transfer-Reaction Time-of-Flight Mass Spectrometer at the Fire Sciences Laboratory in Missoula, MT for the observation of organic gases emitted from biomass burning and secondary oxidation products formed from subsequent OH and O_3 oxidation reactions.
  URL: http://chem.atmos.colostate.edu/FLAME

Chamber Experiments Examining Reactivity and Species (CHEERS, 2011)

- Deployment of a Proton-Transfer-Reaction Time-of-Flight Mass Spectrometer at the European Photoreactor (EUPHORE) chamber in Valencia, Spain for the measurement of OH-initiated isoprene photooxidation products.

Nautical Studies:

Surface Ocean Processes in the Anthropocene (SOPRAN, M91 R/V Meteor, 2012)

- Principle investigator responsible for the preparation, deployment, and operation of a Proton-Transfer-Reaction Time-of-Flight Mass Spectrometer (volatile organic gases) as part of the heavily instrumented Research Vessel Meteor during a one-month cruise off the coast of Peru. This study was designed to develop an improved understanding of the impact of oceanic upwelling events on the partitioning of volatile gases at the surface of the ocean.
  URL: http://sopran.pangaea.de

Honors and Awards

- 2020 NOAA Office of Atmospheric Research, Employee of the Year Award - Research Chemist
  - https://csl.noaa.gov/news/2020/296_1102.html
- 2020 NOAA Office of Atmospheric Research, Administrator's Award - Research Chemist
- 2019 NASA, Group Achievement Award - FIREX-AQ - Research Chemist
- 2019 NASA, Group Achievement Award - ATom - Research Chemist
- 2018 CIRES, Outstanding Performance Award - Research Scientist
- 2016 NOAA Office of Atmospheric Research, Outstanding Paper Award - Research Scientist
- 2014 Colorado Governor's Award for High-Impact Research - Research Scientist
- 2014 CIRES Innovative Research Program Award - Research Scientist
- 2011 Atmospheric Chemistry Colloquium for Emerging Senior Scientists (ACCESS) Participant – Graduate Student
- 2009 AGU (American Geophysical Union) Fall meeting outstanding student paper award – Graduate Student
- 2004 Gary G. Marconi Scholarship Fund in Chemistry - Undergraduate
- 2001 Maximus Scholarship Competition Tradition Scholarship – Undergraduate

Committee and Editorial Service

Journal reviewer for Earth and Space Review, Environmental Science & Technology, Geophysical Research Letters, Accounts of Chemical Research, Atmospheric Measurement Techniques, Atmospheric Chemistry and Physics, Journal of Geophysical Research, Environmental Research, International Journal of Mass Spectrometry, Atmospheric Environment

Proposal reviewer for Natural Environmental Research Council (NERC, Great Britain), Cooperative Institute for Research in Environmental Sciences (CIRES), National Oceanic and Atmospheric Administration (NOAA), National Aeronautics and Space Administration (NASA)

Community Service & Outreach Activities

- NASA Student Airborne Research Program (SARP) participant, 2023
- NASA Student Airborne Research Program (SARP) participant, 2019

- University of Colorado "Wizards" Public Lecture for Elementary Age Children, "The Chemistry of the Atmosphere", December 2016, 2018, 2021

Publications

Number of publications:	113
Cumulative times cited:	5004
H-index:	41
i10-index:	89

Researcher ID #E-7441-2010
ORCID #0000-0001-7539-353X

In Preparation

1. Roozitalab, B., Apel, E.C., Emmons, L.K., Hornbrook, R.S., Kinnison, D., et al. (in preparation, 2023) The distribution of atmospheric chlorinated very short-lived substances during the NASA ATom mission and global model simulation of their interhemispheric transport.
2. Fried, A., Fite, C.H., Holmes, C.D., Schoberl, M., Dollner, M., et al. (in preparation, 2023) Enhanced Trace Gas Reactivity in Smoke Plumes Downwind of Pyrocumulus Clouds During the 2019 FIREX-AQ Study: An Examination of Potential Causes.
3. Robinson, M.A., Roberts, J.M., Neuman, J.A., Jernigan, C.M., Coggon, M.M, et al. (in preparation, 2023) Accurate online calibration of multifunctional biogenic organic nitrates in chemical ionization mass spectrometers.
4. Judd, L.M., Warneke, C., Kopacz, M., Sullivan, J., Schwantes, R., Veres, P.R., Wolfe, G.M. (in preparation, 2023) Growing through AGES+: Interagency Collaboration during Summer 2023 Field Studies of the U.S. Urban and Marine Atmosphere.
5. Travis, K.R., et al., (in preparation, 2023) Agricultural and Prescribed Burning Emission Factors from FIREX-AQ.
6. Perman, W., et al., (in preparation, 2023) Assessing Formic and Acetic Acid Emissions and Chemistry in Western U.S. Wildfire Smoke: Implications for Atmospheric Modeling.

Submitted

7. Dix, B., Li, M., Roosenbrand, E., Francoeur, C., Brown, S.S, et al. (submitted, 2023) Sources of Formaldehyde in U.S. Oil and Gas Production Regions. ACS Earth and Space Chemistry
8. Decker, Z.C.J., Novak, G.A., Aikin, K., Veres, P.R., Neuman, J.A., et al. (submitted, 2023) Airborne Observations Constrain Heterogenerous Nitrogen and Halogen Chemistry on Tropospheric and Stratospheric Biomass Burning Aerosol. Proceedings of the National Academy of Sciences
9. Roberts, J.R., Wang, S., Veres, P.R., Neuman, J.A., Robinson, M.A, et al., (submitted, 2023) Observations of cyanogen bromide (BrCN) in the global troposphere and their relation to polar surface O_3 destruction. Atmospheric Chemistry and Physics. https://doi.org/10.5194/egusphere-2023-860

10. Gkatzelis, G.G., Coggon, M.M., Stockwell, C.E., Hornbrook, R.S., Allen, H., et al. (submitted 2023) Parameterizations of US wildfire and prescribed fire emission ratios and emission factors based on FIREX-AQ aircraft measurements. EGU Sphere. https://doi.org/10.5194/egusphere-2023-1439

2023

11. Assaf, E., Finewax, Z., Marshall, P., Veres, P. R., Neuman, J. A., & Burkholder, J. B. (2023). Measurement of the Intramolecular Hydrogen-Shift Rate Coefficient for the CH3SCH2OO Radical between 314 and 433 K. Journal of Physical Chemistry A, 127(10), 2336–2350. https://doi.org/10.1021/acs.jpca.2c09095
12. Halfacre, J. W., Stewart, J., Herndon, S. C., Roscioli, J. R., Dyroff, C., Yacovitch, T. I., et al. (2023). Using tunable infrared laser direct absorption spectroscopy for ambient hydrogen chloride detection: HCl-TILDAS. Atmospheric Measurement Techinques, 16(5), 1407–1429. https://doi.org/10.5194/amt-16-1407-2023
13. Womack, C. C., Chace, W. S., Wang, S., Baasandorj, M., Fibiger, D. L., Franchin Alessandro and Goldberger, L., et al. (2023). Midlatitude Ozone Depletion and Air Quality Impacts from Industrial Halogen Emissions in the Great Salt Lake Basin. Environmental Science & Technology, 57(5), 1870–1881. https://doi.org/10.1021/acs.est.2c05376

2022

14. Bourgeois, I., Peischl, J., Neuman, J. A., Brown, S. S., Allen, H. M., Campuzano-Jost, P., et al. (2022). Comparison of airborne measurements of NO, NO2, HONO, NOy, and CO during FIREX-AQ. Atmospheric Measurement Techniques, 15(16), 4901–4930. https://doi.org/10.5194/amt-15-4901-2022
15. Breitenlechner, M., Novak, G. A., Neuman, J. A., Rollins, A. W., & Veres, P. R. (2022). A versatile vacuum ultraviolet ion source for reduced pressure bipolar chemical ionization mass spectrometry. Atmospheric Measurement Techniques, 15(5), 1159–1169. https://doi.org/10.5194/amt-15-1159-2022
16. Fung, K. M., Heald, C. L., Kroll, J. H., Wang, S., Jo, D. S., Gettelman, A., et al. (2022). Exploring dimethyl sulfide (DMS) oxidation and implications for global aerosol radiative forcing. Atmospheric Chemistry and Physics, 22(2), 1549–1573. https://doi.org/10.5194/acp-22-1549-2022
17. Roberts, James M., Neuman, J. A., Brown, S. S., Veres, P. R., Coggon, M. M., Stockwell, C. E., et al. (2022). Furoyl peroxynitrate (fur-PAN), a product of VOC–NOx photochemistry from biomass burning emissions: photochemical synthesis, calibration, chemical characterization, and first atmospheric observations. Environmental Science: Atmospheres. https://doi.org/10.1039/D2EA00068G
18. Robinson, M. A., Neuman, J. A., Huey, L. G., Roberts, J. M., Brown, S. S., & Veres, P. R. (2022). Temperature dependent sensitivity of iodide chemical ionization mass spectrometers. https://doi.org/10.5194/amt-2022-295
19. Stockwell, C. E., Bela, M. M., Coggon, M. M., Gkatzelis I, G., Wiggins, E., Gargulinski Emily M. and Shingler, T., et al. (2022). Airborne Emission Rate Measurements Validate Remote Sensing Observations and Emission Inventories of Western US Wildfires. Environmental Science & Technology, 56(12), 7564–7577. https://doi.org/10.1021/acs.est.1c07121

20. Tao, Y., VandenBoer, T. C., Veres, P. R., Warneke, C., de Gouw, J. A., Weber, R. J., et al. (2022). Hydrogen Chloride (HCl) at Ground Sites During CalNex 2010 and Insight Into Its Thermodynamic Properties. Journal of Geophysical Research-Atmospheres, 127(9). https://doi.org/10.1029/2021JD036062
21. Xu, L., Coggon, M. M., Stockwell, C. E., Gilman, J. B., Robinson, M. A., Breitenlechner, M., et al. (2022). Chemical ionization mass spectrometry utilizing ammonium ions (NH4+CIMS) for measurements of organic compounds in the atmosphere. Atmospheric Measurement Techniques 15(24), 7353–7373. https://doi.org/10.5194/amt-15-7353-2022

2021

22. Chen, X., Millet, D. B., Neuman, J. A., Veres, P. R., Ray, E. A., Commane, R., et al. (2021). HCOOH in the Remote Atmosphere: Constraints from Atmospheric Tomography (ATom) Airborne Observations. ACS Earth and Space Chemistry, 5(6), 1436–1454. https://doi.org/10.1021/acsearthspacechem.1c00049
23. Decker, Z. C. J., Robinson, M. A., Barsanti Kelley C. and Bourgeois, I., Coggon, M. M., DiGangi, J. P., Diskin, G. S., et al. (2021). Nighttime and daytime dark oxidation chemistry in wildfire plumes: an observation and model analysis of FIREX-AQ aircraft data. Atmospheric Chemistry and Physics 21(21), 16293–16317. https://doi.org/10.5194/acp-21-16293-2021
24. Decker, Z. C. J., Wang, S., Bourgeois, I., Jost, P. C., Coggon, M. M., DiGangi, J. P., et al. (2021). Novel Analysis to Quantify Plume Crosswind Heterogeneity Applied to Biomass Burning Smoke. Environmental Science & Technology, 55(23), 15646–15657. https://doi.org/10.1021/acs.est.1c03803
25. Furlani, T. C., Veres, P. R., Dawe, K. E. R., Neuman, J. A., Brown, S. S., VandenBoer, T. C., & Young, C. J. (2021). Validation of a new cavity ring-down spectrometer for measuring tropospheric gaseous hydrogen chloride. Atmospheric Measurement Techniques, 14(8), 5859–5871. https://doi.org/10.5194/amt-14-5859-2021
26. Hansen, R. F., Griffith, S. M., Dusanter, S., Gilman, J. B., Graus, M., Kuster, W. C., et al. (2021). Measurements of Total OH Reactivity During CalNex-LA. Journal of Geophysical Research Atmospheres, 126(11). https://doi.org/10.1029/2020JD032988
27. Liao, J., Wolfe, G. M., Hannun, R. A., St Clair Jason M. and Hanisco, T. F., Gilman, J. B., Lamplugh, A., et al. (2021). Formaldehyde evolution in US wildfire plumes during the Fire Influence on Regional to Global Environments and Air Quality experiment (FIREX-AQ). Atmospheric Chemistry and Physics, 21(24), 18319–18331. https://doi.org/10.5194/acp-21-18319-2021
28. Novak, G. A., Fite, C. H., Holmes, C. D., Veres, P. R., Neuman, J. A., Faloona, I., Thornton, J. A., Wolfe, G. M., Vermeuel, M. P., Jernigan, C. M., Peischl, J., Ryerson, T. B., Thompson, C. R., Bourgeois, I., Warneke, C., Gkatzelis, G. I., et al. (2021). Rapid cloud removal of dimethyl sulfide oxidation products limits SO_2 and cloud condensation nuclei production in the marine atmosphere. Proceedings of the National Academy of Sciences, 118(42). https://doi.org/10.1073/pnas.2110472118
29. Stockwell, Chelsea E., Bela, M. M., Coggon, M. M., Wiggins, E., Gargulinski, E. M., Shingler, T., et al. (2021). Airborne Emission Rate Measurements Validate Remote Sensing Observations and Emission Inventories of Western U.S. Wildfires. Environmental Science and Technology. https://doi.org/10.1021/acs.est.1c07121

30. Tuite, K., Thomas, J. L., Veres, P. R., Roberts, J. M., Stevens, P. S., Griffith, S. M., et al. (2021). Quantifying Nitrous Acid Formation Mechanisms Using Measured Vertical Profiles During the CalNex 2010 Campaign and 1D Column Modeling. Journal of Geophysical Research-Atmospheres, 126(13). https://doi.org/10.1029/2021JD034689
31. Veres, Patrick R, Neuman, J. A., Bertram, T. H., Assaf, E., Wolfe, G. M., Williamson, C. J., et al. (2021). Global airborne sampling reveals a previously unobserved dimethyl sulfide oxidation mechanism in the marine atmosphere (vol 117, pg 4505, 2020). Proceedings of the National Academy of Sciences, 118(36). https://doi.org/10.1073/pnas.2113268118
32. Wang, S., Coggon, M. M., Gkatzelis I, G., Warneke, C., Bourgeois, I., Ryerson, T., et al. (2021). Chemical Tomography in a Fresh Wildland Fire Plume: A Large Eddy Simulation (LES) Study. Journal of Geophysical Research-Atmospheres, 126(18). https://doi.org/10.1029/2021JD035203
33. Wang, X., Jacob, D. J., Downs, W., Zhai, S., Zhu, L., Shah, V., et al. (2021). Global tropospheric halogen (Cl, Br, I) chemistry and its impact on oxidants. Atmospheric Chemistry and Physics, 21(18), 13973–13996. https://doi.org/10.5194/acp-21-13973-2021
34. Xu, L., Crounse, J. D., Vasquez, K. T., Allen Hannah and Wennberg, P. O., Bourgeois, I., Brown, S. S., et al. (2021). Ozone chemistry in western US wildfire plumes. Science Advances, 7(50). https://doi.org/10.1126/sciadv.abl3648

2020

35. Brune, W. H., Miller, D. O., Thames, A. B., Allen, H. M., Apel, E. C., Blake, D. R., et al. (2020). Exploring Oxidation in the Remote Free Troposphere: Insights From Atmospheric Tomography (ATom). Journal of Geophysical Research-Atmospheres, 125(1). https://doi.org/10.1029/2019JD031685
36. Ji, Y., Huey, G., Tanner, D. J., Lee, Y. R., Veres, P. R., Neuman, J. A., et al. (2020). A vacuum ultraviolet ion source (VUV-IS) for iodide-chemical ionization mass spectrometry: a substitute for radioactive ion sources. Atmospheric Measurement Techniques, 13(7), 3683–3696. https://doi.org/10.5194/amt-13-3683-2020
37. Lao, M., Crilley, L. R., Salehpoor, L., Furlani, T. C., Bourgeois, I., Neuman, J. A., et al. (2020). A portable, robust, stable, and tunable calibration source for gas-phase nitrous acid (HONO). Atmospheric Measurement Techniques, 13(11), 5873–5890. https://doi.org/10.5194/amt-13-5873-2020
38. Veres, Patrick R., Neuman, J. A., Bertram, T. H., Assaf, E., Wolfe, G. M., Williamson, C. J., et al. (2020). Global airborne sampling reveals a previously unobserved dimethyl sulfide oxidation mechanism in the marine atmosphere. Proceedings of the National Academy of Sciences, 117(9), 4505–4510. https://doi.org/10.1073/pnas.1919344117

2019

39. Chen, X., Millet, D. B., Singh, H. B., Wisthaler, A., Apel, E. C., Atlas, E. L., et al. (2019). On the sources and sinks of atmospheric VOCs: an integrated analysis of recent aircraft campaigns over North America. Atmospheric Chemistry and Physics, 19(14), 9097–9123. https://doi.org/10.5194/acp-19-9097-2019

40. Decker, Z. C. J., Zarzana, K. J., Coggon, M., Min, K.-E., Pollack, I., Ryerson, T. B., et al. (2019). Nighttime Chemical Transformation in Biomass Burning Plumes: A Box Model Analysis Initialized with Aircraft Observations. Environmental Science & Technology, 53(5), 2529–2538. https://doi.org/10.1021/acs.est.8b05359
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