Steven Stuart Brown

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Education

Ph.D., University of Wisconsin, Madison, WI, 1996
Thesis advisor: F. Fleming Crim
B.A., Dartmouth College, Hanover, NH, 1989
Graduated Summa Cum Laude, Phi Beta Kappa

Professional Experience

October 2005 – present
NOAA Earth System Research Laboratory, Chemical Sciences Division
Research Chemist
June 2014 – present
Department of Chemistry and Biochemistry, University of Colorado
Adjoint Professor
October 2000 – September 2005
NOAA Aeronomy Laboratory, Boulder, CO, and Cooperative Institute for Research in the Environmental Sciences, University of Colorado
Research Scientist
October 1997-September 2000
NOAA Aeronomy Laboratory, Boulder, CO
National Research Council Senior Research Fellow with Dr. A. R. Ravishankara

Honors and Awards

Colorado Governor's Award for High Impact Research, 2014
CIRES Outstanding Performance Award, University of Colorado, 2003
Presidential Early Career Award for Scientists and Engineers, White House Office of Science and Technology Policy, 2002
National Research Council Post-Doctoral Fellowship, 1997-2000
Proctor & Gamble Fellowship, University of Wisconsin, 1994 – 1995
National Science Foundation Predoctoral Fellowship, 1991-1994
University of Wisconsin University Fellowship, 1990-1991
Samuel M. McElvain Fellowship, University of Wisconsin, 1990
Elden Bennett Hartshorn Medal & AIC Award, Dartmouth College, 1989

Professional Affiliations

American Geophysical Union (AGU)
American Chemical Society (ACS)
American Association for the Advancement of Science (AAAS)

Field Study Principal Investigator or Lead Scientist

Co-Principal Investigator (with Joel Thornton, University of Washington), "Wintertime Investigation of Emissions, Transport and Reactivity (WINTER)," NSF C-130 Aircraft, Langley, Virginia, February – March 2015

Lead Scientist, "Nitrogen Oxides, Aerosols and Halogens on a Tall Tower" (NACHTT) field campaign, Erie, CO, February – March 2011

Lead Scientist, "Activation of Continental Chloride by Reactive Oxides of Nitrogen in Midwinter (ACCRONIM)," Boulder, CO, February 2009

Conference Organization

Chair, 11th International Symposium on Cavity Enhanced Spectroscopy, Boulder, CO, June 2014

Co-Chair, IGAC Workshop on Nitrate Radicals and Biogenic Hydrocarbons, Atlanta, GA, June 2014

Organizing Committee, Conference on Light Energy and the Environment, Sponsored by the Optical Society of America, Canberra, Australia, December 2014

Chair, Gordon Research Conference on Atmospheric Chemistry, Mt. Snow, VT, July 2013

Organized sessions at American Geophysical Union (AGU) Meetings, including "Wintertime Atmospheric Chemistry, December 2015; "Air Quality in Asia", December 2014; "Tropospheric Halogens: Sources, Multiphase Chemistry and Impacts, December 2011; "Day and Night Chemical Processing in Polluted Atmospheres," December 2007.

Organized symposia at American Chemical Society (ACS) Meetings, including "Chemistry of Atmospheric Nitrogen Containing Compounds," ACS National Meeting, San Francisco, CA, August 2014; "Atmospheric Chemistry and Climate," ACS National Meeting, Boston, MA, August 2010.

Committee and Editorial Service

Editor, Atmospheric Chemistry and Physics, September 2013 – present

Journal reviewer within the last 5 years for Atmospheric Chemistry and Physics, Atmospheric Environment, Atmospheric Measurement Techniques, Chemical Physics Letters, Environmental Chemistry, Environmental Science & Technology, Journal of Atmospheric Chemistry, Journal of Geophysical Research, Geophysical Research Letters, Journal of Physical Chemistry, Physical Chemistry Chemical Physics, Proceedings of the National Academy of Sciences, Reviews of Scientific Instruments, Science, Science of the Total Environment

Proposal Reviewer within the last 5 years for the Department of Energy (DOE), National Aeronautics and Space Administration (NASA), National Science Foundation (NSF), National Oceanic and Atmospheric Administration (NOAA), Research Corporation, University of California, Berkeley, Deutsche Forschungsgemeinschaft (DFG – German Research Foundation), Natural Environment Research Council (NERC, Great Britain)

Service on NASA review panels, 2013, 2010, 2008

Community Service & Outreach Activities

University of Colorado "Wizards" Public Lecture for Elementary Age Children, "The Chemistry of the Atmosphere," December 2014
Science Fair Judge, Peak to Peak High School, 2008, 2009, 2010

Senior Scientists, Post-Doctoral Fellows, Students and Sabbatical Visitors

Senior research scientists and engineers
William P. Dubé (CIRES, mechanical engineer and instrument designer)
Rebecca A. Washenfelder (CIRES research scientist)

Current post-doctoral fellows and graduate students
Kyle Zarzana (CIRES post-doctoral fellow at NOAA)
Dorothy Fibiger (NSF Geospace Sciences post-doctoral fellow at NOAA)
Caroline Womack (NRC post-doctoral fellow at NOAA)
Erin McDuffie (Ph.D. Candidate, University of Colorado, Department of Chemistry)

Previous Post-Doctoral Fellows & Current Positions
Mattias Aldener (Scientist, FOI, Stockholm, Sweeden)
Hans D. Osthoff (Assistant Professor, University of Calgary, Calgary, Canada)
Jonathan E. Flad (Associate Professor, Ohio State University ATI, Wooster, Ohio, USA)
Hendrik Fuchs (Research Scientist, Forschungszentrum Jülich, Germany)
Rebecca A. Washenfelder (Research Scientist II, CIRES & NOAA ESRL)
Roberto Sommariva (University of East Anglia)
Nicholas L. Wagner (Research Scientist II, CIRES & NOAA ESRL)
Cora J. Young (Assistant Professor, Memorial University, St. Johns, Newfoundland, Canada)
Tara F. Kahan, jointly with Veronica Vaida (Assistant Professor, Syracuse University, Syracuse, NY, USA)
Peter M. Edwards (Research Scientist, University of Leeds)
Alexis R. Atwood (Horiba Scientific, Boston, MA)
Kyung-Eun Min (Assistant Professor, Gwangju Institute of Technology, Korea)
Robert Wild (Currently a world traveler)

Graduate Students Hosted & CU Thesis Advisors
Karl J. Feierabend (Veronica Vaida)
Daniel K. Havey (Veronica Vaida)
Ryan Thalman (Rainer Volkamer)
Kyle Zarzana (Maggie Tolbert)
Jessica Axson (Veronica Vaida)

Undergraduate Students Fellows and Home Institution
Maya R. Nunley, NOAA EPP Fellow from Clark Atlanta University, 2005
Thomal Langel, NOAA Hollings Fellow from the University of Wisconsin, 2010
Taylor Brownlee, NOAA Hollings Fellow from the University of Arizona, 2011

Reed Wommack, NOAA Hollings Fellow from Dartmouth College, 2013
Brigitte Rooney, NOAA Hollings Fellow from the University of Colorado, 2014

Sabbatical Visitors
Professor Juliane L. Fry, Reed College, Portland Oregon, 2011-2012
Professor Robert McLaren, York University, Toronto, Ontario, 2011-2012

Recent Presentations

Nighttime aircraft measurements in polluted, biogenic-emitting regions: What have we learned?, IGAC Workshop on Nitrate Radicals and Biogenic Volatile Organic Compounds, Georgia Institute of Technology, Atlanta, Georgia, June 2015

Constraints on Nighttime Oxidation of Biogenic Hydrocarbons from Aircraft Observations in the Southeast U.S., Southeast Atmosphere Study Modeling Workshop, NOAA Geophysical Fluid Dynamics Laboratory, Princeton, NJ, June 2015

The Atmospheric Chemistry of Winter, Harold I. Schiff Lecture, York University, Ontario, Canada, May 2015

The Dark Side of Atmospheric Chemistry: A Decade of Nighttime Aircraft Measurements of NO_3 and N_2O_5, National Institute for Environmental Research, Incheon, South Korea, May 2015

Photochemistry Underlying High Winter Ozone in an Oil and Gas Producing Mountain Basin, American Geophysical Union Meeting, San Francisco, CA, December 2014

NOxCaRD: A Compact Cavity Ring Down Spectrometer to Measure Nitrogen Oxides and Ozone, NIST Technology Transfer Symposium, Boulder, CO, October 2014

Nitrogen Oxides and Aerosol, University of Colorado Analytical Chemistry Seminar, Boulder, CO, October 2014

Organic Aerosol from Nocturnal Oxidation of Biogenic VOC, American Association of Aerosol Research, 33rd Annual Conference, Orlando, FL October 2014

Nighttime Oxidation of Biogenic Hydrocarbons in the Residual Layer, 13th IGAC Science Conference on Atmospheric Chemistry, Natal, Brazil, September 2014

Winter Ozone Photochemistry in an Oil and Gas Producing Mountain Basin, American Chemical Society National Meeting, San Francisco, CA, August 2014

Measurements of Nitrous Acid (HONO) by Cavity Enhanced Spectroscopy during UBWOS 2014, Uintah Basin Winter Ozone Study Science Meeting, Vernal, UT, June 2014

Nighttime Oxidation of Biogenic Hydrocarbons, Weizmann Institute of Science, Rehovot, Isreal, April 2014

Budgets and Modeling of Nighttime Biogenic Hydrocarbon Oxidation from P-3 Night Flights during SENEX, Southeast Atmosphere Study Workshop, Boulder, CO, March 2014

Nighttime Aircraft Measurements of Power Plant Plumes in the Southeast U.S., American Geophysical Union Meeting, San Francisco, CA, December 2013

Emerging Issues in U.S. Air Quality – Hong Kong Polytechnic University, November, 2013

The Changing Face of U.S. Air Quality: Summer vs. Winter, Urban Smog vs. the Natural Gas Boom, and Why Chemical Mechanisms Matter - McElvain Lecture in Physical Chemistry, University of Wisconsin-Madison, October 2013

Reactive Nitrogen Measurements and Ozone Photochemistry - UBWOS 2013 Data Workshop, Vernal, Utah, July 2013

Radicals, Strange Radicals and the Radical Mechanisms that Make Them - SEAS Seminar, Harvard University, March 2013.

Atmospheric Oxidants, Winter vs. Summer - Chemistry Seminar, Weizmann Institute of Science, Israel, January 2013.
Wintertime Ozone and Nitrogen Oxide Photochemistry in a Western Oil and Gas Basin - American Geophysical Union Meeting, San Francisco, CA, December 2012
Heterogeneous Chemistry vs. Photochemistry. What Really Controls Atmospheric Oxidation? - University of Colorado Physical Chemistry / Chemical Physics Colloquium, Boulder, CO October 2012
Optical Cavities and Atmospheric Spectroscopy – Optical, Electronic and Quantum Systems Seminar, University of Colorado, Boulder, CO September 2012
Heterogeneous Chemistry and Regional Oxidants – American Chemical Society National Meeting, Philadelphia, PA, August 2012
If NO_x Oxidizes in the Dark, Can you Read Its Obituary? –Workshop on New Directions in Gas Phase Atmospheric Chemistry, Telluride, CO, August 2012
Nighttime Oxidation of Biogenic Hydrocarbons – Geophysical Fluid Dynamics Laboratory, Princeton, NJ, June 2012
Everything I Ever Needed to Know about Atmospheric Chemistry – Symposium in Honor of Fleming Crim, University of Wisconsin, Madison, May 2012
Nighttime Oxidation of Biogenic Hydrocarbons – Interaction of Air Pollution with the Biosphere, University of Chicago, Geosciences Seminar, Chicago, IL, April 2012
Applications of Visible Cavity Enhanced Spectroscopy to Atmospheric Measurements, Western Spectroscopy Association Meeting, Asilomar, CA, January 2012
Nighttime Oxidation of Biogenic Hydrocarbons, Department of Chemical Engineering, Arizona State University, Tempe, AZ January 2012
Efficiency of N_2O_5 heterogeneous uptake over Los Angeles during CalNex 2010, American Geophysical Union Fall Meeting, San Francisco, CA, December 2011.
Heterogeneous Chemistry after Dark: Reactive Nitrogen, Halogens and a few Surprises about Atmospheric Oxidants. University of Chicago, Chemistry Department Seminar, Chicago, IL, October 2011
Heterogeneous Atmospheric Chemistry of Nitrogen Oxides: New Insights from Recent Field Measurements. NATO Advanced Research Workshop, Gdansk, Poland, October 2011
The Dark Side of Atmospheric Chemistry, University of California, Berkeley, Atmospheric Sciences Center Symposium, Berkeley, CA, October 2011

Publications

Submitted, Discussion or In Press

132. Yuan, B., J. Liggio, J. Wentzell, S.M. Li, H. Stark, J.M. Roberts, J. Gilman, B. Lerner, C. Warneke, R. Li, A. Leithead, H. Osthoff, R. Wild, S.S. Brown, and J.A. de Gouw, *Secondary formation of nitrated phenols: insights from observations during the Uintah Basin Winter Ozone Study (UBWOS) 2014.* Atmos. Chem. Phys., 2015. **submitted**.
131. Washenfelder, R.A., A.R. Attwood, J.M. Flores, Y. Rudich, and S.S. Brown, *Broadband cavity enhanced spectroscopy in the ultraviolet spectral region for measurements of nitrogen dioxide and formaldehyde.* Atmos. Meas. Tech.

Discussions, 2015. **submitted**.

130. Wang, T., Y.J. Tham, L. Xue, Q. Li, Q. Zha, Z. Wang, S.C.N. Poon, S.S. Brown, W.P. Dubé, P.K.K. Louie, C.W.Y. Luk, D.R. Blake, and W. Tsui, *High levels of nitryl chloride in the planetary boundary layer: A case study at a mountain site in Hong Kong.* Geophys. Res. Lett., 2015. **submitted**.
129. Liu, S., R. Li, R. Wild, C. Warneke, J. de Gouw, S.S. Brown, S. Miller, J. Luongo, J.L. Jimenez, and P. Ziemann, *Contribution of human-related sources to indoor volatile organic compounds in a university classroom.* Indoor Air, 2015. **submitted**.
128. Pusede, S.E., T.C. VandenBoer, J.G. Murphy, M.Z. Markovic, C.J. Young, P.R. Veres, J.M. Roberts, R.A. Washenfelder, S.S. Brown, X. Ren, C. Tsai, J. Stutz, W.H. Brune, E.C. Browne, P.J. Wooldridge, A.R. Graham, R. Weber, A.H. Goldstein, S. Dusanter, S.M. Griffith, P.S. Stevens, B.L. Lefer, and R.C. Cohen, *At atmospheric constraint on the NO_2 depencence of daytime near surface nitrous acid (HONO).* Environ. Sci. Technol. Lett., 2015. **submitted**.
127. Wild, R.J., P.M. Edwards, T.S. Bates, R.C. Cohen, J.A. de Gouw, W.P. Dubé, J.B. Gilman, J. Holloway, J. Kercher, A. Koss, L. Lee, B. Lerner, R. McLaren, P.K. Quinn, J.M. Roberts, J. Stutz, J.A. Thornton, P.R. Veres, C. Warneke, E. Williams, C.J. Young, B. Yuan, and S.S. Brown, *Reactive nitrogen partitioning and its relationship to winter ozone events in Utah.* Atmos. Chem. Phys. Discuss., 2015. **15**(15): p. 21383-21413.
126. Ayres, B.R., H.M. Allen, D.C. Draper, S.S. Brown, R.J. Wild, J.L. Jimenez, D.A. Day, P. Campuzano-Jost, W. Hu, J. de Gouw, A. Koss, R.C. Cohen, K.C. Duffey, P. Romer, K. Baumann, E. Edgerton, S. Takahama, J.A. Thornton, B.H. Lee, F.D. Lopez-Hilfiker, C. Mohr, A.H. Goldstein, K. Olson, and J.L. Fry, *Organic nitrate aerosol formation via NO_3 + BVOC in the Southeastern US.* Atmos. Chem. Phys. Discuss., 2015. **15**(12): p. 16235-16272.

Published

125. de Gouw, J.A., S.A. McKeen, K.C. Aikin, C.A. Brock, S.S. Brown, J.B. Gilman, M. Graus, T. Hanisco, J.S. Holloway, J. Kaiser, F.N. Keutsch, B.M. Lerner, J. Liao, M.Z. Markovic, A.M. Middlebrook, K.E. Min, J.A. Neuman, J.B. Nowak, J. Peischl, I.B. Pollack, J.M. Roberts, T.B. Ryerson, M. Trainer, P.R. Veres, C. Warneke, A. Welti, and G.M. Wolfe, *Airborne measurements of the atmospheric emissions from a fuel ethanol refinery.* Journal of Geophysical Research: Atmospheres, 2015. **120**(9): p. 4385-4397.
124. Lee, L., P.J. Wooldridge, J. deGouw, S.S. Brown, T.S. Bates, P.K. Quinn, and R.C. Cohen, *Particulate organic nitrates observed in an oil and natural gas production region during wintertime.* Atmos. Chem. Phys., 2015. **15**(16): p. 9313-9325.
123. Koss, A.R., J. de Gouw, C. Warneke, J.B. Gilman, B.M. Lerner, M. Graus, B. Yuan, P. Edwards, S.S. Brown, R. Wild, J.M. Roberts, T.S. Bates, and P.K. Quinn, *Photochemical aging of volatile organic compounds associated with oil and natural gas extraction in the Uintah Basin, UT, during a wintertime ozone formation event.* Atmos. Chem. Phys., 2015. **15**(10): p. 5727-5741.

122. Kaiser, J., G.M. Wolfe, K.E. Min, S.S. Brown, C.C. Miller, D.J. Jacob, J.A. deGouw, M. Graus, T.F. Hanisco, J. Holloway, J. Peischl, I.B. Pollack, T.B. Ryerson, C. Warneke, R.A. Washenfelder, and F.N. Keutsch, *Reassessing the ratio of glyoxal to formaldehyde as an indicator of hydrocarbon precursor speciation.* Atmos. Chem. Phys., 2015. **15**(13): p. 7571-7583.
121. Veres, P.R., J.M. Roberts, R.J. Wild, P.M. Edwards, S.S. Brown, T.S. Bates, P.K. Quinn, J.E. Johnson, R.J. Zamora, and J. de Gouw, *Peroxynitric acid (HO2NO2) measurements during the UBWOS 2013 and 2014 studies using iodide ion chemical ionization mass spectrometry.* Atmos. Chem. Phys., 2015. **15**(14): p. 8101-8114.
120. Simpson, W.R., S.S. Brown, A. Saiz-Lopez, J.A. Thornton, and R.v. Glasow, *Tropospheric Halogen Chemistry: Sources, Cycling, and Impacts.* Chemical Reviews, 2015. **115**(10): p. 4035-4062.
119. Yuan, B., P.R. Veres, C. Warneke, J.M. Roberts, J.B. Gilman, A. Koss, P.M. Edwards, M. Graus, W.C. Kuster, S.M. Li, R.J. Wild, S.S. Brown, W.P. Dubé, B.M. Lerner, E.J. Williams, J.E. Johnson, P.K. Quinn, T.S. Bates, B. Lefer, P.L. Hayes, J.L. Jimenez, R.J. Weber, R. Zamora, B. Ervens, D.B. Millet, B. Rappenglück, and J.A. de Gouw, *Investigation of secondary formation of formic acid: urban environment vs. oil and gas producing region.* Atmos. Chem. Phys., 2015. **15**(4): p. 1975-1993.
118. Cleary, P.A., N. Fuhrman, L. Schulz, J. Schafer, J. Fillingham, H. Bootsma, J. McQueen, Y. Tang, T. Langel, S. McKeen, E.J. Williams, and S.S. Brown, *Ozone distributions over southern Lake Michigan: comparisons between ferry-based observations, shoreline-based DOAS observations and model forecasts.* Atmos. Chem. Phys., 2015. **15**(9): p. 5109-5122.
117. Washenfelder, R.A., A.R. Attwood, C.A. Brock, H. Guo, L. Xu, R.J. Weber, N.L. Ng, H.M. Allen, B.R. Ayres, K. Baumann, R.C. Cohen, D.C. Draper, K.C. Duffey, E. Edgerton, J.L. Fry, W.W. Hu, J.L. Jimenez, B.B. Palm, P. Romer, E.A. Stone, P.J. Wooldridge, and S.S. Brown, *Biomass burning dominates brown carbon absorption in the rural southeastern United States.* Geophysical Research Letters, 2015: p. 2014GL062444.
116. Ahmadov, R., S. McKeen, M. Trainer, R. Banta, A. Brewer, S.S. Brown, P.M. Edwards, J.A. de Gouw, G.J. Frost, J. Gilman, D. Helmig, B. Johnson, A. Karion, A. Koss, A. Langford, B. Lerner, J. Olson, S. Oltmans, J. Peischl, G. Pétron, Y. Pichugina, J.M. Roberts, T. Ryerson, R. Schnell, C. Senff, C. Sweeney, C. Thompson, P.R. Veres, C. Warneke, R. Wild, E.J. Williams, B. Yuan, and R. Zamora, *Understanding high wintertime ozone pollution events in an oil- and natural gas-producing region of the western US.* Atmos. Chem. Phys., 2015. **15**(1): p. 411-429.
115. VandenBoer, T.C., C.J. Young, R.K. Talukdar, M.Z. Markovic, S.S. Brown, J.M. Roberts, and J.G. Murphy, *Nocturnal loss and daytime source of nitrous acid through reactive uptake and displacement.* Nature Geosci, 2015. **8**(1): p. 55-60.
114. Edwards, P.M., S.S. Brown, J.M. Roberts, R. Ahmadov, R.M. Banta, J.A. deGouw, W.P. Dube, R.A. Field, J.H. Flynn, J.B. Gilman, M. Graus, D. Helmig, A. Koss, A.O. Langford, B.L. Lefer, B.M. Lerner, R. Li, S.-M. Li, S.A. McKeen, S.M. Murphy, D.D. Parrish, C.J. Senff, J. Soltis, J. Stutz, C. Sweeney, C.R.

Thompson, M.K. Trainer, C. Tsai, P.R. Veres, R.A. Washenfelder, C. Warneke, R.J. Wild, C.J. Young, B. Yuan, and R. Zamora, *High winter ozone pollution from carbonyl photolysis in an oil and gas basin.* Nature, 2014. **514**: p. 351-354.

113. Warneke, C., F. Geiger, P.M. Edwards, W. Dube, G. Pétron, J. Kofler, A. Zahn, S.S. Brown, M. Graus, J.B. Gilman, B.M. Lerner, J. Peischl, T.B. Ryerson, J.A. de Gouw, and J.M. Roberts, *Volatile organic compound emissions from the oil and natural gas industry in the Uintah Basin, Utah: oil and gas well pad emissions compared to ambient air composition.* Atmos. Chem. Phys., 2014. **14**(20): p. 10977-10988.
112. Attwood, A.R., R.A. Washenfelder, C.A. Brock, W. Hu, K. Baumann, P. Campuzano-Jost, D.A. Day, E.S. Edgerton, D.M. Murphy, B.B. Palm, A. McComiskey, N.L. Wagner, S.S. de Sá, A. Ortega, S.T. Martin, J.L. Jimenez, and S.S. Brown, *Trends in sulfate and organic aerosol mass in the Southeast U.S.: Impact on aerosol optical depth and radiative forcing.* Geophysical Research Letters, 2014. **41**: p. 7701-7709.
111. Fry, J.L., D.C. Draper, K.C. Barsanti, J.N. Smith, J. Ortega, P.M. Winkler, M.J. Lawler, S.S. Brown, P.M. Edwards, R.C. Cohen, and L. Lee, *Secondary Organic Aerosol Formation and Organic Nitrate Yield from NO3 Oxidation of Biogenic Hydrocarbons.* Environmental Science & Technology, 2014. **48**(20): p. 11944-11953.
110. Wild, R.J., P.M. Edwards, W.P. Dubé, K. Baumann, E.S. Edgerton, P.K. Quinn, J.M. Roberts, A.W. Rollins, P.R. Veres, C. Warneke, E.J. Williams, B. Yuan, and S.S. Brown, *A Measurement of Total Reactive Nitrogen, NO_y, together with NO_2, NO and O_3 via Cavity Ring-Down Spectroscopy.* Environ. Sci. Technol., 2014. **48**: p. 9609-9615.
109. Flores, J.M., R.A. Washenfelder, G. Adler, J.J. Lee, L. Segev, J. Laskin, A. Laskin, A. Nizkorodov, S.S. Brown, and Y. Rudich, *Complex refractive indices in the near-ultraviolet spectral region for biogenic secondary organic aerosol aged with ammonia.* Phys. Chem. Chem. Phys., 2014. **16**: p. 10629-10642.
108. Young, C.J., R.A. Washenfelder, P.M. Edwards, D.D. Parrish, J.B. Gilman, W.C. Kuster, L.H. Mielke, H.D. Osthoff, C. Tsai, O. Pikelnaya, J. Stutz, P.R. Veres, J.M. Roberts, S. Griffith, S. Dusanter, P.S. Stevens, J. Flynn, N. Grossberg, B. Lefer, J.S. Holloway, J. Peischl, T.B. Ryerson, E.L. Atlas, D.R. Blake, and S.S. Brown, *Evaluating evidence for Cl sources and oxidation chemistry in a coastal, urban environment.* Atmos. Chem. Phys., 2014. **14**: p. 3427-3440.
107. Riedel, T.P., G.M. Wolfe, K.T. Danas, J.B. Gilman, W.C. Kuster, D.M. Bon, A. Vlasenko, S.M. Li, E.J. Williams, B.M. Lerner, P.R. Veres, J.M. Roberts, J.S. Holloway, B. Lefer, S.S. Brown, and J.A. Thornton, *An MCM modeling study of nitryl chloride ($ClNO_2$) impacts on oxidation, ozone production and nitrogen oxide partitioning in polluted continental outflow.* Atmos. Chem. Phys., 2014. **14**(8): p. 3789-3800.
106. Kim, S., T.C. VandenBoer, C.J. Young, T.P. Riedel, J.A. Thornton, R. Swarthout, B. Sive, B.M. Lerner, J.B. Gilman, C. Warneke, J.M. Roberts, A. Guenther, N.L. Wagner, W.P. Dubé, E.J. Williams, and S.S. Brown, *The primary and recycling sources of OH during the NACHTT-2011 campaign.* J. Geophys. Res., 2014. **119**: p. 6886-6896.

105. Hagen, C.L., B.C. Lee, I.S. Franka, J.L. Rath, T.C. VandenBoer, J.M. Roberts, S.S. Brown, and A.P. Yalin, *Cavity ring-down spectroscopy sensor for detection of hydrogen chloride.* Atmos. Meas. Tech., 2014. **7**(2): p. 345-357.
104. Washenfelder, R.A., J.M. Flores, C.A. Brock, S.S. Brown, and Y. Rudich, *Broadband measurements of aerosol extinction in the ultraviolet spectral region.* Atmos. Meas. Tech., 2013. **6**: p. 861-877.
103. Wagner, N.L., T.P. Riedel, C.J. Young, R. Bahreini, C.A. Brock, W.P. Dubé, S. Kim, A.M. Middlebrook, F. Öztürk, J.M. Roberts, R. Russo, B. Sive, R. Swarthout, J.A. Thornton, T.C. VandenBoer, Y. Zhou, and S.S. Brown, *N_2O_5 uptake coefficients and nocturnal NO_2 removal rates determined from ambient wintertime measurements.* J. Geophys. Res., 2013. **118**(16): p. 9331-9350.
102. Vicars, W.C., S. Morin, J. Savarino, N.L. Wagner, J. Erbland, E. Vince, J.M.F. Martins, B.M. Lerner, E.J. Williams, and S.S. Brown, *Spatial and diurnal variability in reactive nitrogen oxide chemistry as reflected in the isotopic composition of atmospheric nitrate: Results from the CalNex 2010 field study.* J. Geophys. Res., 2013. **118**(18): p. 10567-10588.
101. VandenBoer, T.C., S.S. Brown, J.G. Murphy, W.C. Keene, C.J. Young, A.A.P. Pszenny, S. Kim, C. Warneke, J. de Gouw, J.R. Maben, N.L. Wagner, T.P. Riedel, J.A. Thornton, D.E. Wolfe, W.P. Dubé, F. Öztürk, C.A. Brock, N. Grossberg, B. Lefer, B.M. Lerner, A.M. Middlebrook, and J.M. Roberts, *Understanding the role of the ground surface in HONO vertical structure: High resolution vertial profiles during NACHTT-11.* J. Geophys. Res., 2013. **118**(17): p. 10155-10171.
100. Riedel, T.P., N.L. Wagner, W.P. Dubé, A.M. Middlebrook, C.J. Young, F. Öztürk, R. Bahreini, T.C. VandenBoer, D.E. Wolfe, E.J. Williams, J.M. Roberts, S.S. Brown, and J.A. Thornton, *Chlorine activation within urban and power plant plumes: vertically resolved $ClNO_2$ and Cl_2 measurements from a tall tower in a polluted continental setting.* J. Geophys. Res., 2013. **118**(15): p. 8702-8715.
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