

## Steven Stuart Brown

NOAA Earth System Research Laboratory  
Chemical Sciences Division  
R/CSD7  
325 Broadway  
Boulder, CO, 80305 USA

Phone: (303) 497 6306  
FAX: (303) 497 5126  
steven.s.brown@noaa.gov  
[https://esrl.noaa.gov/csd/staff/  
steven.s.brown/](https://esrl.noaa.gov/csd/staff/steven.s.brown/)

### 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

Harold I. Schiff Lecture, York University, Toronto, Ontario, 2015  
Colorado Governor's Award for High Impact Research, 2014  
McElvain Lecture, University of Wisconsin, 2013  
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**

Lead Scientist, "Utah Winter Fine Particulate Study," NOAA Twin Otter aircraft study in Salt Lake City, Utah, January-February 2017

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**

Co-Chair (with Professor Sally Ng, Georgia Tech), Special Symposium on the Effect of NO<sub>x</sub> and SO<sub>2</sub> on BVOC Oxidation and Organic Aerosol Formation, American Association for Aerosol Research Annual Conference, Portland, OR October 2016

Co-Chair (with Professor Frank Keutsch, Harvard University), Symposium on Spectroscopy in Atmospheric Chemistry, International Symposium on Molecular Spectroscopy, Champaign-Urbana, IL, June 2016

Co-Chair (with Dr. Rebecca Washenfelder, NOAA), 11<sup>th</sup> International Symposium on Cavity Enhanced Spectroscopy, Boulder, CO, June 2015

Co-Chair (with Professor Sally Ng, Georgia Tech), IGAC Workshop on Nitrate Radicals and Biogenic Hydrocarbons, Atlanta, GA, June 2015

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

Co-Chair (with Professor Yinon Rudich, Weizmann Institute of Science, Israel), 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 & December 2016  
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)  
Zach Decker (First year graduate student, University of Colorado, Department of Chemistry)

#### *Previous Post-Doctoral Fellows & Current Positions*

Mattias Aldener (Scientist, FOI, Stockholm, Sweden)  
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 III, 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 (Droplet Measurement Technologies, Boulder, CO)  
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

### **Academic Courses**

University of Colorado, Chem 4511, Physical Chemistry I, Spring 2016

### **Analytical Instrument Development**

#### Cavity Ring Down Spectroscopy for NO<sub>3</sub> and N<sub>2</sub>O<sub>5</sub>

First *in-situ* detector for nighttime nitrogen oxides and one of the first applications of CRDS in atmospheric sensing. Instrument(s) have flown on 5 aircraft campaigns.

N. L. Wagner *et al.*, *Atmos. Meas. Tech.* **4**, 1227 (2011)

W. P. Dubé *et al.*, *Rev. Sci. Instr.* **77**, 034101 (2006)

S. S. Brown, *et al.* *Rev. Sci. Instr.* **73**, 3291 (2002)

#### Cavity Ring Down Spectroscopic Measurements of NO<sub>2</sub>, NO, O<sub>3</sub> and NO<sub>y</sub>

High sensitivity measurement for NO<sub>2</sub>, and first demonstration of conversions to NO, O<sub>3</sub> and total reactive nitrogen (NO<sub>y</sub>). Flown on 3 aircraft campaigns.

R. J. Wild *et al.*, *Environ. Sci. Technol.* **48**, 9609 (2014).

R. A. Washenfelder *et al.*, *Environ. Sci. Technol.* **45**, 2938 (2011).

H. Fuchs *et al.*, *Environ. Sci. Technol.* **43**, 7831 (2009).

#### Broadband Cavity Enhanced Spectroscopy for UV-VIS absorbing gases

Optical cavities, light emitting diodes (LED) and grating spectrometers / CCD detectors with applications to all structured UV-VIS absorbers.

R. A. Washenfelder *et al.*, *Atmos. Meas. Tech.* **9**, 41 (2016).

K. E. Min *et al.*, *Atmos. Meas. Tech.* **9**, 423 (2016).

R. A. Washenfelder, *et al.*, *Atmos. Chem. Phys.* **8**, 7779 (2008).

## Aerosol Optical Properties

Broadband CES and single wavelength CRDS instruments for aerosol extinction, with spectrally resolved, high sensitivity UV aerosol extinction.

A. R. Attwood *et al.*, *Geophysical Research Letters* **41**, 7701 (2014).

R. A. Washenfelder, *et al. Atmos. Meas. Tech.* **6**, 861 (2013).

T. Baynard *et al.*, *Aerosol Science and Technology* **41**, 447 (Apr, 2007).

## External Collaborators and Research Projects

Yinon Rudich, Weizmann Institute, Israel

U.S. Israel Binational Science Foundation Grant to investigate sources of brown carbon aerosol and new instrumentation for aerosol optical properties

Joel Thornton, University of Washington, Seattle Washington

WINTER (Wintertime Investigation of Transport, Emissions and Reactivity), project co-PI supported through multi investigator NSF grant

Kelley Barsanti, UCR, Riverside, California

Nighttime chemistry of biomass burning emissions

NOAA Atmospheric Chemistry and Climate Cycle Program

Kyung-Eun Min, Gwangju Institute of Science and Technology (GIST), Korea

Nighttime Chemistry from the Seoul Tower

Peter Edwards, University of York, UK

Collaborative proposal for new instrumentation to investigate global halogen cycles through ERC program

Hendrik Fuchs, Forschungszentrum Jülich, Germany

International collaboration for studies at SAPHIR environmental chamber

Keding Lu, Peking University, China

Developing white paper for studies of nighttime chemistry in the context of major field campaigns in China

Tao Wang, Hong Kong Polytechnic University, China

Field studies of nighttime chemical processes in Hong Kong, China

Wahid Mellouki, CNRS, Orleans, France

Laboratory and field studies of nitrate radicals

Veronica Vaida, University of Colorado, Boulder, CO

Development of spectroscopic instrumentation and laboratory studies of atmospheric spectroscopy supported by CIRES innovative research proposal

Julianne Fry, Reed College, Portland, Oregon

José Jimenez, University of Colorado, Boulder, CO

Laboratory and field studies of organic aerosol and nitrate supported through NOAA

NOAA Atmospheric Chemistry and Climate Cycle program

Andy Ruth, University College Cork, Ireland

Andreas Zahn, Karlsruhe Institute of Technology, Germany

Development of new instrument for measurement of N<sub>2</sub>O<sub>5</sub> in the upper troposphere from CARIBIC supported by grant from the Irish National Science Foundation

Nga Lee Ng, Georgia Institute of Technology, Atlanta, GA

Organized symposia on nitrate radicals and biogenic hydrocarbons supported by IGAC. Developing white paper for field and laboratory studies of anthropogenic-biogenic interactions

Allen Goldstein, UC Berkeley, Berkeley CA

Atmospheric chemistry of indoor air, supported through grant from Sloan Foundation

Solomon Bililign, North Carolina A&T, Greensboro, NC

Atmospheric oxidation rates of sulfur

S. Brown appointed as Adjunct professor in Department of Energy and Environmental Systems to advise Ph.D. students at NC A&T

## Recent and Forthcoming Presentations

- Megacities, Forests and Fires: Chemical Complexity across Widely Different Atmospheres, Discussion Leader for forthcoming Gordon Research Conference on Atmospheric Chemistry, Sunday River, Maine, August 2017
- Cavity Enhanced Spectroscopy for Atmospheric Chemistry in the Anthropocene, Invited Presentation for forthcoming Faraday Discussion on Chemistry in the Anthropocene, York, UK, May 2017
- Wintertime Atmospheric Chemistry: Understanding Sources of Oxidants and Particulate Matter, University of Utah Department of Atmospheric Sciences, Salt Lake City, Utah, November 2016
- Measurement of nitrogen oxides using cavity ring down spectroscopy, IAGOS Meeting on Atmospheric Composition, Manchester, England, October 2016
- Nocturnal oxidation of biogenic VOC: new insights from nighttime aircraft measurements, Rice University, Houston, TX, September 2016
- Nighttime Chemistry during Winter and Summer, Workshop on New Directions in Gas Phase Atmospheric Chemistry, Telluride, CO, July 2016
- The Air Quality Impacts of Western U.S. Oil and Gas Development, University of Wisconsin, Madison, July 2016
- Nitrogen Oxides in the Cold and Dark: New Directions in Winter Air Pollution, American Chemical Society Regional Meeting, Anchorage, AK, June 2016
- Nocturnal oxidation of biogenic VOC: new insights from nighttime aircraft measurements, CNRS, Orleans, France, May 2016
- The Air Quality Impacts of North American Oil and Gas Development, Weizmann Institute of Science, Reovot, Israel, March 2016
- The impact of ClNO<sub>2</sub> on nitrogen oxides and oxidants in a global model, American Geophysical Union Meeting, San Francisco, CA, December 2015
- 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<sub>3</sub> and N<sub>2</sub>O<sub>5</sub>, 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
- Organic Aerosol from Nocturnal Oxidation of Biogenic VOC, American Association of Aerosol Research, 33<sup>rd</sup> Annual Conference, Orlando, FL October 2014

Nighttime Oxidation of Biogenic Hydrocarbons in the Residual Layer, 13<sup>th</sup> 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

Nighttime Oxidation of Biogenic Hydrocarbons, Weizmann Institute of Science, Rehovot, Israel, April 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<sub>x</sub> 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

Heterogeneous Chemistry after Dark: Reactive Nitrogen, Halogens and a few Surprises about Atmospheric Oxidants. University of Chicago, Chemistry Department Seminar, Chicago, IL, 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*

159. Baasandorj, M., S. Hoch, R. Bares, J.C. Lin, S.S. Brown, D.B. Millet, R. Martin, K. Kelly, C. Jaramillo, K.J. Zarzana, W.P. Dubé, G. Tonnesen, C.D. Whiteman, and J. Sohl, *Contribution of Early Morning and Nighttime Chemistry to Wintertime PM<sub>2.5</sub> Pollution Episodes in Salt Lake Valley, Utah*. Environ. Sci. Technol., 2016. **submitted**.
158. Edwards, P.M., K. Aikin, W.P. Dubé, J.L. Fry, J.B. Gilman, J.A. de Gouw, M.G. Graus, T.F. Hanisco, J. Holloway, G. Hübler, J. Kaiser, F.N. Keutsch, B.M. Lerner, J.A. Neuman, D.D. Parrish, J. Peischl, I.B. Pollack, A.R. Ravishankara, J.M. Roberts, T.B. Ryerson, M. Trainer, G.M. Wolfe, C. Warneke, and S.S. Brown, *The high to low NO<sub>x</sub> transition in nocturnal biogenic VOC oxidation aloft: Indications of a regime transition in the Southeast U.S.* Nature Geosciences, 2017. **submitted**.
157. Bluvshstein, N., P. Lin, J.M. Flores, L. Segev, Y. Mazar, E. Tas, G. Snider, C. Weagle, S.S. Brown, A. Laskin, and Y. Rudich, *Broadband optical properties of biomass burning aerosol and identification of brown carbon chromophores*. J. Geophys. Res., 2016. **submitted**.
156. Carlton, A.M., J.A. de Gouw, J.L. Jimenez, J.L. Ambrose, S.S. Brown, K.R. Baker, C.A. Brock, R.C. Cohen, S. Edgerton, C. Farkas, D. Farmer, A.H. Goldstein, L. Gratz, A. Guenther, S. Hunt, L. Jaeglé, D.A. Jaffe, J. Mak, C. McClure, A. Nenes, T.K.V. Nguyen, J.R. Pierce, N. Selin, V. Shah, S. Shaw, P.B. Shepson, S. Song, J. Stutz, J. Surratt, B.J. Turpin, C. Warneke, R.A. Washenfelder, P.O. Wennberg, and X. Zhou, *The Southeast Atmosphere Studies (SAS): coordinated investigation and discovery to answer critical questions about fundamental atmospheric processes*. Bulletin of the American Meteorological Society, 2016. **submitted**.
155. B. Baier, W. Brune, D. Miller, D. Blake, R. Long, A. Wisthaler, C. Cantrell, A. Fried, B. Heikes, S. Brown, E. McDuffie, F. Flocke, E. Apel, L. Kaser and A. Weinheimer, *Atmos. Chem. Phys. Discuss.*, 2017, **2017**, 1-29.
154. Palm, B.B., P. Campuzano-Jost, D.A. Day, A.M. Ortega, J.L. Fry, S.S. Brown, K.J. Zarzana, W. Dube, N.L. Wagner, D.C. Draper, L. Kaser, W. Jud, T. Karl, A. Hansel, C. Gutiérrez-Montes, and J.L. Jimenez, *Secondary organic aerosol formation from in situ OH, O<sub>3</sub>, and NO<sub>3</sub> oxidation of ambient forest air in an oxidation flow reactor*. Atmos. Chem. Phys. Discuss., 2017. **2017**: p. 1-46.
153. Womack, C.C., J.A. Neuman, P.R. Veres, S.J. Eilerman, C.A. Brock, Z.C.J. Decker, K.J. Zarzana, W.P. Dube, R.J. Wild, P.J. Wooldridge, R.C. Cohen, and S.S. Brown, *Evaluation of the accuracy of thermal dissociation CRDS and LIF techniques for atmospheric measurement of reactive nitrogen species*. Atmos. Meas. Tech. Discuss., 2016. **2016**: p. 1-30.151.
152. Miller, C.C., D.J. Jacob, E.A. Marais, K. Yu, K.R. Travis, P.S. Kim, J.A. Fisher, L. Zhu, G.M. Wolfe, F.N. Keutsch, J. Kaiser, K.E. Min, S.S. Brown, R.A. Washenfelder, G. González Abad, and K. Chance, *Glyoxal yield from isoprene oxidation and relation to formaldehyde: chemical mechanism, constraints from*

*SENEX aircraft observations, and interpretation of OMI satellite data.* Atmos. Chem. Phys. Discuss., 2016. **2016**: p. 1-25.

*Published*

151. Brown, S.S., H.J. An, M. Lee, J.H. Park, S.D. Lee, D.L. Fibiger, E.E. McDuffie, W.P. Dubé, N.L. Wagner, and K.E. Min, *Cavity Enhanced Spectroscopy for Measurement of Nitrogen Oxides in the Anthropocene: Results from the Seoul Tower during MAPS 2015.* Faraday Discussions, DOI: 10.1039/C7FD00001D, 2017
150. Ng, N.L., S.S. Brown, A.T. Archibald, E. Atlas, R.C. Cohen, J.N. Crowley, D.A. Day, N.M. Donahue, J.L. Fry, H. Fuchs, R.J. Griffin, M.I. Guzman, H. Herrmann, A. Hodzic, Y. Iinuma, J.L. Jimenez, A. Kiendler-Scharr, B.H. Lee, D.J. Luecken, J. Mao, R. McLaren, A. Mutzel, H.D. Osthoff, B. Ouyang, B. Picquet-Varrault, U. Platt, H.O.T. Pye, Y. Rudich, R.H. Schwantes, M. Shiraiwa, J. Stutz, J.A. Thornton, A. Tilgner, B.J. Williams, and R.A. Zaveri, *Nitrate radicals and biogenic volatile organic compounds: oxidation, mechanisms, and organic aerosol.* Atmos. Chem. Phys., 2017. **17**(3): p. 2103-2162.
149. H. Fuchs, Z. Tan, K. Lu, B. Bohn, S. Broch, S. S. Brown, H. Dong, S. Gomm, R. Häsel, L. He, A. Hofzumahaus, F. Holland, X. Li, Y. Liu, S. Lu, K. E. Min, F. Rohrer, M. Shao, B. Wang, M. Wang, Y. Wu, L. Zeng, Y. Zhang, A. Wahner and Y. Zhang, *Atmos. Chem. Phys.*, 2017, **17**, 645-661.
148. Wild, R.J., W.P. Dubé, K.C. Aikin, S.J. Eilerman, J.A. Neuman, J. Peischl, T.B. Ryerson, and S.S. Brown, *On-road measurements of vehicle NO<sub>2</sub>/NO<sub>x</sub> emission ratios in Denver, Colorado, USA.* Atmospheric Environment, 2017. **148**: p. 182-189.
147. Feiner, P.A., W.H. Brune, D.O. Miller, L. Zhang, R.C. Cohen, P.S. Romer, A.H. Goldstein, F.N. Keutsch, K.M. Skog, P.O. Wennberg, T.B. Nguyen, A.P. Teng, J.A. de Gouw, A. Koss, R.J. Wild, S.S. Brown, A. Guenther, E. Edgerton, K. Baumann, and J.L. Fry, *Testing Atmospheric Oxidation in an Alabama Forest.* Journal of the Atmospheric Sciences, 2016. **73**: p. 4699-4710.
146. Guo, H., A.P. Sullivan, P. Campuzano-Jost, J.C. Schroder, F.D. Lopez-Hilfiker, J.E. Dibb, J.L. Jimenez, J.A. Thornton, S.S. Brown, A. Nenes, and R.J. Weber, *Fine particle pH and the partitioning of nitric acid during winter in the northeastern United States.* Journal of Geophysical Research: Atmospheres, 2016. **121**(17): p. 10,355-10,376.
145. Li, J., J. Mao, K.-E. Min, R.A. Washenfelder, S.S. Brown, J. Kaiser, F.N. Keutsch, R. Volkamer, G.M. Wolfe, T.F. Hanisco, I.B. Pollack, T.B. Ryerson, M. Graus, J.B. Gilman, B.M. Lerner, C. Warneke, J.A. de Gouw, A.M. Middlebrook, J. Liao, A. Welti, B.H. Henderson, V.F. McNeill, S.R. Hall, K. Ullmann, L.J. Donner, F. Paulot, and L.W. Horowitz, *Observational constraints on glyoxal production from isoprene oxidation and its contribution to organic aerosol over the Southeast United States.* Journal of Geophysical Research: Atmospheres, 2016. **121**(16): p. 9849-9861.
144. Neuman, J.A., M. Trainer, S.S. Brown, K.E. Min, J.B. Nowak, D.D. Parrish, J. Peischl, I.B. Pollack, J.M. Roberts, T.B. Ryerson, and P.R. Veres, *HONO*

- emission and production determined from airborne measurements over the Southeast U.S.* Journal of Geophysical Research: Atmospheres, 2016. **121**(15): p. 9237-9250.
143. McDuffie, E.E., P.M. Edwards, J.B. Gilman, B.M. Lerner, W.P. Dubé, M. Trainer, D.E. Wolfe, W.M. Angevine, J. deGouw, E.J. Williams, A.G. Tevlin, J.G. Murphy, E.V. Fischer, S. McKeen, T.B. Ryerson, J. Peischl, J.S. Holloway, K. Aikin, A.O. Langford, C.J. Senff, R.J. Alvarez, S.R. Hall, K. Ullmann, K.O. Lantz, and S.S. Brown, *Influence of oil and gas emissions on summertime ozone in the Colorado Northern Front Range.* Journal of Geophysical Research: Atmospheres, 2016. **121**(14): p. 8712-8729.
142. Kaiser, J., K.M. Skog, K. Baumann, S.B. Bertman, S.S. Brown, W.H. Brune, J.D. Crouse, J.A. de Gouw, E.S. Edgerton, P.A. Feiner, A.H. Goldstein, A. Koss, P.K. Misztal, T.B. Nguyen, K.F. Olson, J.M. St. Clair, A.P. Teng, S. Toma, P.O. Wennberg, R.J. Wild, L. Zhang, and F.N. Keutsch, *Speciation of OH reactivity above the canopy of an isoprene-dominated forest.* Atmos. Chem. Phys., 2016. **16**(14): p. 9349-9359.
141. Warneke, C., M. Trainer, J.A. de Gouw, D.D. Parrish, D.W. Fahey, A.R. Ravishankara, A.M. Middlebrook, C.A. Brock, J.M. Roberts, S.S. Brown, J.A. Neuman, B.M. Lerner, D. Lack, D. Law, G. Hübler, I. Pollack, S. Sjostedt, T.B. Ryerson, J.B. Gilman, J. Liao, J. Holloway, J. Peischl, J.B. Nowak, K.C. Aikin, K.E. Min, R.A. Washenfelder, M.G. Graus, M. Richardson, M.Z. Markovic, N.L. Wagner, A. Welti, P.R. Veres, P. Edwards, J.P. Schwarz, T. Gordon, W.P. Dube, S.A. McKeen, J. Brioude, R. Ahmadov, A. Bougiatioti, J.J. Lin, A. Nenes, G.M. Wolfe, T.F. Hanisco, B.H. Lee, F.D. Lopez-Hilfiker, J.A. Thornton, F.N. Keutsch, J. Kaiser, J. Mao, and C.D. Hatch, *Instrumentation and measurement strategy for the NOAA SENEX aircraft campaign as part of the Southeast Atmosphere Study 2013.* Atmos. Meas. Tech., 2016. **9**(7): p. 3063-3093.
140. Chang, W.L., S.S. Brown, J. Stutz, A.M. Middlebrook, R. Bahreini, N.L. Wagner, W.P. Dubé, I.B. Pollack, T.B. Ryerson, and N. Riemer, *Evaluating N<sub>2</sub>O<sub>5</sub> heterogeneous hydrolysis parameterizations for CalNex 2010.* Journal of Geophysical Research: Atmospheres, 2016. **121**(9): p. 5051-5070.
139. Griffith, S.M., R.F. Hansen, S. Dusanter, V. Michoud, J.B. Gilman, W.C. Kuster, P.R. Veres, M. Graus, J.A. de Gouw, J. Roberts, C. Young, R. Washenfelder, S.S. Brown, R. Thalman, E. Waxman, R. Volkamer, C. Tsai, J. Stutz, J.H. Flynn, N. Grossberg, B. Lefer, S.L. Alvarez, B. Rappenglueck, L.H. Mielke, H.D. Osthoff, and P.S. Stevens, *Measurements of hydroxyl and hydroperoxy radicals during CalNex-LA: Model comparisons and radical budgets.* Journal of Geophysical Research: Atmospheres, 2016. **121**(8): p. 4211-4232.
138. Romer, P.S., K.C. Duffey, P.J. Wooldridge, H.M. Allen, B.R. Ayres, S.S. Brown, W.H. Brune, J.D. Crouse, J. de Gouw, D.C. Draper, P.A. Feiner, J.L. Fry, A.H. Goldstein, A. Koss, P.K. Misztal, T.B. Nguyen, K. Olson, A.P. Teng, P.O. Wennberg, R.J. Wild, L. Zhang, and R.C. Cohen, *The lifetime of nitrogen oxides in an isoprene-dominated forest.* Atmos. Chem. Phys., 2016. **16**(12): p. 7623-7637.
137. Nguyen, T.B., J.D. Crouse, A.P. Teng, M.M. Coggon, R.H. Schwantes, K.H. Bates, L. Zhang, P.A. Feiner, D.O. Miller, K.M. Skog, J.C. Rivera, M. Doris, K.F.

- Olson, A. Koss, R.J. Wild, S.S. Brown, A.H. Goldstein, J.A. de Gouw, G.S. Tyndall, W.H. Brune, F.N. Keutsch, J.H. Seinfeld, and P.O. Wennberg, *Atmospheric fates of Criegee intermediates in the ozonolysis of isoprene*. *Phys. Chem. Chem. Phys.*, 2016. **18**: p. 10241-10254.
136. Brown, S.S., W.P. Dubé, Y.J. Tham, Q. Zha, L. Xue, S. Poon, Z. Wang, D.R. Blake, W. Tsui, D.D. Parrish, and T. Wang, *Nighttime chemistry at a high altitude site above Hong Kong*. *Journal of Geophysical Research: Atmospheres*, 2016. **121**(5): p. 2457-2475.
135. Wang, T., Y.J. Tham, L. Xue, Q. Li, Q. Zha, Z. Wang, S.C.N. Poon, W.P. Dubé, D.R. Blake, P.K.K. Louie, C.W.Y. Luk, W. Tsui, and S.S. Brown, *Observations of nitryl chloride and modeling its source and effect on ozone in the planetary boundary layer of southern China*. *Journal of Geophysical Research: Atmospheres*, 2016. **121**(5): p. 2476-2489.
134. Min, K.E., R.A. Washenfelder, W.P. Dubé, A.O. Langford, P.M. Edwards, K.J. Zarzana, J. Stutz, K. Lu, F. Rohrer, Y. Zhang, and S.S. Brown, *A broadband cavity enhanced absorption spectrometer for aircraft measurements of glyoxal, methylglyoxal, nitrous acid, nitrogen dioxide, and water vapor*. *Atmos. Meas. Tech.*, 2016. **9**(2): p. 423-440.
133. 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.D. 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.*, 2016. **16**(4): p. 2139-2153.
132. Washenfelder, R.A., A.R. Attwood, J.M. Flores, K.J. Zarzana, Y. Rudich, and S.S. Brown, *Broadband cavity-enhanced absorption spectroscopy in the ultraviolet spectral region for measurements of nitrogen dioxide and formaldehyde*. *Atmos. Meas. Tech.*, 2016. **9**(1): p. 41-52.
131. 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.R. Koss, L. Lee, B.M. 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, K.J. Zarzana, and S.S. Brown, *Reactive nitrogen partitioning and its relationship to winter ozone events in Utah*. *Atmos. Chem. Phys.*, 2016. **16**(2): p. 573-583.
130. Lee, B.H., C. Mohr, F.D. Lopez-Hilfiker, A. Lutz, M. Hallquist, L. Lee, P. Romer, R.C. Cohen, S. Iyer, T. Kurtén, W. Hu, D.A. Day, P. Campuzano-Jost, J.L. Jimenez, L. Xu, N.L. Ng, H. Guo, R.J. Weber, R.J. Wild, S.S. Brown, A. Koss, J. de Gouw, K. Olson, A.H. Goldstein, R. Seco, S. Kim, K. McAvey, P.B. Shepson, T. Starn, K. Baumann, E.S. Edgerton, J. Liu, J.E. Shilling, D.O. Miller, W. Brune, S. Schobesberger, E.L. D'Ambro, and J.A. Thornton, *Highly functionalized organic nitrates in the southeast United States: Contribution to secondary organic aerosol and reactive nitrogen budgets*. *Proceedings of the National Academy of Sciences*, 2016. **113**(6): p. 1516-1521.
129. Kim, S.W., B.C. McDonald, S. Baidar, S.S. Brown, W. Dubé, R.A. Ferrare, G.J. Frost, R.A. Harley, J.S. Holloway, H.J. Lee, S.A. McKeen, J.A. Neuman, J.B. Nowak, H. Oetjen, I. Ortega, I.B. Pollack, J.M. Roberts, T.B. Ryerson, A.J. Scarino, C.J. Senff, R. Thalman, M. Trainer, R. Volkamer, N. Wagner, R.A.

- Washenfelder, E. Waxman, and C.J. Young, *Modeling the weekly cycle of NO<sub>x</sub> and CO emissions and their impacts on O<sub>3</sub> in the Los Angeles-South Coast Air Basin during the CalNex 2010 field campaign*. Journal of Geophysical Research: Atmospheres, 2016. **121**(3): p. 1340-1360.
128. Liu, S., R. Li, R.J. Wild, C. Warneke, J.A. de Gouw, S.S. Brown, S.L. Miller, J.C. Luongo, J.L. Jimenez, and P.J. Ziemann, *Contribution of human-related sources to indoor volatile organic compounds in a university classroom*. Indoor Air, 2016. **26**(6): p. 925-938.
127. 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, P.O. Wennberg, T.B. Nguyen, A. Teng, A.H. Goldstein, K. Olson, and J.L. Fry, *Organic nitrate aerosol formation via NO<sub>3</sub> + biogenic volatile organic compounds in the southeastern United States*. Atmos. Chem. Phys., 2015. **15**(23): p. 13377-13392.
126. 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, *An Atmospheric Constraint on the NO<sub>2</sub> Dependence of Daytime Near-Surface Nitrous Acid (HONO)*. Environmental Science & Technology, 2015. **49**(21): p. 12774-12781.
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, *Peroxy nitric acid (HO<sub>2</sub>NO<sub>2</sub>) 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 NO<sub>3</sub> 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<sub>y</sub>, together with NO<sub>2</sub>, NO and O<sub>3</sub> 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<sub>2</sub>) 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<sub>2</sub>O<sub>5</sub> uptake coefficients and nocturnal NO<sub>2</sub> 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 vertical 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<sub>2</sub> and Cl<sub>2</sub> measurements from a tall tower in a polluted continental setting*. J. Geophys. Res., 2013. **118**(15): p. 8702-8715.
99. Öztürk, F., R. Bahreini, N.L. Wagner, W.P. Dubé, C.J. Young, S.S. Brown, C.A. Brock, I.M. Ulbrich, J.L. Jimenez, O.R. Cooper, and A.M. Middlebrook, *Vertically resolved chemical characteristics and sources of sub-micron aerosols in a suburban area near Denver, Colorado in winter*. J. Geophys. Res., 2013. **118**: p. 13591-13605.
98. McQuaid, J., H. Schlager, M.D. Andrés-Hernández, S.M. Ball, A. Borbon, S.S. Brown, V. Catoire, P. Di Carlo, T.G. Custer, M. von Hobe, J. Hopkins, K. Pfeilsticker, T. Röckmann, A. Roiger, F. Stroh, J. Williams, and H. Ziereis, *In Situ Trace Gas Measurements*, in *Airborne Measurements for Environmental Research 2013*, Wiley-VCH Verlag GmbH & Co. KGaA. p. 77-155.
97. Huang, M., K.W. Bowman, G.R. Carmichael, B.P. R., H.M. Worden, M. Luo, O.R. Cooper, I.B. Pollack, T.B. Ryerson, and S.S. Brown, *Impact of Southern California anthropogenic emissions on ozone pollution in the mountain states: Model analysis and observational evidence from space*. Journal of Geophysical Research: Atmospheres, 2013. **118**(22): p. 12784-12803.
96. Fry, J.L., D.C. Draper, K.J. Zarzana, P. Campuzano-Jost, D.A. Day, J.L. Jimenez, S.S. Brown, R.C. Cohen, L. Kaser, A. Hansel, L. Cappellin, T. Karl, A. Hodzic Roux, A. Turnipseed, C. Cantrell, B. Lefer, and N. Grossberg, *Observations of gas- and aerosol-phase organic nitrates at BEACHON-RoMBAS 2011*. Atmos. Chem. Phys., 2013. **13**: p. 8585-8605.
95. Edwards, P.M., C.J. Young, K.C. Aikin, J.A. de Gouw, W.P. Dubé, F. Geiger, J. Gilman, D. Helmig, J.S. Holloway, J. Kercher, B. Lerner, R. Martin, R. McLaren, D.D. Parrish, J. Peischl, J.M. Roberts, T.B. Ryerson, J.A. Thornton, C. Warneke, E.J. Williams, and S.S. Brown, *Ozone photochemistry in an oil and natural gas extraction region during winter: Simulations of a snow-free season in the Uintah Basin, Utah*. Atmos. Chem. Phys., 2013. **13**: p. 8955-8971.



94. Dorn, H.P., R.L. Apodaca, S.M. Ball, T. Brauers, S.S. Brown, J.N. Crowley, W.P. Dubé, H. Fuchs, R. Häseler, U. Heitmann, R.L. Jones, A. Kiendler-Scharr, I. Labazan, J.M. Langridge, J. Meinen, T.F. Mentel, U. Platt, D. Pöhler, F. Rohrer, A.A. Ruth, E. Schlosser, G. Schuster, A.J.L. Shillings, W.R. Simpson, J. Thieser, R. Tillmann, R. Varma, D.S. Venables, and A. Wahner, *Intercomparison of NO<sub>3</sub> radical detection instruments in the atmosphere simulation chamber SAPHIR*. Atmos. Meas. Tech., 2013. **6**: p. 1111-1140.
93. Chen, D., Q. Li, J. Stutz, Y. Mao, L. Zhang, O. Pikelnaya, J.Y. Tsai, C. Haman, B. Lefer, B. Rappenglück, S.L. Alvarez, J.A. Neuman, J. Flynn, J.M. Roberts, J.B. Nowak, J. de Gouw, J. Holloway, N.L. Wagner, P. Veres, S.S. Brown, T.B. Ryerson, C. Warneke, and I.B. Pollack, *WRF-Chem simulation of NO<sub>x</sub> and O<sub>3</sub> in the L.A. basin during CalNex-2010*. Atmos. Environ., 2013. **81**: p. 421-432.
92. Brown, S.S., N.L. Wagner, W.P. Dubé, and J.M. Roberts, *Heterogeneous Atmospheric Chemistry of Nitrogen Oxides: New Insights from Recent Field Measurements*, in *Disposal of Dangerous Chemicals in Urban Areas and Mega Cities*, I. Barnes and K.J. Rudziński, Editors. 2013, Springer: Dordrecht. p. 125-138.
91. Brown, S.S., J.A. Thornton, W.C. Keene, A.A.P. Pszenny, B.C. Sive, W.P. Dubé, N.L. Wagner, C.J. Young, T.P. Riedel, J.M. Roberts, T.C. VandenBoer, R. Bahreini, F. Öztürk, A.M. Middlebrook, S. Kim, G. Hübler, and D.E. Wolfe, *Nitrogen, Aerosol Composition and Halogens on a Tall Tower (NACHTT): Overview of a Wintertime Air Chemistry Field Study in the Front Range Urban Corridor of Colorado*. J. Geophys. Res., 2013. **118**: p. 8067-8085.
90. Brown, S.S., W.P. Dubé, R. Bahreini, A.M. Middlebrook, C.A. Brock, C. Warneke, J.A. de Gouw, R.A. Washenfelder, E. Atlas, J. Peischl, T.B. Ryerson, J.S. Holloway, J.P. Schwarz, R. Spackman, M. Trainer, D.D. Parrish, F.C. Fehsenfeld, and A.R. Ravishankara, *Biogenic VOC oxidation and organic aerosol formation in an urban nocturnal boundary layer: Aircraft vertical profiles in Houston, TX*. Atmos. Chem. Phys., 2013. **13**: p. 11317-11337.
89. Brioude, J., W.M. Angevine, R. Ahmadov, S.W. Kim, S. Evan, S.A. McKeen, E.Y. Hsie, G.J. Frost, J.A. Neuman, I.B. Pollack, J. Peischl, T.B. Ryerson, J. Holloway, S.S. Brown, J.B. Nowak, J.M. Roberts, S.C. Wofsy, G.W. Santoni, and M. Trainer, *Top-down estimate of surface flux in the Los Angeles Basin using a mesoscale inverse modeling technique: assessing anthropogenic emissions of CO, NO<sub>x</sub> and CO<sub>2</sub> and their impacts*. Atmos. Chem. Phys., 2013. **13**: p. 3661-3677.
88. Young, C.J., R.A. Washenfelder, L.H. Mielke, H.D. Osthoff, P. Veres, A.K. Cochran, T.C. VandenBoer, H. Stark, J. Flynn, N. Grossberg, C.L. Haman, B. Lefer, J.B. Gilman, W.C. Kuster, C. Tsai, O. Pikelnaya, J. Stutz, J.M. Roberts, and S.S. Brown, *Vertically resolved measurements of nighttime radical reservoirs in Los Angeles and their contribution to the urban radical budget*. Environ. Sci. Technol., 2012. **46**: p. 10965-10973.
87. Wagner, N.L., T.P. Riedel, J.M. Roberts, J.A. Thornton, W.M. Angevine, E.J. Williams, B.M. Lerner, A. Vlasenko, S.-M. Li, W.P. Dubé, D. Coffman, D. Bon, J. de Gouw, W.C. Kuster, J. Gilman, and S.S. Brown, *The sea breeze / land breeze circulation in Los Angeles and its influence on nitryl chloride production and air*

- quality in this region.* J. Geophys. Res., 2012. **116**: p. D00V24.
86. Riedel, T.P., T.H. Bertram, T.A. Crisp, E.J. Williams, B.M. Lerner, A. Vlasenko, S.-M. Li, J.B. Gilman, J. de Gouw, D.M. Bon, N.L. Wagner, S.S. Brown, and J.A. Thornton, *Nitryl chloride and molecular chlorine in the coastal marine boundary layer.* Environ. Sci. Technol., 2012. **46**: p. 10463-10470.
  85. Pollack, I.B., T.B. Ryerson, M. Trainer, D.D. Parrish, A. Andrews, E. Atlas, D. Blake, S.S. Brown, R. Commane, B.C. Daube, J.A. de Gouw, W.P. Dube, J. Flynn, G. Frost, J. Gilman, N. Grossberg, J. Holloway, J. Kofler, E.A. Kort, W.C. Kuster, P. Lang, B. Lefer, R. Lueb, J.A. Neuman, J.B. Nowak, P. Novelli, J. Peischl, A. Perring, J.M. Roberts, G. Santoni, J. Schwarz, J.R. Spackman, N.L. Wagner, C. Warneke, S.C. Wofsy, and B. Xiang, *Airborne and ground-based observations of a weekend effect in ozone, precursors, and oxidation products in the California South Coast Air Basin.* J. Geophys. Res., 2012. **117**: p. D00V05.
  84. Neuman, J.A., M. Trainer, K.C. Aikin, W.M. Angevine, J. Brioude, S.S. Brown, J.A. de Gouw, W.P. Dubé, M. Graus, J.H. Flynn, J. Holloway, B.L. Lefer, P. Nedelec, J.B. Nowak, D.D. Parrish, I.B. Pollack, J.M. Roberts, T.B. Ryerson, H. Smit, V. Thouret, and N.L. Wagner, *Ozone transport from the free troposphere to the Los Angeles Basin.* J. Geophys. Res., 2012. **117**: p. D00V09.
  83. Kahan, T.F., R.A. Washenfelder, V. Vaida, and S.S. Brown, *Cavity-enhanced measurements of hydrogen peroxide absorption cross sections from 353 to 410 nm.* J. Phys. Chem., 2012. **116**: p. 5941-5947.
  82. Fuchs, H., W.R. Simpson, R.L. Apodaca, T. Brauers, R.C. Cohen, J.N. Crowley, H.P. Dorn, W.P. Dubé, J.L. Fry, R. Häsel, Y. Kajii, A. Kiendler-Scharr, I. Labazan, J. Matsumoto, T.F. Mentel, Y. Nakashima, F. Rohrer, A.W. Rollins, G. Schuster, R. Tillmann, A. Wahner, P.J. Wooldridge, and S.S. Brown, *Comparison of N<sub>2</sub>O<sub>5</sub> mixing ratios during NO<sub>3</sub>Comp 2007 in SAPHIR.* Atmos. Meas. Tech., 2012. **5**: p. 2763-2777.
  81. Brown, S.S. and J. Stutz, *Nighttime Radical Observations and Chemistry.* Chem. Soc. Reviews, 2012. **41**: p. 6405-6447.
  80. Brown, S.S., W.P. Dubé, P. Karamchandari, G. Yarwood, J. Peischl, T.B. Ryerson, J.A. Neuman, J.B. Nowak, J.S. Holloway, R.A. Washenfelder, C.A. Brock, G.J. Frost, M. Trainer, D.D. Parrish, F.C. Fehsenfeld, and A.R. Ravishankara, *The effects of NO<sub>x</sub> control and plume mixing on nighttime chemical processing of plumes from coal-fired power plants.* J. Geophys. Res., 2012. **117**: p. D07304.
  79. Bahreini, R., A.M. Middlebrook, J.A. de Gouw, C. Warneke, M. Trainer, C.A. Brock, H. Stark, S.S. Brown, W.P. Dube, J.B. Gilman, K. Hall, J.S. Holloway, W.C. Kuster, A.E. Perring, A.S.H. Prevot, J.P. Schwarz, J.R. Spackman, S. Szidat, N.L. Wagner, R.J. Weber, P. Zotter, and D.D. Parrish, *Gasoline emissions dominate over diesel in formation of secondary organic aerosol mass.* Geophys. Res. Lett., 2012. **39**(6): p. L06805.
  78. Young, C.J., R.A. Washenfelder, and S.S. Brown, *Cavity Enhanced Spectroscopy: Applications, Theory and Instrumentation*, in *Encyclopedia of Analytical Chemistry*, M.W. Sigrist, Editor 2011, John Wiley & Sons: West Sussex, UK.
  77. Washenfelder, R.A., C.J. Young, S.S. Brown, W.M. Angevine, E.L. Atlas, D.R.

- Blake, D.M. Bon, M.J. Cubinson, J.A. de Gouw, S. Dusanter, J. Flynn, J.B. Gilman, M. Graus, S. Griffith, N. Grossberg, P.L. Hayes, J.L. Jimenez, W.C. Kuster, B.L. Lefer, I.B. Pollack, T.B. Ryerson, H. Stark, P.S. Stevens, and M.K. Trainer, *The glyoxal budget and its contribution to organic aerosol for Los Angeles, California during CalNex 2010*. J. Geophys. Res., 2011. **116**: p. D00V02.
76. Washenfelder, R.A., W.P. Dubé, N.L. Wagner, and S.S. Brown, *Measurement of atmospheric ozone by cavity ring-down spectroscopy*. Environ. Sci. Technol., 2011. **45**: p. 2938-2944.
75. Wagner, N.L., W.P. Dubé, R.A. Washenfelder, C.J. Young, I.B. Pollack, T.B. Ryerson, and S.S. Brown, *Diode laser-based cavity ring-down instrument for NO<sub>3</sub>, N<sub>2</sub>O<sub>5</sub>, NO, NO<sub>2</sub> and O<sub>3</sub> from aircraft*. Atmos. Meas. Tech., 2011. **4**: p. 1227-1240.
74. Stark, H., S.S. Brown, K.W. Wong, J. Stutz, C.D. Elvidge, I.B. Pollack, T.B. Ryerson, W.P. Dubé, N.L. Wagner, and D.D. Parrish, *City lights and urban air*. Nature Geosciences, 2011. **4**(11): p. 730-731.
73. Sommariva, R., S.S. Brown, J.M. Roberts, D.M. Brookes, A.E. Parker, P.S. Monks, T.S. Bates, D. Bon, W.H. Brune, J.A. de Gouw, G.J. Frost, J.B. Gilman, P.D. Goldan, S.C. Herndon, W.C. Kuster, B.M. Lerner, H.D. Osthoff, S.C. Tucker, C. Warneke, E.J. Williams, and M.S. Zahniser, *Ozone production in remote oceanic and industrial areas derived from ship based measurements of peroxy radicals during TexAQS 2006*. Atmos. Chem. Phys., 2011. **11**: p. 2471-2485.
72. Sommariva, R., T.S. Bates, D. Bon, D.M. Brookes, J.A. de Gouw, J.B. Gilman, S.C. Herndon, W.C. Kuster, B.M. Lerner, P.S. Monks, H.D. Osthoff, A.E. Parker, J.M. Roberts, S.C. Tucker, C. Warneke, E.J. Williams, M.S. Zahniser, and S.S. Brown, *Modeled and measured concentrations of peroxy radicals and nitrate radical in the U.S. Gulf Coast region during TexAQS 2006*. Journal of Atmospheric Chemistry, 2011. **68**(4): p. 331-362.
71. Fry, J.L., A. Kiendler-Scharr, A.W. Rollins, T. Brauers, S.S. Brown, H.P. Dorn, W.P. Dubé, H. Fuchs, A. Mensah, F. Rohrer, R. Tillmann, A. Wahner, P.J. Wooldridge, and R.C. Cohen, *SOA from limonene: role of NO<sub>3</sub> in its generation and degradation*. Atmos. Chem. Phys., 2011. **11**: p. 3879-3894.
70. Chang, W.L., P.V. Bhave, S.S. Brown, N. Riemer, J. Stutz, and D. Dabdub, *Heterogeneous Atmospheric Chemistry, Ambient Measurements, and Model Calculations of N<sub>2</sub>O<sub>5</sub>: A Review*. Aerosol Science and Technology, 2011. **45**: p. 655-685.
69. Brown, S.S., W.P. Dubé, J. Peischl, T.B. Ryerson, E. Atlas, C. Warneke, J. de Gouw, S. Te Lintel Hekkert, C.A. Brock, F. Flocke, M. Trainer, D.D. Parrish, F.C. Fehsenfeld, and A.R. Ravishankara, *Budgets for nocturnal VOC oxidation by nitrate radicals aloft during the 2006 Texas Air Quality Study*. J. Geophys. Res., 2011. **116**: p. D24305.
68. Begashaw, I., M.N. Fiddler, S. Bililign, and S.S. Brown, *Measurement of the fourth O-H overtone absorption cross section in acetic acid using cavity ring-down spectroscopy*. J. Phys. Chem. A., 2011. **115**: p. 753-761.
67. Axson, J.L., R.A. Washenfelder, T.F. Kahan, C.J. Young, V. Vaida, and S.S. Brown, *Absolute ozone absorption cross section in the Huggins Chappius*

- minimum (350-470 nm) at 296 K.* Atmos. Chem. Phys., 2011. **11**: p. 11581-11590.
66. Thornton, J.A., J.P. Kercher, T.P. Riedel, N.L. Wagner, J. Cozic, J.S. Holloway, W.P. Dubé, G.M. Wolfe, P.K. Quinn, A.M. Middlebrook, B. Alexander, and S.S. Brown, *A large atomic chlorine source inferred from mid-continental reactive nitrogen chemistry.* Nature, 2010. **464**: p. 271-274.
  65. Simon, H., Y. Kimura, G. McGaughey, D.T. Allen, S.S. Brown, D. Coffman, J.E. Dibb, H.D. Osthoff, P.K. Quinn, J.M. Roberts, G. Yarwood, S. Kembal-Cook, D. Byun, and D. Lee, *Modeling heterogeneous ClNO<sub>2</sub> formation, chloride availability, and chlorine cycling in Southeast Texas.* Atmos. Environ., 2010. **44**: p. 5476-5488.
  64. Roberts, J.M., P. Veres, C. Warneke, J.A. Neuman, R.A. Washenfelder, S.S. Brown, M. Baasandorj, J.B. Burkholder, I.R. Burling, T.J. Johnson, R.J. Yokelson, and J. de Gouw, *Measurement of HONO, HNCO, and other inorganic acids by negative-ion proton-transfer chemical-ionization mass spectrometry (NI-PT-CIMS): application to biomass burning emissions.* Atmos. Meas. Tech., 2010. **3**: p. 981-990.
  63. Peischl, J., T.B. Ryerson, J.S. Holloway, D.D. Parrish, M. Trainer, G.J. Frost, K.C. Aikin, S.S. Brown, W.P. Dubé, H. Stark, and F.C. Fehsenfeld, *A top-down analysis of emission from selected East Texas power plants during TexAQS 2000 and 2006.* J. Geophys. Res., 2010. **115**: p. D16303.
  62. Fuchs, H., S.M. Ball, B. Bohn, T. Brauers, R.C. Cohen, H.P. Dorn, W.P. Dubé, J.L. Fry, R. Häsel, U. Heitmann, R.L. Jones, J. Kleffmann, T.F. Mentel, P. Müsgen, F. Rohrer, A.W. Rollins, A.A. Ruth, A. Kiendler-Scharr, E. Schlosser, A.J.L. Shillings, R. Tillmann, R.M. Varma, D.S. Venables, G. Villena Tapia, A. Wahner, R. Wegener, P.J. Wooldridge, and S.S. Brown, *Intercomparison of measurements of NO<sub>2</sub> concentrations in the atmosphere simulation chamber SAPHIR during the NO<sub>3</sub>Comp campaign.* Atmos. Meas. Tech., 2010. **3**: p. 21-37.
  61. Sommariva, R., H.D. Osthoff, S.S. Brown, T.S. Bates, T. Baynard, D. Coffman, J.A. de Gouw, P.D. Goldan, W.C. Kuster, B.M. Lerner, H. Stark, C. Warneke, E.J. Williams, F.C. Fehsenfeld, A.R. Ravishankara, and M. Trainer, *Radicals in the marine boundary layer during NEAQS 2004: a model study of day-time and night-time sources and sinks.* Atmos. Chem. Phys., 2009. **9**: p. 3075-3093.
  60. Simon, H., Y. Kimura, G. McGaughey, D.T. Allen, S.S. Brown, H.D. Osthoff, J.M. Roberts, D. Byun, and D. Lee, *Modeling the Impact of ClNO<sub>2</sub> on Ozone Formation in the Houston Area.* J. Geophys. Res., 2009. **114**: p. D00F03.
  59. Rollins, A.W., A. Kiendler-Scharr, J.L. Fry, T. Brauers, S.S. Brown, H.-P. Dorn, W.P. Dubé, H. Fuchs, A. Mensah, T.F. Mentel, F. Rohrer, R. Tillmann, R. Wegener, P.J. Wooldridge, and R.C. Cohen, *Isoprene oxidation by nitrate radical: alkyl nitrate and secondary organic aerosol yields.* Atmos. Chem. Phys., 2009. **9**: p. 6685-6703.
  58. Roberts, J.M., H.D. Osthoff, S.S. Brown, and A.R. Ravishankara, *Laboratory studies of products of N<sub>2</sub>O<sub>5</sub> uptake on Cl containing substrates.* Geophys. Res. Lett., 2009. **36**: p. L20808.
  57. Osthoff, H.D., T.S. Bates, J.E. Johnson, W.C. Kuster, P.D. Goldan, R. Sommariva, E.J. Williams, B.M. Lerner, C. Warneke, J.A. de Gouw, A.

- Pettersson, T. Baynard, J.F. Meagher, F.C. Fehsenfeld, A.R. Ravishankara, and S.S. Brown, *Regional variation of dimethyl sulfide oxidation mechanism in the summertime marine boundary layer in the Gulf of Maine*. J. Geophys. Res., 2009. **114**: p. D07301.
56. Fuchs, H., W.P. Dubé, B.M. Lerner, N.L. Wagner, E.J. Williams, and S.S. Brown, *A sensitive and versatile detector for atmospheric NO<sub>2</sub> and NO<sub>x</sub> based on blue diode laser cavity ring-down spectroscopy*. Environ. Sci. Technol., 2009. **43**: p. 7831-7836.
55. Fry, J.L., A. Kiendler-Scharr, A.W. Rollins, P.J. Wooldridge, S.S. Brown, H. Fuchs, W.P. Dubé, A. Mensah, M. dal Maso, R. Tillmann, H.-P. Dorn, T. Brauers, and R.C. Cohen, *Organic nitrate and secondary organic aerosol yield from NO<sub>3</sub> oxidation of  $\beta$ -pinene evaluated using a gas-phase kinetics/aerosol partitioning model* Atmos. Chem. Phys., 2009. **9**: p. 1431-1449.
54. Feierabend, K.J., J.E. Flad, S.S. Brown, and J.B. Burkholder, *HCO Quantum Yields in the Photolysis of HC(O)C(O)H (Glyoxal) between 290 and 420 nm*. J. Phys. Chem. A., 2009. **113**: p. 7784-7794.
53. Brown, S.S., W.P. Dubé, H. Fuchs, T.B. Ryerson, A.G. Wollny, C.A. Brock, R. Bahreini, A.M. Middlebrook, J.A. Neuman, E. Atlas, M. Trainer, F.C. Fehsenfeld, and A.R. Ravishankara, *Reactive uptake coefficients for N<sub>2</sub>O<sub>5</sub> determined from aircraft measurements during TexAQS 2006; Comparison to current model parameterizations*. J. Geophys. Res., 2009. **114**: p. D00F10.
52. Brown, S.S., J.A. de Gouw, C. Warneke, T.B. Ryerson, W.P. Dubé, E. Atlas, R.J. Weber, R.E. Peltier, J.A. Neuman, J.M. Roberts, A. Swanson, F. Flocke, S.A. McKeen, J. Brioude, R. Sommariva, M. Trainer, F.C. Fehsenfeld, and A.R. Ravishankara, *Nocturnal isoprene oxidation over the Northeast United States in summer and its impact on reactive nitrogen partitioning and secondary organic aerosol*. Atmos. Chem. Phys., 2009. **9**: p. 3027-3042.
51. Washenfelder, R.A., A.O. Langford, H. Fuchs, and S.S. Brown, *Measurement of glyoxal using an incoherent broadband cavity enhanced absorption spectrometer*. Atmos. Chem. Phys., 2008. **8**: p. 7779-7793.
50. Stark, H., M. Aldener, S.S. Brown, J.B. Burkholder, V. Riffault, T. Gierczak, and A.R. Ravishankara, *Vibrational Overtones of Peroxynitric Acid (HO<sub>2</sub>NO<sub>2</sub>): Absorption Cross Sections for the Second and Third OH overtones and production of HO<sub>2</sub> from photolysis*. J. Phys. Chem., 2008. **112**: p. 9296-9303.
49. Roberts, J.M., H.D. Osthoff, S.S. Brown, and A.R. Ravishankara, *N<sub>2</sub>O<sub>5</sub> Oxidizes Chloride to Cl<sub>2</sub> in Acidic Atmospheric Aerosol*. Science, 2008. **321**: p. 1059.
48. Osthoff, H.D., J.M. Roberts, A.R. Ravishankara, E.J. Williams, B.M. Lerner, R. Sommariva, T.S. Bates, D. Coffman, P.K. Quinn, J.E. Dibb, H. Stark, J.B. Burkholder, R.K. Talukdar, J.F. Meagher, F.C. Fehsenfeld, and S.S. Brown, *High levels of nitryl chloride in the polluted subtropical marine boundary layer*. Nature Geosciences, 2008. **1**: p. 324-328.
47. Fuchs, H., W.P. Dubé, S.J. Ciciora, and S.S. Brown, *Determination of Inlet Transmission and Conversion Efficiencies for in Situ Measurements of the Nocturnal Nitrogen Oxides, NO<sub>3</sub>, N<sub>2</sub>O<sub>5</sub> and NO<sub>2</sub>, via Pulsed Cavity Ring-Down Spectroscopy*. Anal. Chem., 2008. **80**(15): p. 6010-6017.
46. Stark, H., S.S. Brown, P.D. Goldan, M. Aldener, W.C. Kuster, R. Jakoubek, F.C.

- Fehsenfeld, J. Meagher, T.S. Bates, and A.R. Ravishankara, *Influence of the nitrate radical on the oxidation of dimethyl sulfide in a polluted marine environment*. J. Geophys. Res., 2007. **112**(D10): p. D10S10.
45. Osthoff, H.D., M.J. Pilling, A.R. Ravishankara, and S.S. Brown, *Temperature dependence of the NO<sub>3</sub> absorption cross section above 298 K and determination of the equilibrium constant for NO<sub>3</sub> + NO<sub>2</sub> ⇌ N<sub>2</sub>O<sub>5</sub> at atmospherically relevant conditions*. Phys. Chem. Chem. Phys., 2007. **9**: p. 5785-5793.
44. Brown, S.S., W.P. Dubé, H.D. Osthoff, D.E. Wolfe, W.M. Angevine, and A.R. Ravishankara, *High resolution vertical distributions of NO<sub>3</sub> and N<sub>2</sub>O<sub>5</sub> through the nocturnal boundary layer*. Atmos. Chem. Phys., 2007. **7**: p. 139-149.
43. Brown, S.S., W.P. Dubé, H.D. Osthoff, J. Stutz, T.B. Ryerson, A.G. Wollny, C.A. Brock, C. Warneke, J.A. de Gouw, E. Atlas, J.A. Neuman, J.S. Holloway, B.M. Lerner, E.J. Williams, W.C. Kuster, P.D. Goldan, W.M. Angevine, M. Trainer, F.C. Fehsenfeld, and A.R. Ravishankara, *Vertical profiles in NO<sub>3</sub> and N<sub>2</sub>O<sub>5</sub> measured from an aircraft: Results from the NOAA P-3 and surface platforms during NEAQS 2004*. J. Geophys. Res., 2007. **112**: p. D22304.
42. Baynard, T., E.R. Lovejoy, A. Pettersson, S.S. Brown, D. Lack, H. Osthoff, P. Massoli, S. Ciciora, W.P. Dube, and A.R. Ravishankara, *Design and application of a pulsed cavity ring-down aerosol extinction spectrometer for field measurements*. Aerosol Science and Technology, 2007. **41**(4): p. 447-462.
41. Osthoff, H.D., R. Sommariva, T. Baynard, A. Pettersson, E.J. Williams, B.M. Lerner, J.M. Roberts, H. Stark, P.D. Goldan, W.C. Kuster, T.S. Bates, D. Coffman, A.R. Ravishankara, and S.S. Brown, *Observations of daytime N<sub>2</sub>O<sub>5</sub> in the marine boundary layer during New England Air Quality Study - Intercontinental Transport and Chemical Transformation 2004*. J. Geophys. Res., 2006. **111**(D23): p. D23S14.
40. Osthoff, H.D., S.S. Brown, T.B. Ryerson, T.J. Fortin, B.M. Lerner, E.J. Williams, A. Pettersson, T. Baynard, W.P. Dube, S.J. Ciciora, and A.R. Ravishankara, *Measurement of atmospheric NO<sub>2</sub> by pulsed cavity ring-down spectroscopy*. J. Geophys. Res., 2006. **111**: p. D12305.
39. Neuman, J.A., D.D. Parrish, M. Trainer, T.B. Ryerson, J.S. Holloway, J.B. Nowak, A. Swanson, F. Flocke, J.M. Roberts, S.S. Brown, H. Stark, R. Sommariva, A. Stohl, R. Peltier, R.J. Weber, A.G. Wollny, D.T. Sueper, G. Hübler, and F.C. Fehsenfeld, *Reactive nitrogen transport and photochemistry in urban plumes over the North Atlantic Ocean*. J. Geophys. Res., 2006. **111**: p. D23S54.
38. Flad, J.E., S.S. Brown, J.B. Burkholder, H. Stark, and A.R. Ravishankara, *Absorption cross sections for the A<sup>2</sup>A''(0,9<sup>0</sup>,0) - X<sup>2</sup>A'(0,0<sup>1</sup>,0) band of the HCO radical*. Phys. Chem. Chem. Phys., 2006. **8**: p. 3636-3642.
37. Feierabend, K.J., D.K. Havey, S.S. Brown, and V. Vaida, *Experimental absolute intensities of the 4ν<sub>9</sub> and 5ν<sub>9</sub> O-H stretching overtones of H<sub>2</sub>SO<sub>4</sub>*. Chem. Phys. Lett., 2006. **420**: p. 438-442.
36. Dubé, W.P., S.S. Brown, H.D. Osthoff, M.R. Nunley, S.J. Ciciora, M.W. Paris, R.J. McLaughlin, and A.R. Ravishankara, *Aircraft instrument for simultaneous, in-situ measurements of NO<sub>3</sub> and N<sub>2</sub>O<sub>5</sub> via cavity ring-down spectroscopy*. Rev. Sci. Instr., 2006. **77**: p. 034101.

35. Brown, S.S., T.B. Ryerson, A.G. Wollny, C.A. Brock, R. Peltier, A.P. Sullivan, R.J. Weber, J.S. Holloway, W.P. Dubé, M. Trainer, J.F. Meagher, F.C. Fehsenfeld, and A.R. Ravishankara, *Variability in nocturnal nitrogen oxide processing and its role in regional air quality*. Science, 2006. **311**: p. 67-70.
34. Brown, S.S., J.A. Neuman, T.B. Ryerson, M. Trainer, W.P. Dubé, J.S. Holloway, C. Warneke, J.A. de Gouw, S.G. Donnelly, E. Atlas, B. Matthew, A.M. Middlebrook, R. Peltier, R.J. Weber, A. Stohl, J.F. Meagher, F.C. Fehsenfeld, and A.R. Ravishankara, *Nocturnal odd-oxygen budget and its implications for ozone loss in the lower troposphere*. Geophys. Res. Lett., 2006. **33**: p. L08801.
33. Aldener, M., S.S. Brown, H. Stark, E.J. Williams, B.M. Lerner, W.C. Kuster, P.D. Goldan, P.K. Quinn, T.S. Bates, and F.C. Fehsenfeld, *Reactivity and loss mechanisms of NO<sub>3</sub> and N<sub>2</sub>O<sub>5</sub> in a marine environment: results from in-situ measurements during NEAQS 2002*. J. Geophys. Res., 2006. **111**(D23): p. D23S73.
32. Brown, S.S., H.D. Osthoff, H. Stark, W.P. Dube, T.B. Ryerson, C. Warneke, J.A. de Gouw, A.G. Wollny, D.D. Parrish, F.C. Fehsenfeld, and A.R. Ravishankara, *Aircraft observations of daytime NO<sub>3</sub> and N<sub>2</sub>O<sub>5</sub> and their implications for tropospheric chemistry*. J. Photochem. and Photobiol. A, 2005. **176**(1-3): p. 270-278.
31. Aldener, M., S.S. Brown, H. Stark, J.S. Daniel, and A.R. Ravishankara, *Near-IR absorption of water vapor: Pressure dependence of lines strengths and an upper limit for continuum absorption*. J. Mol. Spec., 2005. **232**: p. 223-230.
30. Warneke, C., J.A. de Gouw, P.D. Goldan, W.C. Kuster, E.J. Williams, B.M. Lerner, S.S. Brown, H. Stark, M. Aldener, A.R. Ravishankara, J.M. Roberts, M. Marchewka, S. Bertman, D.T. Sueper, S.A. McKeen, J.F. Meagher, and F.C. Fehsenfeld, *Comparison of day and nighttime oxidation of biogenic and anthropogenic VOCs along the New England coast in summer during New England Air Quality Study 2002*. J. Geophys. Res., 2004. **109**: p. D10309.
29. Pettersson, A., E.R. Lovejoy, C.A. Brock, S.S. Brown, and A.R. Ravishankara, *Measurement of aerosol optical extinction at 532 nm with pulsed cavity ring down spectroscopy*. J. Aerosol Sci., 2004. **35**: p. 995-1011.
28. Brown, S.S., J.E. Dibb, H. Stark, M. Aldener, M. Vozella, S. Whitlow, E.J. Williams, B.M. Lerner, R. Jakoubek, A.M. Middlebrook, J.A. DeGouw, C. Warneke, P.D. Goldan, W.C. Kuster, W.M. Angevine, D.T. Sueper, P.K. Quinn, T.S. Bates, J.F. Meagher, F.C. Fehsenfeld, and A.R. Ravishankara, *Nighttime removal of NO<sub>x</sub> in the summer marine boundary layer*. Geophys. Res. Lett., 2004. **31**: p. L07108.
27. McCabe, D.C., S.S. Brown, M.K. Gilles, R.K. Talukdar, I.W.M. Smith, and A.R. Ravishankara, *Kinetics of the Removal of OH (v=1) and OD (v=1) by HNO<sub>3</sub> and DNO<sub>3</sub> from 253 to 383 K*. J. Phys. Chem. A., 2003. **107**: p. 7762-7769.
26. Brown, S.S., H. Stark, T.B. Ryerson, E.J. Williams, D.K.J. Nicks, M. Trainer, F.C. Fehsenfeld, and A.R. Ravishankara, *Nitrogen oxides in the nocturnal boundary layer: Simultaneous, in-situ detection of NO<sub>3</sub>, N<sub>2</sub>O<sub>5</sub>, NO, NO<sub>2</sub> and O<sub>3</sub>*. J. Geophys. Res., 2003. **108**(D9): p. 4299.
25. Brown, S.S., H. Stark, and A.R. Ravishankara, *Applicability of the Steady-State Approximation to the Interpretation of Atmospheric Observations of NO<sub>3</sub> and*

- $N_2O_5$ . *J. Geophys. Res.*, 2003. **108**(D17): p. 4539.
24. Brown, S.S., *Absorption Spectroscopy in High-Finesse Cavities for Atmospheric Studies*. *Chem. Rev.*, 2003. **103**: p. 5219-5238.
  23. Talukdar, R.K., E.J. Dunlea, S.S. Brown, J.S. Daniel, and A.R. Ravishankara, *Kinetics of  $O_2(1\Sigma_g^+)$  Reaction with  $H_2$  and an Upper Limit for OH Production*. *J. Phys. Chem.*, 2002. **106**(36): p. 8461-8470.
  22. Brown, S.S., H. Stark, and A.R. Ravishankara, *Cavity ring-down spectroscopy for atmospheric trace gas detection: Application to the nitrate radical ( $NO_3$ )*. *Appl. Phys. B.*, 2002. **75**: p. 173-182.
  21. Brown, S.S., H. Stark, S.J. Ciciora, R.J. McLaughlin, and A.R. Ravishankara, *Simultaneous in-situ detection of atmospheric  $NO_3$  and  $N_2O_5$  via cavity ring-down spectroscopy*. *Rev. Sci. Instr.*, 2002. **73**(9): p. 3291-3301.
  20. Brown, S.S., H. Stark, S.J. Ciciora, and A.R. Ravishankara, *In-situ measurement of atmospheric  $NO_3$  and  $N_2O_5$  via cavity ring-down spectroscopy*. *Geophys. Res. Lett.*, 2001. **28**(17): p. 3227-3230.
  19. Brown, S.S., J.B. Burkholder, R.K. Talukdar, and A.R. Ravishankara, *Reaction of hydroxyl radical with nitric acid: Insights into its mechanism*. *J. Phys. Chem.*, 2001. **105**(9): p. 1605-1614.
  18. Brown, S.S., R.W. Wilson, and A.R. Ravishankara, *Absolute Intensities for Third and Fourth Overtone Absorptions in  $HNO_3$  and  $H_2O_2$  Measured by Cavity Ring Down Spectroscopy*. *J. Phys. Chem.*, 2000. **104**(21): p. 4976-4983.
  17. Brown, S.S., A.R. Ravishankara, and H. Stark, *Simultaneous Kinetics and Ring-down: Rate Coefficients from Single Cavity Loss Temporal Profiles*. *J. Phys. Chem.*, 2000. **104**(30): p. 7044-7052.
  16. Portmann, R.W., S.S. Brown, T. Gierczak, R.K. Talukdar, J.B. Burkholder, and A.R. Ravishankara, *Role of nitrogen oxides in the lower stratosphere: a reevaluation based on laboratory studies*. *Geophys. Res. Lett.*, 1999. **26**(15): p. 2387-2390.
  15. Gao, R.-S., D.W. Fahey, L.A. DelNegro, S.G. Donnelly, E.R. Keim, J.A. Neuman, L. Teverovski, P.O. Wennberg, T.F. Hanisco, E.J. Lazendorf, M.H. Proffitt, J. Margitan, J.C. Wilson, J.W. Elkins, R.M. Stimpfle, R.C. Cohen, C.T. McElroy, T.P. Bui, R.J. Salawitch, S.S. Brown, A.R. Ravishankara, R.W. Portman, M.K.W. Ko, D.K. Weisenstein, and P.A. Newman, *A comparison of observations and model simulations of the  $NO_x/NO_y$  ratio in the lower stratosphere*. *Geophys. Res. Lett.*, 1999. **26**(8): p. 1153-1156.
  14. Brown, S.S., R.K. Talukdar, and A.R. Ravishankara, *Reconsideration of the rate constant for the reaction of OH with  $HNO_3$* . *J. Phys. Chem.*, 1999. **103**(16): p. 3031-3037.
  13. Brown, S.S., R.K. Talukdar, and A.R. Ravishankara, *Rate Constants for the Reaction  $OH + NO_2 + M \rightarrow HNO_3 + M$  under Atmospheric Conditions*. *Chem. Phys. Lett.*, 1999. **299**: p. 277 - 284.
  12. Berghout, H.L., S.S. Brown, R. Delgado, and F.F. Crim, *Nonadiabatic effects in the photodissociation of vibrationally excited  $HNCO$ : The branching between singlet ( $a^1\Delta$ ) and triplet ( $X^3\Sigma$ )  $NH$* . *J. Chem. Phys.*, 1998. **109**(6): p. 2257-2263.
  11. Brown, S.S., H.L. Berghout, and F.F. Crim, *Raman spectroscopy of the  $\nu_1$  N-H stretch fundamental in isocyanic acid ( $HNCO$ ): State mixing probed by*



- photoacoustic spectroscopy and by photodissociation of vibrationally excited states.* J. Chem. Phys., 1997. **106**(14): p. 5805-5815.
10. Brown, S.S., H.L. Berghout, and F.F. Crim, *Initial State Resolved Electronic Spectroscopy of HNCO: Stimulated Raman Preparation of Initial States and Photofragment Detection.* J. Chem. Phys., 1997. **107**(21): p. 8985-8993.
  9. Brown, S.S., H.L. Berghout, and F.F. Crim, *Raman spectroscopy of the N-C-O symmetric and antisymmetric stretch fundamentals in isocyanic acid (HNCO).* J. Chem. Phys., 1997. **107**(23): p. 9764-9771.
  8. Brown, S.S., R.B. Metz, H.L. Berghout, and F.F. Crim, *Vibrationally mediated photodissociation of isocyanic acid (HNCO): Preferential N-H bond fission by excitation of the reaction coordinate.* J. Chem. Phys., 1996. **105**(15): p. 6293-6303.
  7. Brown, S.S., C.M. Cheatum, D. Fitzwater, and F.F. Crim, *A Simple Model of the HNCO (<sup>1</sup>A') Excited State Potential Energy Surface and a Classical Trajectory Analysis of the Vibrationally Directed Bond-Selected Photodissociation.* J. Chem. Phys., 1996. **105**(24): p. 10911-10918.
  6. Brown, S.S., H.L. Berghout, and F.F. Crim, *The internal energy distribution of the NCO fragment from the near threshold photolysis of isocyanic acid, HNCO.* J. Phys. Chem., 1996. **100**(19): p. 7948-7955.
  5. Brown, S.S., H.L. Berghout, and F.F. Crim, *The HNCO Heat of Formation and the N-H and C-N Bond Enthalpies from Initial State Selected Photodissociation.* J. Chem. Phys., 1996. **105**(18): p. 8103-8110.
  4. Brown, S.S., H.L. Berghout, and F.F. Crim, *Vibrational state controlled bond cleavage in the photodissociation of isocyanic acid (HNCO).* J. Chem. Phys., 1995. **102**(21): p. 8440-8447.
  3. Scott, J.L., D. Luckhaus, S.S. Brown, and F.F. Crim, *Overtone spectroscopy of the hydroxyl stretch vibration in hydroxylamine (NH<sub>2</sub>OH).* J. Chem. Phys., 1995. **102**(2): p. 675-679.
  2. Braun, C.L., S.N. Smirnov, S.S. Brown, and T.W. Scott, *Picosecond transient absorption-measurements of geminate electron-cation recombination.* J. Phys. Chem., 1991. **95**(14): p. 5529-5532.
  1. Brown, S.S. and C.L. Braun, *Rotational currents as a measure of excited-state dipole moments.* J. Phys. Chem., 1991. **95**(2): p. 511-515.