

## **XINRONG REN**

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### **EDUCATION**

Ph.D. in Environmental Sciences, Peking University, 2001  
B.S. in Applied Chemistry, Peking University, 1996

### **APPOINTMENTS**

10/2012 – present	Senior Research Scientist & Aircraft Program Director, Department of Atmospheric and Oceanic Science, University of Maryland College Park
01/2011 – present	Visiting Scientist, NOAA Air Resources Laboratory
01/2011 – 09/2012	Associate Scholar, Department of Earth, Ocean, and Atmospheric Science, Florida State University
08/2007 – 12/2010	Research Associate Professor, RSMAS, University of Miami
10/2005 – 07/2007	Research Associate, Departmental of Meteorology, Penn State University
06/2001 – 09/2005	Post-doctoral fellow, Departmental of Meteorology, Penn State University
09/1996 – 06/2001	Research Assistant, Center for Environmental Sciences, Peking University

### **RESEARCH INTERESTS**

Atmospheric chemistry, air pollution, atmospheric photochemical oxidation, climate change, ground-based and aircraft monitoring of atmospheric pollutants, laser spectroscopic and chromatograph methods for environmental monitoring, model simulation of atmospheric oxidation.

### **FUNDED PROJECTS**

1. “Aircraft observations of and analysis of trace gases and meteorology over the Long Island Sound during LISTOS”, co-PI (PI: Russell Dickerson), University of Maryland, funded by Northeast States for Coordinated Air Use Management, \$160,000, 04/01/2018-12/31/2019.
2. “Hart-Miller Island Measurements and Data Analysis during OWLETS-II”, co-PI (PI: Russell Dickerson), University of Maryland, funded by Maryland Department of Environment, \$100,000, 04/01/2018-12/31/2019.
3. Air Pollution in Maryland – RAMMPP”, co-PI (PI: Russell Dickerson), University of Maryland, funded by Maryland Department of Environment, ~\$300,000, renewable annually.
4. “Fluxes of Greenhouse Gases in Maryland: FLAGG-MD”, co-PI (PI: Russell Dickerson), University of Maryland, funded by NIST, \$914,000, 11/01/2016 – 09/14/2017.
5. “Participation in Climate Research Activities at the NOAA Air Resources Laboratory”, co-I (PI: Russell Dickerson), NOAA, \$90k, 07/01/2017-06/30/2018.

6. “Air Chemistry Research In Asia, ARIAs: Aerosol and Trace Gas Emissions and Transformations over the North China Plain”, co-PI (PI: Russell Dickerson), University of Maryland, funded by NSF, \$550,000, 04/01/2016 – 03/31/2019.
7. “Operation of NADP/MDN Beltsville, MD Station”, PI, University of Maryland, funded by Maryland Department of Natural Resources, \$25,000, renewable annually.
8. “Analysis of Ozone Production and Its Sensitivity in Houston Using the Data Collected during DISCOVER-AQ”, PI, University of Maryland, funded by Taxes Commission on Environmental Quality, \$70,000, 02/01/2015 – 09/30/2015.
9. “Operation of Passive GOM Sample at the Beltsville Station and Data Analysis”, PI, University of Maryland, funded by Maryland Department of Natural Resources, \$15,000, 1/1/2014 – 6/30/2015.
10. “Regional Air Quality Impact of Natural Gas Production Operations”, co-I (PI: Sheryl Ehrman), University of Maryland, funded by NSF, \$300,000, 10/01/2014 – 09/30/2017.
11. “Climate Maryland: Measurements of Methane (CH<sub>4</sub>), Carbon Dioxide (CO<sub>2</sub>), and Other Emissions from Natural Gas Operations (Climate RAMMPP)”, co-PI (PI: Russell Dickerson), University of Maryland, funded by Maryland Department of Environment, \$100,000, 06/20/2014 – 09/30/2015.
12. “Aircraft Observations in Support of GOES-R/VIIIRS”, co-PI (PI: Russell Dickerson), funded by NOAA, University of Maryland, \$60,000, 05/19/2014 – 06/30/2015.
13. “Surface Measurements of Trace Gases in Support of DISCOVER-AQ in Houston in Summer 2013”, PI, University of Maryland, sponsored by Texas Commission on Environmental Quality (TCEQ), \$90,444, 10/01/2012 – 11/30/2013.
14. “Data Analysis for the Dallas-Fort Worth Field Study in 2011”, co-I (PI: Dr. Barry Lefer), University of Maryland, sponsored by Texas Commission on Environmental Quality (TCEQ), \$245,000 (\$29,308 towards University of Maryland), 10/01/2012 – 07/31/2013.
15. “Aircraft Measurement of Atmospheric Mercury and Trace Gases, co-I (PI: Dr. William Landing), Florida State University, subcontract from University of Tennessee Space Institute, \$25,000, 07/01/2012 – 06/30/2013.
16. “Deep Convective Clouds and Chemistry (DC3)” project, co-I (PI: William Brune), NOAA Air Resources Laboratory /Penn State University, funded by NSF/NASA, 1/1/2012 – 12/31/2013.
17. “American Mercury Network (AMNet)” for ambient mercury monitoring at 3 sites, co-I (PI: Winston Luke), NOAA Air Resources Laboratory, sponsored by US EPA, ~\$100,000/yr, 07/01/2012 – 06/30/2017.
18. “Southeastern Atmospheric Mercury Consortium”, co-I (PI: William Landing), Florida State University, funded by NOAA, \$1,000,000, 08/2009 – 08/2012.
19. “SHARP data analysis: Radical Budget and Ozone Production”, co-PI, University of Miami, funded by TCEQ, \$248,652 (\$64,789 towards University of Miami), 08/2010 – 11/2011.
20. “Measurements of Nitrous Acid and Nitric Acid during BEARPEX 2009”, PI, University of Miami, funded by NSF, \$97,600, 06/01/2009 – 11/30/2011.
21. “Laboratory Study of Nitrous Acid Formation through surface Photolysis of Nitric Acid and Nitrate”, PI, University of Miami, Provost Research Award, \$15,300, 06/2010–05/2011.
22. “Deployment of HONO Calibration System and HONO Instrument during Study of Houston Atmospheric Radical Precursor (SHARP) 2009”, PI, University of Miami, funded by Houston Advanced Research Center (HARC), \$18,000, 03/2009–12/2009.
23. “Air Quality Monitoring in the Coastal Environment of Miami, FL”, PI, University of Miami, Summer Research Award, \$9,300, 05/2008–12/2008.
24. “Hydroxyl, Hydroperoxyl, and OH Reactivity: Development of the Airborne Tropospheric Hydrogen Oxides Sensor (ATHOS) on the NASA DC-8 during ARCTAS and Analysis of the results”, PI, University of Miami, NASA subcontract through Penn State University, \$35,688, 08/2007–12/2008.

25. “Texas Air Quality Study II (TexAQ5 II) 2006”, Co-I (PI: William H. Brune), Penn State University, funded by Houston Advanced Research Center (HARC), 1/1/2006–12/31/2007.
26. “Measurements of OH, HO<sub>2</sub>, RO<sub>2</sub>, OH Reactivity and Naphthalene from the NASA DC-8 during INTEX-B”, co-I, (PI: William H. Brune), Penn State University, funded by NASA, ~\$450,000, 09/2005–08/2007.
27. “Experimental and Observational Investigation of the Sensitivity of Ozone and Aerosol Formation to NO<sub>x</sub> and VOCs”, co-I, (PI: William Brune), Penn State University, funded by the Camille and Henry Dreyfus Foundation, \$126,000, 1/2004–12/2005.
28. “Measurements of OH, HO<sub>2</sub>, and Naphthalene from the NASA DC-8 during INTEX-A”, co-I (PI: Dr. William Brune), Penn State University, funded by NASA, ~\$400,000, 9/2003–08/2005.
29. US EPA “Experimental Evaluation of Observation Based Methods for Assessing the Sensitivity of Ozone to VOC and NO<sub>x</sub>”, acted as a co-I, (Co-PIs: Drs. Gail Tonnesen, William Carter, and William Brune), Penn State University, funded by US EPA, \$240,000, 8/2003–12/2004
30. “Tropospheric Oxidation Chemistry: Atmospheric Observations and Laboratory Study of OH, HO<sub>2</sub>, RO<sub>2</sub>, and OH Reactivity, and the Response of Atmospheric Air Perturbations,” co-I (PI: William Brune), Penn State University, funded by NSF, \$1,006,776, 09/2002–08/2007.
31. “Intercomparison of peroxy radical measurements at a rural site using laser-induced fluorescence (LIF) and Peroxy Radical Chemical Ionization Mass Spectrometer (PerCIMS) techniques,” Co-I (PI: William Brune), Penn State University, funded by NSF.
32. “PM<sub>2.5</sub> Technology Assessment and Characterization Study-New York” project funded by U.S. EPA, Co-I (PI: William Brune), Penn State University, funded by US EPA.
33. “Determination and Study of Atmospheric Hydroxyl and Hydroperoxy Radicals”, co-I (PI: Huixiang Wang), Peking University, funded by NSF of China, RMB200,000, 01/2001–12/2002.

## **TEACHING EXPERIENCE**

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| 2015 Spring | Air Sampling and Analysis, co-Instructor, University of Maryland College Park   |
| 2010 Fall   | Tropospheric Chemistry II (MAC661), Instructor, University of Miami             |
| 2009 Fall   | Introduction to Marine Science Lab (MSC112), co-Instructor, University of Miami |
| 2009 Fall   | Tropospheric Chemistry I (MAC650), Instructor, University of Miami              |
| 2004 Fall   | The Chemistry of Atmosphere (METEO532), co-Instructor, Penn State University    |

## **HONORS AND AWARDS**

1. NASA Group Achievement Award for DISCOVER-AQ, 2015
2. University of Miami Provost Research Award, 2010
3. NASA Group Achievement Award for ARCTAS, 2009
4. University of Miami Summer Research Award, 2008
5. NASA Group Achievement Award for INTEX-B, 2007
6. NOAA Research Outstanding Scientific Paper Award (Cooper et al, JGR, 2006), 2007
7. NASA Group Achievement Award for INTEX-A, 2005

## **PEER-REVIEWED PUBLICATIONS**

**H-Index: 27, Citations: ~2400 (as of Feb. 2017).** See [www.researcherid.com/rid/E-7838-2015](http://www.researcherid.com/rid/E-7838-2015) for details.

1. Wang, F. Z. Li, X. Ren, Q. Jiang, H. He, R. R. Dickerson, X. Dong, F. Lv Vertical distributions of aerosol optical properties during the spring 2016 ARIAs airborne campaign in the North China Plain, *Atmos. Chem. Phys. Discuss.*, <https://doi.org/10.5194/acp-2017-1021>, 2018.
2. Christian, K. E., W. H. Brune, J. Mao, and X. Ren, Global sensitivity analysis of GEOS-Chem modeled ozone and hydrogen oxides during the INTEX campaigns, *Atmos. Chem. Phys.*, 18, 2443–2460, 2018,

doi:10.5194/acp-18-2443-2018

3. Li, C., C. McLinden, V. Fioletov, N. Krotkov, S. Carn, J. Joiner, D. Streets, H. He, X. Ren, R. Dickerson, India is overtaking China as the world's largest emitter of anthropogenic sulfur dioxide, *Scientific Report*, 7: 14304, doi:10.1038/s41598-017-14639-8, 2017.
4. Salmon, O. E., P. B. Shepson, X. Ren, A. B. M. Collow, M. A. Miller, A. G. Carlton, M. O. L. Cambaliza, A. Heimbürger, K. L. Morgan, J. D. Fuentes, B. H. Stirm, R. Grundman II, R. R. Dickerson, Urban emissions of water vapor in winter, *J. Geophys. Res. – Atmos.*, 122, doi:10.1002/2016JD026074, 2017.
5. Martin, C. R., N. Zeng, A. Karion, R. R. Dickerson, X. Ren, B. N. Turpie, K. J. Weber, Evaluation and enhancement of a low-cost NDIR CO<sub>2</sub> sensor, *Atmos. Meas. Tech.*, 10, 2383–2395, doi: 10.5194/amt-10-2383-2017, 2017.
6. Ren, X., D. L. Hall, T. Vinciguerra, S. E. Benish, P. R. Stratton, D. Ahn, J. R. Hansford, M. D. Cohen, S. Sahu, H. He, C. Grimes, R. J. Salawitch, S. H. Ehrman, and R. R. Dickerson, Methane Emissions from the Marcellus Shale in Southwestern Pennsylvania and Northern West Virginia Based on Airborne Measurements, *J. Geophys. Res. – Atmos.*, 122, doi: 10.1002/2016JD026070, 2017.
7. Bieser, J., F. Slemr, J. Ambrose, C. Brenningkmeijer, S. Brooks, A. Dastoor, F. DeSimone, R. Ebinghaus, C. N. Gencarelli, B. Geyer, L. E. Gratz, I. M. Hedgecock, D. Jaffe, P. Kelley, C. Lin, L. Jaegle, V. Matthias, A. Ryjkov, N. E. Selin, S. Song, O. Travnikov, A. Weigelt, W. Luke, X. Ren, A. Zahn, X. Yang, Y. Zhu, N. Pirrone, Multi-model study of mercury dispersion in the atmosphere: Vertical distribution of mercury species, *Atmos. Chem. Phys.*, 17, 6925–6955, doi: 10.5194/acp-17-6925-2017, 2017.
8. Ren, X., W. T. Luke, P. Kelley, M. D. Cohen, R. Artz, M. L. Olson, D. Schmeltz, M. Puchalski, D. L. Goldberg, A. Ring, G. M. Mazzuca, K. A. Cummings, L. Wojdan, S. Preaux, and J. W. Stehr, Atmospheric mercury measurements at a suburban site in the Mid-Atlantic United States: Inter-annual, seasonal and diurnal variations and source-receptor relationships, *Atmos. Environ.*, 146, 141-152, doi: 10.1016/j.atmosenv.2016.08.028, 2016.
9. Mazzuca, G. M., X. Ren, C. P. Loughner, M. Estes, J. H. Crawford, K. E. Pickering, A. J. Weiheimer, and R. R. Dickerson, Ozone production and its sensitivity to NO<sub>x</sub> and VOCs: results from the DISCOVER-AQ field experiment, Houston 2013, *Atmos. Chem. Phys.*, 16, 14,463–14,474, doi: 10.5194/acp-16-14463-2016, 2016.
10. Ma, Y., Y. Diao, B. Zhang, W. Wang, X. Ren, D. Yang, M. Wang, X. Shi, and J. Zheng, Detection of formaldehyde emissions from an industrial zone in the Yangtze-River-Delta region of China using a proton transfer reaction ion-drift chemical ionization mass spectrometer, *Atmos. Meas. Tech.*, 9, 6101-6116, doi: 10.5194/amt-9-6101-2016, 2016.
11. Lyman, S., C. Jones, T. O'Neil, T. Allen, M. Miller, M. S. Gustin, A. M. Pierce, W. Luke, X. Ren, P. Kelley, Automated calibration of atmospheric oxidized mercury measurements, *Environ. Sci. Technol.*, 50, 12,921–12,927, doi: 10.1021/acs.est.6b04211, 2016.
12. Mok, J., N. A. Krotkov, A. Arola, O. Torres, H. Jethva, M. Andrade, G. Labow, T. F. Eck, Z. Li, R. R. Dickerson, G. L. Stenchikov, S. Osipov, and X. Ren, Impacts of brown carbon from biomass burning on surface UV and ozone photochemistry in the Amazon Basin. *Sci. Rep.*, 6, 36940, doi: 10.1038/srep36940, 2016.
13. Cohen, M. D., R. R. Draxler, R. S. Artz, C. Banic, P. Blanchard, M. S. Gustin, Y.-J. Han, T. M. Holsen, D. A. Jaffe, P. Kelly, H. Lei, C. P. Loughner, W. T. Luke<sup>1</sup>, S. N. Lyman, D. Niemi, J. M. Pacyna, M. Pilote, L. Poissant, D. Ratte, X. Ren, F. Steenhuisen, A. Steffen, R. Tordon, and S. Wilson, Modeling the global atmospheric transport and deposition of mercury to the Great Lakes, *Elementa*, 4:000118, doi: 10.12952/journal.elementa.000118, 2016.
14. Barth, M. C., M. M. Bela, A. Fried, P. O. Wennberg, J. D. Crouse, J. M. St. Clair, N. J. Blake, D. R. Blake, C. R. Homeyer, W. H. Brune, L. Zhang, J. Mao, X. Ren, T. B. Ryerson, I. B. Pollack, J. Peischl, R. C. Cohen, B. A. Nault, L. G. Huey, X. Liu and C. A. Cantrell, Convective Transport of Peroxides by Thunderstorms Observed over the Central U.S. during DC3, *J. Geophys. Res. – Atmos.*, 121 (8), 4272–4295, doi:

- 10.1002/2015JD024570, 2016.
15. Brune, W. H., B. C. Baier, J. Thomas, X. Ren, R. C. Cohen, S. E. Pusede, E. Browne, A.H. Goldstein, D. R. Gentner, F. N. Keutsch, J. Thornton, S. Harrold, F. Lopez-Hilfiker, P. O. Wennberg, Ozone Production Chemistry in the Presence of Urban Plumes, *Faraday Discuss.*, 189, 169-189, 2016, doi: 10.1039/c5fd00204d.
  16. Nowlan, C. R., X. Liu, J. W. Leitch, K. Chance, G. González Abad, C. Liu, P. Zoogman, J. Cole, T. Delker, W. Good, F. Murcray, L. Ruppert, D. Soo, M. B. Follette-Cook, S. Janz, M. Kowalewski, C. Loughner, K. Pickering, J. Herman, M. Beaver, R. Long, J. Szykman, L. Judd, X. Ren, W. Luke, P. Kelly, and J. Al-Saadi, Nitrogen dioxide observations from the Geostationary Trace gas and Aerosol Sensor Optimization airborne instrument: Retrieval algorithm and measurements during DISCOVER-AQ Texas 2013, *Atmos. Meas. Tech.* 9, 2647–2668, doi:10.5194/amt-9-2647-2016, 2016.
  17. Nault, B. A., C. Garland, P. J. Wooldridge, W. H. Brune, P. Campuzano-Jost, J. D. Crouse, D. A. Day, J. Dibb, S. R. Hall, G. Huey, J. L. Jimenez, X. Liu, J. Mao, T. Mikoviny, J. Peischl, I. B. Pollack, X. Ren, T. B. Ryerson, E. Scheuer, K. Ullmann, P. O. Wennberg, A. Wisthaler, Li Zhang, and Ronald C. Cohen, Observational Constraints on the Oxidation of NO<sub>x</sub> in the Upper Troposphere, *J. Chem. Phys. A*, 120(9), 1468-1478, doi:10.1021/acs.jpca.5b07824, 2016.
  18. 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), *Environ. Sci. Technol.*, 49(21), 12,774–12,781 doi:10.1021/acs.est.5b02511, 2015.
  19. Aburn, G., Jr., R. R. Dickerson, J. C. Hains, D. King, R. Salawitch, T. Canty, X. Ren, A. M. Thompson, and M. Woodman, Ground-level ozone: A path forward for the Eastern United States, Air & Waste Management Associate, *Environmental Manager*, 18-24, May 2015.
  20. Ngan, F., M. Cohen, W. Luke, X. Ren and R. Draxler, Meteorological modeling using WRF-ARW model for Grand Bay Intensive studies of atmospheric mercury, *Atmosphere*, 6, 209-233, doi:10.3390/atmos6030209, 2015.
  21. Song, S., Selin, N. E., Soerensen, A. L., Angot, H., Artz, R., Brooks, S., Brunke, E.-G., Conley, G., Dommergue, A., Ebinghaus, R., Holsen, T. M., Jaffe, D. A., Kang, S., Kelley, P., Luke, W. T., Magand, O., Marumoto, K., Pfaffhuber, K. A., Ren, X., Sheu, G.-R., Slemr, F., Warneke, T., Weigelt, A., Weiss-Penzias, P., Wip, D. C., and Zhang, Q.: Top-down constraints on atmospheric mercury emissions and implications for global biogeochemical cycling, *Atmos. Chem. Phys. Discuss.*, 15, 5269-5325, doi:10.5194/acpd-15-5269-2015, 2015.
  22. VandenBoer, T. C., M. Z. Markovic, J. E. Sanders, X. Ren, S. E. Pusede, E. C. Browne, R. C. Cohen, L. Zhang, J. Thomas, W. H. Brune and J. G. Murphy, Evidence for a nitrous acid (HONO) reservoir at the ground surface in Bakersfield, CA, during CalNex 2010, *Journal of Geophysical Research-Atmospheres*, 119(14), 9093-9106, 2014.
  23. Brooks, S.; Ren, X.; Cohen, M.; Luke, W.T.; Kelley, P.; Artz, R.; Hynes, A.; Landing, W.; Martos, B., Airborne Vertical Profiling of Mercury Speciation near Tullahoma, TN, USA. *Atmosphere*, 5, 557-574, 2014.
  24. Ren, X., W. T. Luke, P. Kelley, M. Cohen, F. Ngan, R. Artz, J. Walker, S. Brooks, C. Moore, P. Swartzendruber, D. Bauer, J. Remeika, A. Hynes, J. Dibb, J. Rolison, N. Krishnamurthy, W. M. Landing, A. Hecobian, J. Shook, L. G. Huey, Mercury speciation at a coastal site in the northern Gulf of Mexico: Results from the Grand Bay intensive studies in summer 2010 and spring 2011. *Atmosphere*, 5(2):230-251, 2014.
  25. Pinto, J. P., J. Dibb, B. H. Lee, Rappenglück, E. C. Wood, M. Levy, R.-Y. Zhang, B. Lefer, X.-R. Ren, J. Stutz, C. Tsai, L. Ackermann, J. Golovko, S. C. Herndon, M. Oakes, Q.-Y. Meng, J. W. Munger, M. Zahniser, and J. Zheng, Intercomparison of Field Measurements of nitrous acid (HONO) during the SHARP campaign, *J. Geophys. Res.*, 119(9), 5583-5601, doi: 10.1002/2013JD0202872014.

26. Pusede, S. E., D. R. Gentner, P. J. Wooldridge, E. C. Browne, A. W. Rollins, K.-E. Min, A. R. Russell, J. Thomas, L. Zhang, W. H. Brune, S. B. Henry, J. P. DiGangi, F. N. Keutsch, S. A. Harrold, J. A. Thornton, M. R. Beaver, J. M. St. Clair, P. O. Wennberg, J. Sanders, X. Ren, T. C. VandenBoer, M. Markovic, J. G. Murphy, A. Guha, R. Weber, A. H. Goldstein, and R. C. Cohen, On the temperature dependence of organic reactivity, nitrogen oxides, ozone production, and the impact of emission controls in San Joaquin Valley California, *Atmos. Chem. Phys.*, 14, 3373–3395, doi:10.5194/acp-14-3373-2014, 2014,
27. Lei, H., D. J. Wuebbles, X.-Z. Liang, Z. Tao, S. Olsen, R. Artz, X. Ren, and M. Cohen, Projections of atmospheric mercury levels and their effect on air quality in the United States, *Atmos. Chem. Phys.*, 14, 783–795, 2014.
28. Ren, X., D. van Duin, M. Cazorla, S. Chen, J. Mao, L. Zhang, W. H. Brune, J. H. Flynn, N. Grossberg, B. L. Lefer, B. Rappenglück, K. W. Wong, C. Tsai, J. Stutz, J. E. Dibb, B. T. Jobson, W. T. Luke, and P. Kelley, Atmospheric oxidation chemistry and ozone production: Results from SHARP 2009 in Houston, Texas, *J. Geophys. Res. -Atmos.*, 118, 5770–5780, doi:10.1002/jgrd.50342, 2013.
29. Worton, D. R., J. D. Surratt, B. W. Lafranchi, A. W. H. Chan, Y. Zhao, R. J. Weber, J.-H. Park, J. B. Gilman, J. de Gouw, C. Park, G. Schade, M. Beaver, J. M. St. Clair, J. Crouse, P. Wennberg, G. M. Wolfe, S. Harrold, J. A. Thornton, D. K. Farmer, K. S. Docherty, M. J. Cubison, J.-L. Jimenez, A. A. Frossard, L. M. Russell, K. Kristensen, M. Glasius, J. Mao, X. Ren, W. Brune, E. C. Browne, S. E. Pusede, R. C. Cohen, J. H. Seinfeld, and A. H. Goldstein, Observational Insights into Aerosol Formation from Isoprene, *Environ. Sci. Technol.*, 47, 11,403–11,413, doi:10.1021/es4011064, 2013.
30. Ren, X., J. Mao, W. H. Brune, C. A. Cantrell, R. L. Mauldin, R. S. Hornbrook, E. Kosciuch, J. R. Olson, James H. Crawford, and Gao Chen, Intercomparison of HO<sub>x</sub> measurements using laser-induced fluorescence and chemical ionization mass spectrometry during ARCTAS, *Atmos. Meas. Tech.*, 5, 2025–2037, 2012.
31. Mao, J., X. Ren, L. Zhang, D. M. Van Duin, R. C. Cohen, J.-H. Park, A. H. Goldstein, F. Paulot, M. R. Beaver, J. D. Crouse, P. O. Wennberg, J. P. DiGangi, S. B. Henry, F. N. Keutsch, C. Park, G. W. Schade, G. M. Wolfe, J. A. Thornton, and W. H. Brune, Insights into hydroxyl measurements and the atmospheric oxidation in a California forest, *Atmos. Chem. Phys.*, 12, 8009–8020, 2012.
32. Olson, J. R., Crawford, J. H., Brune, W., Mao, J., Ren, X., Fried, A., Anderson, B., Apel, E., Beaver, M., Blake, D., Chen, G., Crouse, J., Dibb, J., Diskin, G., Hall, S. R., Huey, L. G., Knapp, D., Richter, D., Rierner, D., Clair, J. St., Ullmann, K., Walega, J., Weibring, P., Weinheimer, A., Wennberg, P., and Wisthaler, A.: An analysis of fast photochemistry over high northern latitudes during spring and summer using in-situ observations from ARCTAS and TOPSE, *Atmos. Chem. Phys.*, 12, 6799–6825, doi:10.5194/acp-12-6799-2012, 2012.
33. Ahlm, L., S. Liu, D. A. Day, L. M. Russell, R. Weber, D. R. Gentner, A. H. Goldstein, J. P. DiGangi, S. B. Henry, F. N. Keutsch, T. C. VandenBoer, M. Z. Markovic, J. G. Murphy, X. Ren, and S. Scheller, Formation and growth of ultrafine particles from secondary sources in Bakersfield, California, *J. Geophys. Res.*, 117, D00V08, doi:10.1029/2011JD017144, 2012.
34. Cazorla, M., W. H. Brune, X. Ren, B. Lefer, Direct Measurement of ozone production rates in Houston in 2009 and comparison with two estimation methods, *Atmos. Chem. Phys.*, 12, 1203–1212, 2012.
35. Wong, K. W., Tsai, C., Lefer, B., Haman, C., Grossberg, N., Brune, W. H., Ren, X., Luke, W., and Stutz, J.: Daytime HONO vertical gradients during SHARP 2009 in Houston, TX, *Atmos. Chem. Phys.*, 12, 635–652, 2012.
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