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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. “Analysis of Ozone Production and Its Sensitivity in Houston Using the Data Collected during DISCOVER-AQ”, PI, University of Maryland, sponsored by Taxes Commission on Environmental Quality, \$70,000, 02/01/2015 – 09/30/2015.
2. “Operation of NADP/MDN Beltsville, MD Station”, PI, University of Maryland, sponsored by Maryland Department of Natural Resources, \$25,000 (renewable annually).
3. “Operation of Passive GOM Sample at the Beltsville Station and Data Analysis”, PI, University of Maryland, sponsored by Maryland Department of Natural Resources, \$15,000, 1/1/2014 – 6/30/2015.
4. “Regional Air Quality Impact of Natural Gas Production Operations”, co-I (PI: Sheryl Ehrman), University of Maryland, sponsored by NSF, \$300,000, 10/01/2014 – 09/30/2017.
5. “Fluxes of Greenhouse Gases in Maryland: FLAGG-MD”, co-PI (PI: Russell Dickerson), University of Maryland, sponsored by NIST, \$559,868, 09/15/2014 – 09/14/2016.

6. "Climate Maryland: Measurements of Methane (CH₄), Carbon Dioxide (CO₂), and Other Emissions from Natural Gas Operations (Climate RAMMPP)", co-PI (PI: Russell Dickerson), University of Maryland, sponsored by Maryland Department of Environment, \$100,000, 06/20/2014 – 09/30/2015.
7. "Aircraft Observations in Support of GOES-R/VIIRS", co-PI (PI: Russell Dickerson), sponsored by NOAA, University of Maryland, \$60,000, 05/19/2014 – 06/30/2015.
8. "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.
9. "Data Analysis for the Dallas-Fort Worth Field Study in 2011", co-I (PI: Dr. Barry Lefler), 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.
10. "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.
11. "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.
12. "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.
13. "Southeastern Atmospheric Mercury Consortium", co-I (PI: William Landing), Florida State University, sponsored by NOAA, \$1,000,000, 08/2009 – 08/2012.
14. "SHARP data analysis: Radical Budget and Ozone Production", co-PI, University of Miami, sponsored by TCEQ, \$248,652 (\$64,789 towards University of Miami), 08/2010 – 11/2011.
15. "Measurements of Nitrous Acid and Nitric Acid during BEARPEX 2009", PI, University of Miami, sponsored by NSF, \$97,600, 06/01/2009 – 11/30/2011.
16. "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.
17. "Deployment of HONO Calibration System and HONO Instrument during Study of Houston Atmospheric Radical Precursor (SHARP) 2009", PI, University of Miami, sponsored by Houston Advanced Research Center (HARC), \$18,000, 03/2009–12/2009.
18. "Air Quality Monitoring in the Coastal Environment of Miami, FL", PI, University of Miami, Summer Research Award, \$9,300, 05/2008–12/2008.
19. "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.
20. "Texas Air Quality Study II (TexAQS II) 2006", Co-I, Penn State University, sponsored by Houston Advanced Research Center (HARC), 1/1/2006–12/31/2007.
21. "Measurements of OH, HO₂, RO₂, OH Reactivity and Naphthalene from the NASA DC-8 during INTEX-B", co-I, (PI: Dr. William H. Brune), Penn State University, funded by NASA, ~\$450,000, 09/2005–08/2007.
22. "Experimental and Observational Investigation of the Sensitivity of Ozone and Aerosol Formation to NO_x and VOCs", co-I, (PI: Dr. William Brune), Penn State University, funded by the Camille and Henry Dreyfus Foundation, \$126,000, 1/2004–12/2005.
23. "Measurements of OH, HO₂, 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.

24. US EPA “Experimental Evaluation of Observation Based Methods for Assessing the Sensitivity of Ozone to VOC and NO_x”, 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
25. “Tropospheric Oxidation Chemistry: Atmospheric Observations and Laboratory Study of OH, HO₂, RO₂, and OH Reactivity, and the Response of Atmospheric Air Perturbations,” co-I (PI: Dr. William Brune), Penn State University, funded by NSF, \$1,006,776, 09/2002–08/2007.
26. “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, Penn State University, sponsored by NSF.
27. “PM_{2.5} Technology Assessment and Characterization Study-New York” project funded by U.S. EPA, Co-I, Penn State University, sponsored by US EPA.
28. “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

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

PEER-REVIEWED PUBLICATIONS

1. 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, 2015.
2. 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.
3. 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, *J. Geophys. Res.-Atmos.*, 119, 9093-9106, 2014.
4. Brooks, S., X. Ren, M. Cohen, W. T. Luke, P. Kelley, R. Artz, A. Hynes, W. Landing, B. Martos, Airborne Vertical Profiling of Mercury Speciation near Tullahoma, TN, USA, *Atmosphere*, 5, 557-574, 2014.

5. 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.
6. 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, 2014.
7. 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.
8. 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, 2013.
9. 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, 2013.
10. 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_x measurements using laser-induced fluorescence and chemical ionization mass spectrometry during ARCTAS, *Atmos. Meas. Tech.*, 5, 2025–2037, 2012.
11. 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.
12. 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.
13. 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., Riemer, 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, 2012.
14. 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, 2012.
15. 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.
16. 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.
17. Ren, X., J. E. Sanders, A. Rajendran, R. J. Weber, A. H. Goldstein, S. E. Pusede, E. C. Browne, K.-E. Min, and R. C. Cohen, A relaxed eddy accumulation system for measuring vertical fluxes of nitrous acid, *Atmos. Meas. Tech.*, 4, 2093–2103, 2011.
 18. Fried, A., C. Cantrell, J. Olson, J. H. Crawford, P. Weibring, J. Walega, D. Richter, W. Junkermann, R. Volkamer, R. Sinreich, B. G. Heikes, D. O'Sullivan, D. R. Blake, N. Blake, S. Meinardi, E. Apel, A. Weinheimer, D. Knapp, A. Perring, R. C. Cohen, H. Fuelberg, R. E. Shetter, S. R. Hall, K. Ullmann, W. H. Brune, J. Mao, X. Ren, L. G. Huey, H. B. Singh, J. W. Hair, D. Riemer, G. Diskin, and G. Sachse, Detailed comparisons of airborne formaldehyde measurements with box models during the 2006 INTEX-B and MILAGRO campaigns: potential evidence for significant impacts of unmeasured and multi-generation volatile organic carbon compounds, *Atmos. Chem. Phys.*, 11, 11,867-11,894, 2011.
 19. Ren, X., H. Gao, X. Zhou, J. Crouse, P. O. Wennberg, E. C. Browne, B. W. LaFranchi, R. C. Cohen, M. McKay, A. H. Goldstein, J. Mao, Measurement of Nitrous Acid at Blodgett Forest during BEARPEX2007, *Atmos. Chem. Phys.*, 10, 6283–6294, 2010.
 20. Chatfield, R. B., X. Ren, W. H. Brune, J. Schwab, Controls on urban ozone production rate as indicated by formaldehyde oxidation rate and nitric oxide, *Atmos. Environ.*, 44, 5395-5406, doi:10.1016/j.atmosenv.2010.08.056, 2010.
 21. Mao, J., D. J. Jacob, M. J. Evans, J. R. Olson, X. Ren, W. H. Brune, J. M. St. Clair, J. D. Crouse, K. M. Spencer, M. R. Beaver, P. O. Wennberg, M. J. Cubison, J. L. Jimenez, A. Fried, P. Weibring, J. G. Walega, S. R. Hall, A. J. Weinheimer, R. C. Cohen, G. Chen, J. H. Crawford, L. Jaeglé, J. A. Fisher, R. M. Yantosca1, P. Le Sager, and C. Carouge, Chemistry of hydrogen oxide radicals (HOx) in the Arctic troposphere in spring, *Atmos. Chem. Phys.*, 10, 5823–5838, 2010.
 22. Chen, S., X. Ren, J. Mao, Z. Chen, W. H. Brune, , B. Lefer, B. Rappenglück, J. Flynn, J. Olson, J. H. Crawford, A comparison of chemical mechanisms based on TRAMP–2006 field data, *Atmos. Environ.*, 44(33), 4116-4125, 2010.
 23. Mao, J., X. Ren, S. Chen, W. H. Brune, Z. Chen, M. Martinez, H., Harder, B. Lefer, B. Rappenglück, J. Flynn, and M. Leuchner, Atmospheric oxidation capacity in the summer of Houston 2006: Comparison with summer measurements in other metropolitan studies, *Atmos. Environ.*, 44(33), 4107-4115, 2010.
 24. Flynn, J., B. Lefer, B. Rappenglück , M. Leuchner, R. Perna, J. Dibb, L. Ziemba, C. Anderson, J. Stutz, W. Brune, X. Ren, J. Mao, W. Luke, J. Olson, G. Chen, J. Crawford, Impact of clouds and aerosols on ozone production in Southeast Texas, *Atmos. Environ.*, 44(33), 4126-4125,2010.
 25. Mao, J., X. Ren, W. H. Brune, J. R. Olson, J. H. Crawford, A. Fried, L. G. Huey, R. C. Cohen, B. Heikes, H. B. Singh, D. R. Blake, G. W. Sachse, G. S. Diskin, S. R. Hall, and R. E. Shetter, Airborne measurement of OH reactivity during INTEX-B, *Atmos. Chem. Phys.*, 9, 163-173, 2009.
 26. LaFranchi, B. W., G. M. Wolfe, J. A. Thornton, S. A. Harrold, E. C. Browne, K. E. Min, P. J. Wooldridge, J. B. Gilman, W. C. Kuster, P. D. Goldan, J. A. deGouw, M. McKay, A. H. Goldstein, X. Ren, J. Mao, and R. C. Cohen, Closing the peroxy acetyl (PA) radical budget: observations of acyl peroxy nitrates (PAN, PPN, and MPAN) during BEARPEX 2007, *Atmos. Chem. Phys.*, 9, 7623–7641, 2009.
 27. Cooper, O. R., S. Eckhardt, J. H. Crawford, C. C. Brown, R. C. Cohen, T. H. Bertram, P. Wooldridge, A. Perring, W. H. Brune, X. Ren, D. Brunner, and S. Baughcum, Summertime buildup and decay of lightning NOx and aged thunderstorm outflow above North America, *J. Geophys. Res.*, 114, D01101, doi:10.1029/2008JD010293, 2009
 28. Ren, X., J. R. Olson, J. H. Crawford, W. H. Brune, J. Mao, R. B. Long, G. Chen, M. A. Avery, G. W. Sachse, J. D. Barrick, G. S. Diskin, L. G. Huey, A. Fried, R. C. Cohen, B. Heikes, P. O. Wennberg, H. B.

- Singh, D. R. Blake, and R. E. Shetter, HO_x Chemistry during INTEX-A 2004: Observation, Model Calculations and comparison with previous studies, *J. Geophys. Res.*, 113, D05310, 2008.
29. Cai, C., C. Hogrefe, J. J. Schwab, P. Katsafados, G. Kallos, X. Ren, W. H. Brune, X. Zhou, Y. He, and K. L. Demerjian, Performance Evaluation of an Air Quality Forecast Modeling System for a Summer and Winter Season - Photochemical Oxidants and Their Precursors, *Atmos. Environ.*, 42, 8585–8599, 2008.
 30. Fried, A., J. R. Olson, J. G. Walega, J. H. Crawford, G. Chen, P. Weibring, D. Richter, C. Roller, F. Tittel, M. Porter, H. Fuelberg, J. Halland, T. H. Bertram, R. C. Cohen, K. Pickering, B. G. Heikes, J. A. Snow, H. Shen, D. W. O'Sullivan, W. H. Brune, X. Ren, D. R. Blake, N. Blake, G. Sachse, G. S. Diskin, J. Podolske, S. A. Vay, R. E. Shetter, S. R. Hall, B. E. Anderson, L. Thornhill, A. D. Clarke, C. S. McNaughton, H. B. Singh, M. A. Avery, G. Huey, S. Kim, and D. B. Millet, Role of convection in redistributing formaldehyde to the upper troposphere over North America and the North Atlantic during the summer 2004 INTEX campaign, *J. Geophys. Res.*, 113, D17306, 2008.
 31. Hudman, R. C., D. J. Jacob, S. Turquety, E. M. Leibensperger, L. T. Murray, S. Wu, A. B. Gilliland, M. Avery, T. H. Bertram, W. Brune, R. C. Cohen, J. E. Dibb, F. M. Flocke, A. Fried, J. Holloway, J. A. Neuman, R. Orville, A. Perring, X. Ren, G. W. Sachse, H. B. Singh, A. Swanson, P. J. Wooldridge, Surface and lightning sources of nitrogen oxides over the United States: magnitudes, chemical evolution, and outflow, *J. Geophys. Res.*, 112, D12S05, doi:10.1029/2006JD007912, 2007.
 32. Liang, Q., L. Jaeglé, R. Hudman, S. Turquety, D. Jacob, M. Avery, G. Sachse, D. Blake, E. Browell, W. Brune, X. Ren, R. Cohen, J. Dibb, G. Huey, H. B. Singh, P. Wennberg, L. Pfister, H. Fuelberg, Summertime influence of Asian pollution in the free troposphere over North America, *J. Geophys. Res.*, 112, D12S11, 2007.
 33. Venkatachari, P., P. K. Hopke, W. H. Brune, X. Ren, R. Leshner, J. Mao, and M. Mitchell, Characterization of wintertime reactive oxygen species concentrations in Flushing, New York, *Aerosol Sci. Technol.*, 41, 97-111, 2007
 34. Kim, S., L. G. Huey, R. E. Stickel, D. J. Tanner, J. H. Crawford, J. R. Olson, G. Chen, W. H. Brune, X. Ren, R. Leshner, P. J. Wooldridge, T. H. Bertram, A. Perring, R. C. Cohen, B. L. Lefer, R. E. Shetter, M. Avery, G. Diskin, and I. Sokolik, Measurement of HO₂NO₂ in the free troposphere during the Intercontinental Chemical Transport Experiment–North America 2004, *J. Geophys. Res.*, 112, D12S01, 2007.
 35. Cooper, O. R., A. Stohl, M. Trainer, A. M. Thompson, J. C. Witte, S. J. Oltmans, G. Morris, K. E. Pickering, J. H. Crawford, G. Chen, R. C. Cohen, T. H. Bertram, P. Wooldridge, A. Perring, W. H. Brune, J. Merrill, J. L. Moody, D. Tarasick, P. Nédélec, G. Forbes, M. J. Newchurch, F. J. Schmidlin, B. J. Johnson, S. Turquety, S. L. Baughcum, X. Ren, F. C. Fehsenfeld, J. F. Meagher, N. Spichtinger, C. C. Brown, S. A. McKeen, I. S. McDermid, and T. Leblanc, Large upper tropospheric ozone enhancements above midlatitude North America during summer: In situ evidence from the IONS and MOZAIC ozone measurement network, *J. Geophys. Res.*, 111, D24S05, 2006.
 36. Ren, X., et al., HO_x in the winter urban atmosphere in New York City: Observations and model comparison, *Atmos. Environ.*, 40, S252-S263, 2006.
 37. Ren, X., et al., OH and HO₂ during the PMTACS–NY Whiteface Mountain 2002 Campaign: Observations and Model Comparison, *J. Geophys. Res.*, 111, D10S03, 2006.
 38. Shirley, T. R., W. H. Brune, X. Ren, J. Mao, R. Leshner, B. Cardenas, R. Volkamer, L. T. Molina, M. J. Molina, B. Lamb, E. Velasco, T. Jobson, and M. Alexander, Atmospheric oxidation in the Mexico City Metropolitan Area (MCMA) during April 2003, *Atmos. Chem. Phys.*, 6, 2753–2765, 2006.
 39. Ren, X., et al., Hydroxyl and peroxy radical chemistry in a rural area of Central Pennsylvania: Observations and model comparisons, *J. Atmos. Chem.*, 52, 231–257, 2005.

40. Ren, X., L. Wang, H. Wang, and G. Miao, Conversion rates of surface HO_x radicals in Beijing City, *Chinese Geographical Science*, 14(1), 34-38, 2004.
41. Ren, X., et al., Interference testing for atmospheric HO_x measurements by laser-induced fluorescence, *J. Atmos. Chem.*, 47(2), 169-190, 2004.
42. Faloon, I. C., D. Tan, R. L. Lesher, N. L. Hazen, C. L. Frame, J. B. Simpas, H. Harder, M. Martinez, P. Di Carlo, X. Ren, and W. H. Brune, A laser induced fluorescence instrument for detecting tropospheric OH and HO₂: Characteristics and calibration, *J. Atmos. Chem.*, 47(2), 139-167, 2004.
43. Shao, M., X. Ren, et al., Quantitative relationship between production and removal of OH and HO₂ radicals in urban atmosphere, *Chinese Science Bulletin*, 49(21), 2253-2257, 2004.
44. Di Carlo, P., W. H. Brune, M. Martinez, H. Harder, R. Lesher, X. Ren, et al., Missing OH reactivity in a forest: Evidence for unknown reactive terpenes, *Science*, 304(5671), 722-725, 2004.
45. Martinez, M., H. Harder, X. Ren, R. L. Lesher, and W. H. Brune, Measuring atmospheric naphthalene with laser-induced fluorescence, *Atmos. Chem. Phys.*, 4, 563-569, 2004.
46. Ren, X., et al., Preliminary study of HO_x photochemical processes in urban atmosphere of Guangzhou City, *Chinese Journal of Environmental Science* (in Chinese), 25(4), 28-31, 2004.
47. Ren, X., et al., OH and HO₂ chemistry in the urban atmosphere of New York City, *Atmos. Environ.*, 37(26), 3627-3637, 2003.
48. Ren, X., et al., HO_x concentrations and OH reactivity observations in New York City during PMTACS-NY2001, *Atmos. Environ.*, 37(26), 3639-3651, 2003.
49. Ren, X., et al., Intercomparison of peroxy radical measurements at a rural site using laser-induced fluorescence and Peroxy Radical Chemical Ionization Mass Spectrometer (PerCIMS) techniques, *J. Geophys. Res.*, 108(D19), 4605, 2003.
50. Ren, X., et al., Determination and characteristics of OH radical in urban atmosphere in Beijing, *Environmental Science* (in Chinese), 23(4), 24-27, 2002.
51. Ren, X., et al., Determination of salicylic acid and its hydroxylated products using high performance liquid chromatography and fluorescence detection, *Chinese Journal of Chromatography* (in Chinese), 19(2), 191-192, 2001.
52. Ren, X., et al., Measurement of gas-phase OH using liquid phase scrubbing and high performance liquid chromatography, *Environmental Chemistry* (in Chinese), 20(1), 81-85, 2001.
53. Ren, X., et al., Determination of Hydroxyl Radical Concentration in the Atmosphere, *China Environmental Science* (in Chinese), 21(2), 115-118, 2001.
54. Ren, X., et al., Advances in measurement of atmospheric peroxy radicals, *Environmental Science Technology* (in Chinese), 8(3), 5-9, 2001.
55. Ren, X., et al., Establishment of OH radical measurement using laser-induced fluorescence technique, *Chinese Journal of Spectroscopy Laboratory* (in Chinese), 17(2), 125-128, 2000.
56. Ren, X., et al., Establishment and study of the gas phase calibration source of hydroxyl radical, *Acta Scientiarum Naturalium Universitatis Pekinensis* (in Chinese), 36(6), 772-776, 2000.
57. Ren, X., et al., Establishment and study of the absolute calibration system of hydroxyl radical detection, *Acta Scientiae Circumstantiae* (in Chinese), 20(6), 688-692, 2000.
58. Wu, J., and X. Ren, Problem in Ozone Layer Protection of China, *Yunnan Environ. Sci.* (in Chinese), 19, 13-16, 2000.
59. Ren, X., et al., The study of OH concentration in OH generating systems by long path FTIR, *Environmental Science* (in Chinese), 20(6), 26-29, 1999.
60. Ren, X., et al., Advances in measurement of atmospheric OH radical using laser-induced fluorescence technique, *Advances in Environmental Science* (in Chinese), 7(6), 13-20, 1999.

61. Ren, X., M. Otting, K. Shao, and X. Tang, Measurement of hydroxyl radical using fluorescence assay with gas expansion technique, *Modern Scientific Instruments*, 6, 11-13, 1999.
62. Li, S., Z. Chen, X. Ren, K. Shao, and X. Tang, Study of organic hydroperoxides and H₂O₂ yields in isoprene and O₃ reactions, *Chinese Journal of Environmental Science* (in Chinese), 18(6), 16-18, 1997.

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