

December 31, 2023

Mark Andrew Zondlo

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Education

Ph. D., Chemistry (physical and atmospheric), University of Colorado, Boulder, 1999
Thesis title: Laboratory studies of heterogeneous reactions on surfaces representative of polar stratospheric cloud and cirrus cloud ice particles (Advisor: Prof. Margaret A. Tolbert)
B.A., Chemistry, Rice University, 1994

Professional Experience

2021- Professor, Dept. of Civil and Environmental Engineering, Princeton University
Associated Faculty:
Program in Atmospheric and Oceanic Sciences
Ctr. for Mid-Infrared Technologies for Health and the Environment
Princeton Institute for the Science and Technology of Materials
Princeton Environmental Institute
Andlinger Center for Energy and the Environment
2014-2021 Associate Professor, Dept. of Civil and Environmental Engineering, Princeton University
2008-2014 Assistant Professor, Dept. of Civil and Environmental Engineering, Princeton University
2002-2007 Senior Research Scientist, Southwest Sciences, Inc., Santa Fe, New Mexico.
1999-2002 Advanced Study Program Postdoctoral Fellow, Natl. Ctr. for Atmos. Research, Boulder, Colorado
Postdoc adviser: Fred L. Eisele, nitric acid airborne field measurements
1994-1999 Graduate research assistant, Univ. of Colorado, Boulder (advisor: Prof. Margaret A. Tolbert)
Thesis: Heterogeneous chemistry on polar stratospheric cloud and cirrus cloud ice particles
1992-1993 Undergraduate research assistant, Univ. of Calif.-Irvine (advisor: Prof. F. Sherwood Rowland)
Research: biomass burning source strength of methyl halides

PI Awards/Honors

2020 NASA Group Achievement Award for FIREX
2015-2016 Visiting Scientist, EUMETSAT Satellite Application Facility on Atmospheric Composition Monitoring, Brussels, Belgium
2015 NASA Group Achievement Award for DISCOVER-AQ
2014 Outstanding Engineering Teaching Faculty, Princeton Univ., Spring 2014
2013 Nomination for Popular Mechanics 100 Breakthrough Innovations, NSF Engineering Directorate
2001-2002 NCAR ACD Visiting Scientist
1999-2001 NCAR Advanced Study Program Postdoctoral Fellowship
1996-1998 NASA Earth Systems Science Graduate Fellowship
1995-1996 NASA Global Change Graduate Fellowship
1994-1995 University of Colorado Chancellor's Fellowship

Teaching

Princeton University:

CEE/CHM/GEO 311, "Global Air Pollution" (S2009, F2010, S2012-2015, S2017-2021, S2023, S2024)
CEE 509/510, "Directed Graduate Research" (AY 2019-2020, 2020-2021, 2022-2023, 2023-2024)
CEE/AOS 593, "Aerosol Chemistry and Physics" (F2018, F2020)
CEE 599B, "Special Topics: Environmental Field Sampling and Design" (F2019, F2022)
ELE/CEE/MAE/MSE 455, "Mid-Infrared Technol. for Health and the Environment" (S2011, F2012, F2013)
CEE/AOS 593, "Aerosol Observations and Modeling" (F2009 (CEE 599B), F2011, F2014)
CEE 501, "Environmental Engineering Fundamentals I: Atmospheric and Surface Processes" (F2008-2011)
CEE 445/578, "Air Quality and Aerosol Processes" (S2009)

Santa Fe Community College:

HB 365, "Understanding Global Climate Change", Continuing Education (S2006, S2007, F2007)

University of Colorado, Boulder:

Teaching Assistant, Physical Chemistry laboratory and lecture, 1994-1995.

University Service

2019-2024 Director of Graduate Studies, Dept. of Civil and Environmental Engineering,
2019-2024 Faculty Committee on the Graduate School
Fellowship Subcommittee (2020-2021 AY, 2022-2023 AY)
Student Life and Discipline Committee (2019-2020 AY)
2016-2022 Executive Committee, Andlinger Center for Energy and the Environment
2018-2021 CEE/SEAS Building Subcommittee
2017-2021 SEAS Robotics and Cyber Physical Systems Search Committee
2017-2021 Environmental Studies and SEAS Building Planning Committee
2016-2019 Associate Director for External Partnerships, Andlinger Center for Energy and the Environment
2016-2019 Princeton E-affiliates Partnership (director), Andlinger Center for Energy and the Environment
2014-2015 Chair, SEAS Self-study: Relationships with External Entities Subcommittee
2013-2015 CEE Undergraduate Adviser (Engineering track)
2013-2014 Member, Committee on Library and Computing
2008-2010 Coordinator, seminar series, Dept. of Civil and Environmental Engineering
multiple years SEAS BSE First year Adviser (AY 2013/14, 2017/18, 2019/20, 2020/21)

Professional Activities

Atmospheric Chemistry Field Experiments and Science Teams:

NASA ASIA-AQ, PI for open-path NH₃ sensor on NASA DC-8 aircraft (2024 field campaign)
NOAA AEROMMA, PI for open-path NH₃ sensor on NASA DC-8 aircraft (2023 field campaign)
NASA FIREX-AQ, PI for open-path NH₃ sensor on NASA DC-8 aircraft (2019 field campaign)
EPA Duke Forest Ammonia Eddy Covariance study, PI for open-path NH₃ sensor (2017)
NSF LTER Kellogg Biological Station, PI for open-path, eddy covariance nitrous oxide sensor (2015-2017)
EPA/NPS Rocky Mountain Nitrogen Study, PI for open-path, eddy covariance ammonia sensor (2015-2016)
NASA DISCOVER-AQ Colorado, PI for Mobile mapping of NH₃/CO/CO₂/CH₄ (2014)
EDF Barnett Shale Methane Emissions Coordinated Campaign, PI for drone-based methane measurements (2013)
NASA DISCOVER-AQ Houston, PI for Mobile mapping of NH₃/CO and greenhouse gas measurements (2013)
CAREBEIJING-North Coastal Plain, PI for Mobile greenhouse gas and air pollutant measurements (2013)
NASA DISCOVER-AQ California, PI for Mobile mapping of NH₃/CO and greenhouse gas measurements (2013)
NASA Southeast Asia Cloud, Climate, Coupling and Composition Regional Study (SEAC4RS), PI for VCSEL hygrometer (NSF-cancelled their participation in 2012)
NSF Deep Convection and Cloud Chemistry (DC3), PI for VCSEL hygrometer (2012)
NSF Tropical Ocean Troposphere Exchange of Reactive Halogen Species and Oxygenated VOCs, PI for VCSEL hygrometer (2012)
NSF Pre-Depression Investigation of Cloud Systems in the Tropics, PI for VCSEL hygrometer (2010)
NOAA Nexus of Climate Change and Air Quality (CalNex 2010), PI for open-path ammonia measurements (2010)
NSF HIAPER Pole-to-Pole Observations, PI for VCSEL hygrometer (2009-2011)
NSF Pre-Depression Investigation of Cloud-systems in the Tropics, PI for VCSEL hygrometer (2010)
NSF Stratosphere-Troposphere Analyses of Regional Transport, PI for VCSEL hygrometer (2008)
Program Committee, 16th Intl. Conf. on Mid-Infrared Optoelectronics: Materials and Devices, 2022-2023
NASA Mission Selection Evaluation Team, DISCOVERY Mission, 2020-2021
Principal Investigator, NASA Health and Air Quality Applied Sciences Team Member (HAQAST), 2016-2020
Chair, CLEO A&T 4: Photonic Instrumentation for Energy and Environment Committee, 2014-2019
AquaVIT International Water Vapour Intercomparison, Karlsruhe, Germany, PI for VCSEL hygrometer (2008)
Member, EUMETRISPEC, European Spectral Data for Metrology Analyses, 2012-2017
Member, Program Committee, Energy and Environment, CLEO: Applications and Technology, 2011-2013
Chair and Discussion Leader, NSF Facilities Users Workshop, UT/LS Science, Sept. 24-26, 2007
Member, Environmental Technology Advisory Committee, Santa Fe Community College, 2007
Member, Expert Working Group on Turbulence and Thermodynamics, European Fleet for Airborne Research, 2006
Co-chair, "Dynamics and Chemistry of the UT/LS, A31G", AGU Fall Meeting, December 10, 2005

Convener, Special Session, “Cloud Chemistry and Processing”, Fall AGU Meeting, December 13-17, 2004
Chair, NCAR Advanced Study Program 2000-2001 Seminar Series

Reviewer for *Environmental Science and Technology*, *PNAS*, *Nature*, *Journal of Geophysical Research-Atmospheres*,
Journal of Geophysical Research-Biogeosciences, *Geophysical Research Letters*, *Physical Chemistry*
Chemical Physics, *Aerosol Science and Technology*, *Journal of Atmospheric and Oceanic Technology*,
Journal of Physical Chemistry, *Atmospheric Chemistry and Physics*, *Atmospheric Measurement*
Techniques, *Sensors*, *Optics Express*; also reviewer for NASA Science Mission Directorate, NASA
DISCOVERY Planetary Mission, DOE Biological and Environmental Research, NOAA AC4,
European Space Agency, and NSF Geosciences Directorate proposals

Graduate Student Advising

current:

Nathan Li (7th year Ph.D. candidate, CEE)
Daniel Moore (5th year Ph.D. candidate, CEE)
Vlad Sevostianov (3rd year Ph.D. candidate, CEE)
Yunseo Choi (2nd year Ph.D. candidate, CEE)
Ryan Boyd (1st year Ph.D. candidate, CEE)

past:

Rui Wang, Ph.D., CEE, 2022 (now postdoctoral researcher, NOAA GFDL)
Xuehui Guo, Ph.D., CEE, 2022 (now postdoctoral researcher, Univ. of Virginia, Prof. Sally Pusede)
Da Pan, Ph.D., CEE 2021 (now postdoctoral researcher, Colorado State University with Prof. Jeff Collett)
Levi M. Golston, Ph.D., CEE, 2019 (now NASA Postdoctoral Fellow/Ames)
Kang Sun, Ph.D., CEE, 2015 (now Assistant Professor, University at Buffalo)
David Miller, Ph.D., CEE, 2014 (now Senior Scientist, Environmental Defense Fund)
Minghui Diao, Ph.D., CEE, 2013 (now Professor, Dept. of Meteorology, San Jose St. Univ.)
Qiushi Zhang, MSE Civil and Environmental Engineering, 2013 (unknown)
Loayeh Jumbam, MSE Civil and Environmental Engineering, 2010 (Res. Sci. at Sonoma Tech.)

Other Ph.D./Masters thesis committee members (all Princeton University unless otherwise noted):

Charles Link Patrick, Ph.D., Electrical and Computer Engineering, 2023
Joel Strothers, MSE, Civil and Environmental Engineering, 2023
Xiaohan Li, Ph.D., Civil and Environmental Engineering, 2023
Julie Kim, Ph.D., Civil and Environmental Engineering, 2023
Mohammad Allouche, Ph.D., Civil and Environmental Engineering, 2022
Yiheng Tao, Ph.D., Civil and Environmental Engineering, 2022
Sassan Hajirezaie, Ph.D., Civil and Environmental Engineering, 2021
Zahra Bajalan, MSE, Civil and Environmental Engineering, 2021
Joseph Fogarty, Ph.D., Civil and Environmental Engineering, 2021
Sassan Hajirezaie, Ph.D., Civil and Environmental Engineering, 2021
Yifeng Chen, Ph.D., Electrical Engineering, 2021
Michael Soskind, Ph.D., Electrical Engineering, 2021
Peeyush Khare, Ph.D., Chemical and Environmental Engineering, Yale University, 2020
Xiili Sarkela-Bassett, MSE, Civil and Environmental Engineering, 2020
Cheyenne Teng, Ph.D., Electrical Engineering, 2020
Peeyush Kare, Ph.D., Yale University, 2020
Cheyenne Teng, Ph.D., Electrical Engineering, 2020
Melany Ruiz Uriguen, Ph.D., Civil and Environmental Engineering, 2019
Xiaogang He, Ph.D., Civil and Environmental Engineering, 2019
Enrico Dammers, Ph.D., Vrije Universiteit Amsterdam, 2017
Genevieve B. Plant, Ph.D., Electrical Engineering, 2016
Qi Li, Ph.D., Civil and Environmental Engineering, 2016
Hagar ElBishlwai, Ph.D., Civil and Environmental Engineering, 2014
Matthew Reid, Ph.D., Civil and Environmental Engineering, 2014

Yin Wang, Ph.D., Electrical Engineering, November 2013
 Jeff Paull, Ph.D., Electrical Engineering, November 2012
 Tracy Tsai, Ph.D., Electrical Engineering, September 2012
 Lauren Crandell, Ph.D., Civil and Environmental Engineering, May 2012
 Zhihua Wang, Ph.D., Civil and Environmental Engineering, August 2011
 Ekuu Bentil, Ph.D., Electrical Engineering, April 2011
 Richard Cendejas, Ph.D., Electrical Engineering, April 2011
 Scott Sheridan Howard, Ph.D., Electrical Engineering, May 2008
 Afusat Dirisu, Ph.D., Electrical Engineering, December 2008
 Fatima Toor, Ph.D., Electrical Engineering, May 2009

Undergraduate Student Advising

Senior Thesis Students:

Alec Pirone, Civil and Environmental Engineering, 2023-2024
 Christopher Gilwa, Civil and Environmental Engineering, 2020-2021
 Peyton Brown, Civil and Environmental Engineering, 2020-2021
 Rei Zhang, Civil and Environmental Engineering, 2020-2021
 Sierra Castaneda, Civil and Environmental Engineering, 2019-2020
 Sofio Bisogno, Civil and Environmental Engineering, 2019-2020
 Margaret McAllister, Civil and Environmental Engineering, 2018-2019
 Mikaela Sawyer, Civil and Environmental Engineering, 2018-2019
 Chinezimuzo Mmega, Civil and Environmental Engineering, 2017-2018
 Jessica Lu, Civil and Environmental Engineering, 2016-2017
 Haley Lane, Civil and Environmental Engineering, 2015-2016
 Levi Stanton, Civil and Environmental Engineering, 2014-2015
 Kevin Ross, Civil and Environmental Engineering, 2013-2014
 Michelle L. Yakubisin, Chemical and Biological Engineering, 2013-2014
 Brian Pourciau, Civil and Environmental Engineering, 2012-2013
 Garnet Abrams, Geosciences, 2011-2012
 Otavio Fleury, Civil and Environmental Engineering, 2011-2012
 Nicole McAndrew, Chemical and Biological Engineering, 2010-2011
 Emma Bedard, Chemical and Biological Engineering, 2010-2011

Undergraduate research students:

2020: Natasha Montiel, Princeton University
 2019: Sierra Castaneda, Princeton University
 Allen Dai, Princeton University
 2018: Sofia Bisogno, Princeton University
 Kira Olander, MIRTHERU, Wheaton College
 Sal Lombardo, Worcester Polytechnic University
 2016: Jessica Lu, CEE / Princeton University
 Tanvir Mangat, University of Massachusetts, MIRTHERU
 Kira Olander, MIRTHERU, Wheaton College
 2015: Haley Lane, CEE / Princeton University
 Jessica Lu, CEE / Princeton University
 Tanvir Mangat, University of Massachusetts, MIRTHERU
 Stephanie Paredes Mesa, City College of New York, MIRTHERU
 2014: Victor Fu, Univ. Southern California, MIRTHERU
 Naomi Pohl, Univ. Of Pennsylvania, MIRTHERU
 Levi Stanton, PEI Summer Intern
 2013: John Buglione, Villanova, MIRTHERU
 Victor Fu, Univ. Southern California, MIRTHERU
 Levi Stanton, CEE / Princeton University, MIRTHERU
 2012: John Buglione, Villanova, MIRTHERU
 Andrew Ortiz, SUNY-Buffalo, MIRTHERU

Kathryn Nicolich, Bucknell University, PCCM REU
 Levi Stanton, CEE / Princeton University, PEI intern
 Christopher Hamm, CEE / Princeton University, PEI intern
 2011: Garnet Abrams, GEO / Princeton University, PEI intern
 Oshare Mcrae, Vanderbilt University, MIRTHERU
 Caitlyn Puzio, Northeastern University, MIRTHERU
 2010: Kristine Rafferty, Univ. of Notre Dame, MIRTHERU
 George Apfelbach, Boston College, PCCM REU
 Jeff Schreiber, University of Dayton, MIRTHERU
 2009: Alex Trevisan, CHM / Princeton University
 Kristine Rafferty, Univ. of Notre Dame, MIRTHERU
 Elise Pusateri, Rensselaer Polytechnic Institute, PCCM REU
 David Tersegno, St. Lawrence University, MIRTHERU
 2008: David Tersegno, St. Lawrence University, MIRTHERU

High School Advising

Summer research students:

2022: Caroline Zhao, Montgomery High School (NJ)
 Joseph Lansang, Notre Dame High School (Lawrence, NJ)
 2018: Sal Lomabardo, Hunterdon Central Regional High School (NJ)
 2017: Sal Lomabardo, Hunterdon Central Regional High School (NJ)
 Wendy Wu, High Tech High School (NJ)
 2015: Brancis Leal, Raritan-Bridgewater High School (NJ)
 2013: Namoi Pohl, high school student, Morristown (NJ) High School
 2012: Joel Martin, Bridgewater-Raritan High School (NJ)
 Victor Fu, The Peddy School (NJ)
 2010: Caitlyn Puzio, Pennington High School (NJ)
 Marissa Portenti, Bayonne High School (NJ)
 2009: Humaira Admani, William L. Dickinson High School

High school teachers research advising:

2013-2019: Lars Wendt, Hunterdon Central Regional High School, Flemington, NJ
 (summers + fall 2017 sabbatical)

External Funding (lead PI unless explicitly noted, since 2008)

Current:

Metropolitan Water Reclamation District of Greater Chicago, "Greenhouse Gas Monitoring and Quantification at the Metropolitan Water Reclamation District of Greater Chicago Facilities", Agreement No. 1598272, Dec. 1, 2023-Dec. 31, 2024 (\$100,324).
 NASA 80NSSC23K0815, "Tropospheric ammonia measurements by the Open-Path Airborne Laser Spectrometer during ASIA-AQ", May 1, 2023-April 30, 2026 (\$886,245).
 California Air Resources Board, "Ammonia and nitrous oxide emissions during digester effluent storage and field application", Agreement No. 2021319, August 1, 2022-June 30, 2025 (\$556,142).
 U.S. EPA via Wood Environmental and Infrastructure Solutions, Inc., TTR2022-001 (PRIME U.S. EPA #68HERH21D0006), "Open-path ammonia analyzer", February 1, 2022-January 30, 2024 (\$120,708.43).
 NEC Laboratories of America, Inc., "Development of drone-based optical sensors for use in decarbonization", January 1, 2022-December 31, 2022 (\$80,017).
 NASA 80NSSC21K1632, "Characterization of reactive nitrogen emissions from agricultural hotspots", September 1, 2021-August 31, 2024 (\$135,000).
 DOE PNNL, "Vertical cavity surface emitting laser (VCSEL) hygrometer for Challenger 850 aircraft test flights", DOE #DE-AC05-76RL01830, April 12, 2021-December 31, 2024 (\$95,699).
 DOE ARPA-E DE-AR0001385, "NitroNet: Quantifying spatial and temporal nitrous oxide emissions", May 21, 2021-May 20, 2024 (\$3,004,563).
 Alfred P. Sloan Foundation, "Quantifying emissions from wastewater and agricultural waste", April 2020-April 2024 (\$1,499,583).

Past:

- NASA NNH17ZDA001N, “Tropospheric ammonia measurements onboard the DC8 in FIRE-CHEM”, Mar. 1, 2018-March 19, 2023 (\$850,000).
- NASA 80NSSC17K0377, “Understanding tropospheric ammonia through remote sensing measurements: student Xuehui Guo”, Sept. 1, 2017-Dec. 31, 2020 (\$135,000).
- ACEE/EMRE, “Understanding Atmospheric Ammonia and its Impacts on Air Quality and Climate Using Satellites and Models”, June 1, 2018-October 31, 2020 (\$316,281).
- DOE DE-FE0029059, “Remote Methane Sensor for Emissions from Pipelines and Compressor Stations using chirped-laser dispersion spectroscopy”, March 1, 2017-February 28, 2021 (\$1,141,204).
- NASA NNX16AQ90G, “Spatiotemporal variability of ammonia through syntheses of in-situ, ground-based, and remote sensing instruments”, Aug. 17, 2016-Aug. 16, 2020 (\$715,304).
- DOE ARPA-E SC67232-1867 (subcontractor), “RMLD™ Sentry for Upstream Natural Gas Leak Monitoring” for ARPA-E Methane Observation Networks with Innovative Technology to Obtain Reductions (MONITOR), Subcontract via Physical Sciences, Inc., April 24, 2015-April 17, 2018 (\$432,876 Princeton PI share).
- NOAA Climate Program Office, Atmospheric Chemistry, Carbon Cycle, and Climate, #NA14OAR4310134, “Distribution of fugitive methane emissions in the Marcellus Shale”, August 1, 2014-July 31, 2017 (\$598,451).
- EPA via Amec Foster Wheeler MSSP #TMH2017-084 via prime #EP-W-16-015, “Support for Ammonia Eddy Covariance Flux Measurements”, March 8, 2017-July 8, 2017 (\$100,000).
- DOD Navy N68335-17-C-0359 (co-PI), “US Navy SBIR Phase I: UAV-Compatible Secondary Payload for Meteorological Profiling”, Oct. 11, 2017 -Nov. 27, 2017 (\$12,000 Princeton PI share).
- EPA via Amec Foster Wheeler MSSP #TMH2017-084 via prime #EP-W-16-015, “Support for Ammonia Eddy Covariance Flux Measurements”, March 8, 2017-July 8, 2017 (\$100,000).
- DOE DE-SC00021004 (co-PI), “Compact laser hygrometer for in-situ measurements of water vapor from small unmanned aerial vehicles”, February 19, 2016-December 1, 2016 (\$82,000 Princeton co-PI share).
- NOAA NA14OAR4320106 (co-I), “Reactive nitrogen biogeochemical cycling in the GFDL Earth System Models: Advancing understanding of atmosphere-land interactions under changing climate and land use”, July 1, 2013-June 30, 2018 (\$53,364 co-I share).
- NASA NNX14AT36G, “Quantifying ammonia emissions from agriculture and cities during DISCOVER-AQ”, Oct. 1, 2014-Sept. 30, 2015 (\$50,000).
- NASA NNX14AT32G, “Understanding spatial variability of methane by comparing bottom-up and top-down methods during DISCOVER-AQ Colorado”, Oct. 1, 2014-Sept. 30, 2015 (\$50,000).
- NSF IIP-1445031, “Partnerships for Innovation: Accelerating Innovation Research-Technology Transfer: Prototype mid-infrared, methane sensor for natural gas leak detection on small unmanned aerial systems”, Sept. 15, 2014-February 29, 2016 (\$193,147).
- NSF DEB-1359538, “EAGER: Collaborative research: development of a new technique to measure ecosystem-level soil nitrous oxide fluxes using micrometeorological towers”, August 4, 2014-August 3, 2016 (\$59,998).
- DOE DE-SC0011288 (subcontractor, co-PI), “Portable nitrous oxide sensor for understanding agricultural and soil emissions”, February 17, 2014-November 16, 2016 (\$828,334 Princeton co-PI share).
- Environmental Defense Fund, Barnett Shale Methane Emissions Coordinated Campaign, “Methane emissions from near field sources using an electric aircraft”, August 1, 2013-July 31, 2014 (\$81,666).
- NSF IIP-1263579, “I-Corps: Open-path, Compact Nitrous Oxide Sensor Using Quantum Cascade Laser Spectroscopy”, Oct. 1, 2012-March 31, 2013 (\$50,000).
- NASA NNX12AN64H, “Validation of TES Ammonia Using an Open-path Quantum Cascade Laser Based Spectrometer (student: Kang Sun)”, NASA Earth and Space Science Graduate Fellowship, Sept. 1, 2012-Aug. 31, 2015 (\$90,000).
- NSF AGS-1063466, “Supplement: Environmental Conditions and Characteristics of Ice Supersaturated Regions in Deep Convective Clouds and Chemistry (DC3)”, April 7, 2012-April 30, 2014, awarded but returned to NSF due to cancellation of NSF involvement in the NASA SEAC4RS field study (\$151,198).
- NSF AGS-1063466, “Environmental conditions and characteristics of ice supersaturated regions in Deep Convective Clouds and chemistry (DC3)”, Apr. 7, 2011-Apr. 30, 2014 (\$608,741).
- NSF AGS-1036275, “RAPID: Ice supersaturated regions and distribution of water vapor during the third HIPPO deployment”, Aug. 15, 2010-July 31, 2012 (\$119,646).

NSF IIP-1038825, “High precision, range-resolved remote gas sensing”, July 1, 2010-June 30, 2012 (\$92,487).
 NASA NNX09AO51H, “Aircraft-based measurements of ice supersaturated regions in the upper troposphere and lower stratosphere and comparison to AIRS climatologies (student: Minghui Diao)”, NASA Earth and Space Science Graduate Fellowship, Sept. 1, 2009-Aug. 31, 2012 (\$90,000).
 NSF IIP-0646479, “Phase IIR: Balloon-based instrument for measurements of atmospheric water vapor and methane”, July 2, 2009-Jan. 31, 2011 (\$97,334).
 USDA 2009-35112-05274, Air Quality, “Nitrous oxide measurements using a quantum cascade laser near 4.54 microns”, Feb. 1, 2009-July 31, 2010 (\$100,000).
 NSF ATM-0840732, “SGER: Water vapor measurements from the G-V VCSEL hygrometer during START08/PreHIPPO”, Sep. 1, 2008-Aug. 31, 2009 (\$31,253).
 NSF MIRTHE, “Nitrous oxide measurements using a quantum cascade laser near 4.54 microns”, May 1, 2008-Apr. 30, 2009 (\$96,638).

Community Service

Director of Mentoring and Program Strategy, Young Science Achievers Program (2008-present), 501c3 non-profit
 Member, Board of Directors, Young Science Achievers Program (2008-present), 501c3 non-profit
 Transportation Advisory Council, Member, Montgomery Township, New Jersey (2014-present)
 Board Member, Montgomery Friends of Open Space (2015-present)

Professional Organizations

American Geophysical Union, 1994-present
 Optical Society of America, 2011-present
 American Chemical Society, 2015-present
 American Meteorological Society, 2023-present

Peer-reviewed Publications *=Primary author, corresponding author, or first author is from my group at Princeton
 ORCID: 0000-0003-2302-9554 Scopus ID: 55926866400 ResearcherID: R-6173-2016

- 79.* Wang, R., D. Pan, X. Guo, K. Sun, L. Clarisse, M. van Damme, P.-F. Coheur, C. Clerbaux, M. Puchalski, and **M.A. Zondlo** (2023), "Bridging the spatial gaps of the Ammonia Monitoring Network using satellite ammonia measurements", *Atmos. Chem. Phys.*, 23, 13217-13234, <https://doi.org/10.5194/acp-23-13217-203>.
78. Bertagnia, M.B., R.H. Socolow, J.M.P. Martirez, E.A. Carter, C. Greig, Y.G. Gu, T. Lieuwen, M.E. Mueller, S. Sundaresan, R. Wang, **M.A. Zondlo**, and A. Porporato (2023), "Minimizing the impacts of the ammonia economy on the nitrogen cycle and climate", *Proc. Natl. Acad. Sci.*, 120, doi:10.1073/pnas.2311728120.
77. Soskind, M.G., N.P. Li, D.P. Moore, Y. Chen, L.P. Wendt, J. McSpiritt, **M.A. Zondlo**, and G. Wysocki (2023), "Stationary and drone-assisted methane plume localization with dispersion spectroscopy", *Remote Sens. Environ.*, 289, <https://doi.org/10.1016/j.rse.2023.113513>.
76. Song, C., J.-J. Zhu, J.L. Willis, D.P. Moore, **M.A. Zondlo**, and Z.J. Ren (2023), "Methane emissions from municipal wastewater collection and treatment systems", *Envi. Sci. Technol.*, 57 (6), 2248-2261, <https://doi.org/10.1021/acs.est.2c04388>.
- 75.* Moore, D.M., N.P. Li, L.P. Wendt, S.R. Castaneda, M.M. Falinski, J.-J. Zhu, C. Song, Z.J. Ren, and **M.A. Zondlo** (2022), "Underestimation of sector-wide emissions from United States wastewater treatment", *Envi. Sci. Technol.*, 57 (10), 4082-4090, <https://doi.org/10.1021/acs.est.2c05373>.
- 74.* Guo, X., D. Pan, R.W. Daly, X. Chen, J.T. Walker, L. Tao, J. McSpiritt, and **M.A. Zondlo** (2022), "Spatial heterogeneity of ammonia fluxes in a deciduous forest and adjacent grassland", *Agric. Forest Meteorol.*, 326, 109128, <https://doi.org/10.1016/j.agrformet.2022.109128>.
- 73.* Beale, C.A., F. Paulot, C.A. Randles, R. Wang, X. Guo, L. Clarisse, M. Van Damme, S. Whitburn, P.-F. Coheur, C. Clerbaux, M.W. Shephard, E. Dammers, K. Cady-Pereira, and **M.A. Zondlo** (2022), "Large

- sub-regional differences of ammonia seasonal patterns over India reveal inventory discrepancies", *Environmental Research Letters*, 17 (10), <https://doi.org/10.1088/1748-9326/ac881f>.
- 72.* Pan, D., I. Gelfand, L. Tao, M. Abraha, K. Sun, X. Guo, J. Chen, G.P. Robertson, and **M.A. Zondlo** (2021), "A new open-path eddy covariance method for nitrous oxide and other trace gases that minimizes temperature corrections", *Global Change Biology*, 28, 1446-1457, doi:10.1111/gcb.15986.
- 71.* Pan, D., K.B. Benedict, L.M. Golston, R. Wang, J.L. Collett Jr., L. Tao, K. Sun, X. Guo, J. Ham, A.J. Prenni, B.A. Schichtel, T. Mikoviny, M. Müller, A. Wisthaler, and **M.A. Zondlo** (2021), "Ammonia Dry Deposition in an Alpine Ecosystem Traced to Agricultural Emission Hotspots", *Environ. Sci. Technol.*, 55, 7776-7785, doi: 10.1021/acs.est.0c05749.
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Peer-reviewed book chapters

Zondlo, M.A. (2021) "Chapter 6: Unmanned aerial systems for trace gases" in *Advances in Spectroscopic Monitoring of the Atmosphere*, W. Chen, D.S. Venables, and M.W. Sigrist (Eds.), 321-344, Elsevier, pp. 623, ISBN: 978-0-12-815014-6 (2021).

Schäfer, K., M. Wenig, **M.A. Zondlo**, A. Murk, and K. Weber (2021), "Chapter 28: Spectrometers" in *Springer Handbook of Atmospheric Measurements*, T. Foken (ed.), Springer Nature, Switzerland, 799-819, ISBN: 978-3-030-52170-7, pp. 1748, <https://doi.org/10.1007/978-3-030-52171-4>, chapter doi:10.1007/978-3-030-52171-4_28.

Manuscripts in review *=Primary author, corresponding author, or first author is from my group

*Moore, D.P., N.P. Li, C. Song, J.-J. Zhu, H. Yi, L. Tao, J. McSpirtt, V.I. Sevostianov, L.P. Wendt, N.E. Rojas Robles, F.M. Hopkins, Z.J. Ren, **M.A. Zondlo** (2024), "Greater contribution of wastewater treatment to urban greenhouse gas emissions", submitted to *Nature Water*, manuscript #NATWATER-24-0273.

Gerges, F., M. Llaguno-Munitxa, **M.A. Zondlo**, M.C. Boufadel, and E. Bou-Zeid (2024), "Weather and the City: Machine Learning for Predicting and Attributing Fine Scale Air Quality to Urban and Meteorological Determinants", submitted to *Envi. Sci. Technol.*, manuscript # es-2024-00783j.

*Pan, D., D.L. Mauzerall, R. Wang, X. Guo, M. Puchalski, Y. Guo, S. Song, D. Tong, A.P. Sullivan, B.A. Schichtel, J.L. Collett Jr., **M.A. Zondlo** (2023), "Regime Shift in Atmospheric Secondary Inorganic Aerosol Formation in the Rural United States", submitted to *Nature Geoscience*, manuscript #NGS-2023-10-02034-T.

Allouche, M., V.I. Sevostianov, E. Zahn, **M.A. Zondlo**, N.L. Dias, G.G. Katul, J.D. Fuentes, and E. Bou-Zeid (2023), "Estimating scalar turbulent fluxes with slow-response sensors in the stable atmospheric boundary layer", submitted to *Atmos. Chem. Phys. Letters*, manuscript #egosphere-2023-2620.

Unrefereed articles

Puchalski, M.A., J.T. Walker, G.M. Beachley, **M.A. Zondlo**, K.B. Benedict, R.H. Grant, B.A. Schichtel, C.M. Rogers, A.B. Leytem, J. Rice, K. Morris, J.J. Schauer, and R. Wang (2019), "Need for improved monitoring of spatial and temporal trends of reduced nitrogen", *Environmental Monitor*, July 2019 (trade journal for the Air and Waste and Management Association).

Intellectual Property

Patents:

Zondlo, M.A., L. Tao, D. Pan, J. Collins, P. Guiguizian, H. Bell, A. Elliott, P. Killough, B. Geerthuis, and H. Soto, "Spectroscopic devices, systems, and methods for optical sensing of molecular species", WO 2020/172541 A1, PCT/US2020/019239.

K. Sun, L. Tao, D. Miller; M.A. Khan, **M.A. Zondlo**, "Multi-Harmonic Inline Reference Cell for Optical Trace Gas Sensing", United States Patent and Trademark Office, US 8,970,842, March 3, 2015.

Provisional patent applications:

Sevostianov, V., **M.A. Zondlo**, N.P. Li, J. Collins and L. Tao, "Mid-IR thin low-cost retroreflector", application 63/523,690, submitted June 28, 2023.

Invention disclosures:

Sevostianov, V., **M.A. Zondlo**, D. Moore, N. Li, J. McSpirtt, D. Pan, H. Yi, L. Tao, "Open-path mid-IR sensors for measurement of atmospheric fluxes using the eddy covariance approach", Office of Technology Licensing and Intellectual Property, Princeton University, December 18, 2023.

Sevostianov, V., **M.A. Zondlo**, J. Collins, P. Guiguizian, and L. Tao, "Optical web for spatio-temporal measurements of nitrous oxide", Office of Technology Licensing and Intellectual Property, Princeton University, November 14, 2023.

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M.A. Zondlo, L. Tao, and K. Sun, Invention # 13-2843-1, "Open-Path, Optical Trace Gas Sensor with Integrated Three Dimensional Wind Speed and Temperatures Measurements", Office of Technology Licensing and Intellectual Property, Princeton University, August 6, 2012.

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Public Relations / Media

Interview, Princeton Office of Communication, Air Quality from Canadian Fires, <https://www.youtube.com/watch?v=EZKjq6jIqI>, June 7, 2023 (also interviewed on CNN, NJ.com, ABC news, e.g.: <https://edition.cnn.com/2023/06/08/weather/air-quality-smoke-nyc-northeast-thursday/index.html>, <https://edition.cnn.com/us/live-news/canada-wildfire-smoke-air-quality-06-28-23/index.html>).

Interview, NPR Science Friday, "Sewage is a biological necessity, and a methane minefield", <https://www.sciencefriday.com/segments/sewage-methane/>, March 31, 2023.

Feature, Chemical and Engineering News, "Wastewater treatment releases nearly double the methane that was previously thought", https://cen.acs.org/environment/greenhouse-gases/Wastewater-treatment-releases-nearly-double/101/web/2023/03?utm_source=LatestNews&utm_medium=LatestNews&utm_campaign=CENRSS, March 14, 2023.

Feature, Chemical and Engineering News, quoted in "Scientists look to answer questions about urban ammonia", <https://cen.acs.org/environment/atmospheric-chemistry/Scientists-look-answer-questions-urban/100/i41>, 100 (41), November 22, 2022.

Feature, Inside Climate News, quoted in "California Has Provided Incentives for Methane Capture at Dairies, but the Program May Have 'Unintended Consequences'", <https://insideclimatenews.org/news/19092022/dairy-digesters-methane-california-manure/>, September 20, 2022.

Feature, Physics.org, "New sensor paves way to low-cost sensitive methane measurements", February 23, 2021, <https://phys.org/news/2021-02-sensor-paves-low-cost-sensitive-methane.html>

Feature, Optics and Photonics News, "Infrared Sensors Offer Insights into Invisible Threats", https://www.photonics.com/Articles/Infrared_Sensors_Offer_Insights_into_Invisible/a65414, February 2020.

Feature, Princeton homepage story, "Controlling methane is a fast and critical way to slow global warming, say Princeton experts", <https://www.princeton.edu/news/2019/09/19/controlling-methane-fast-and-critical-way-slow-global-warming-say-princeton-experts>, September 19, 2019.

Feature, Princeton homepage story, "A small number of leaky natural gas wells produce emissions of greenhouse gases", <https://www.princeton.edu/news/2019/08/01/small-number-leaky-natural-gas-wells-produce-large-emissions-greenhouse-gases>, August 1, 2019.

NASA Earth Observatory Image of the Day, "The seasonal rhythms of ammonia", <https://earthobservatory.nasa.gov/images/144351/the-seasonal-rhythms-of-ammonia>, December 10, 2018.

Feature, Princeton homepage story, "On the road in Hawaii, Princeton team seeks clearer picture of volcanic air quality", <https://www.princeton.edu/news/2018/10/23/road-hawaii-princeton-team-seeks-clearer-picture-volcanic-air-quality>, October 23, 2018.

Feature, Princeton homepage story, "Probing air pollution with laser sensors", <https://www.princeton.edu/news/2017/12/19/probing-air-pollution-laser-sensors>.

Feature, Science, J. Plautz, "Piercing the haze", 361, 6407, 1060-1063, doi:10.1126/science.361.6407.1060

Feature, Princeton homepage story, “Vehicles, not farms, are likely source of smog-causing ammonia”, <https://www.princeton.edu/news/2017/03/30/vehicles-not-farms-are-likely-source-smog-causing-ammonia>

Feature, Optics and Photonics News, “Air-Quality Monitoring in the Mid-Infrared”, November 2015, Optical Society of America, http://www.osa-opn.org/home/articles/volume_26/november_2015/features/air-quality_monitoring_in_the_mid-infrared/#.VjJAIN5-U0

Feature, Yale Environment 360, “On fracking front, a push to reduce leaks of methane”, April 7, 2014, http://e360.yale.edu/feature/on_fracking_front_a_push_to_reduce_leaks_of_methane/2754/

Feature, Princeton Alumni Weekly, “Engineering: Aloft, Zondlo tracks greenhouse gases”, 114 (7), Feb. 5, 2014, <http://paw.princeton.edu/issues/2014/02/05/pages/4049/index.xml>

Feature, Discovery Research at Princeton, “Inventions bridge the gap between lab and marketplace”, 2013 issue, November 3, 2013, <https://discovery.princeton.edu/2013/11/03/inventions-bridge-the-gap-between-lab-and-marketplace/>

Press release, NASA, September 25, 2013: “Mobile laboratories measure air quality in Houston”, http://www.nasa.gov/mission_pages/discover-aq/news/mobile-laboratories-measure-air-quality-in-houston/#.UwubMP0vuUM

Feature, NSF GEO Innovation Call Newsletter, <http://www.nsf.gov/geo/innovation/2013-geo-innovation.pdf>

Feature, Princeton homepage, “Researchers' entrepreneurial skills shine at Innovation Forum”, posted March 19, 2013, <http://www.princeton.edu/main/news/archive/S36/36/42153/index.xml?section=topstories>

Feature, Fondriest Environmental Monitor, “Mobile air sensor lab takes a California road trip”, February 27, 2013, <http://www.fondriest.com/news/mobile-air-sensor-lab-takes-a-california-road-trip.htm>

Feature, Princeton SEAS homepage, “Launchpad helps blast new teams into business”, <https://www-dept-edit.princeton.edu/engineering/news/archive/?id=9556>

Feature, Princeton homepage, “Fund bridges gap between lab and marketplace”, posted January 24, 2013, <http://www.princeton.edu/main/news/archive/S35/89/52G24/index.xml?section=topstories>

Interview, German Public Radio, on methane emissions from fracking, January 4, 2013 <http://www.dradio.de/dlf/sendungen/forschak/1968450/>

Press release highlighting two papers from the Zondlo group: Miller et al. (field ammonia measurements) and Khan et al. (UAV greenhouse gas sensors) at CLEO 2012 in San Jose, California, May 10, 2012

Morristown Green Sustainability series, “Cloudy World of Climate Change”, April 29, 2010, invited community lecture (story in online version of Newark Star-Ledger, nj.com on April 30, 2010)

Research highlighted on Princeton University homepage, July 14, 2010

Research featured in Princeton Alumni Weekly, April 2010, “Nothing Succeeds like Failure”, April 7, 2010

Research in highlighted in story in EQUAD News, “Round-the-world mission puts greenhouse gases in laser focus”, Winter 2010

NSF 09-01 press release on HIPPO Global field campaign (Jan. 7, 2009) and media advisory (Jan. 27, 2009) that mentioned the PI as part of the field experiment.

MIRTHE REU Summer Outreach story on Princeton University home page, July 14-17, 2008

Selected Presentations

Alternative Fuels and Chemicals Coalition annual meeting, "NitroNet: new tool for N₂O emissions", National Harbor, Maryland, November 13, 2023 (panelist).

DOE ARPA-E Agricultural Portfolio Meeting, "NitroNet: a new tool for spatiotemporal patterns of N₂O emissions", St. Louis, Missouri, November 3, 2023 (INVITED).

High Meadows Environmental Institute, Faculty Seminar, Princeton University, "Mysteries and challenges of agricultural emissions to the atmosphere", October 3, 2023 (INVITED).

Photonics and Electromagnetics Research Symposium (PIERS), "Agricultural Greenhouse Gas Emissions through Open-path Laser Spectroscopy", Advanced Photonic Technologies for Spectroscopic Applications, Prague, Czech Republic, July 5, 2023 (INVITED).

Canadian Society of Soil Science, Greenhouse Gas Workshop, "New advances in N₂O sensing for agricultural emissions", Truro, Nova Scotia, Canada, June 25, 2023 (INVITED).

Carbon Mitigation Initiative Annual Meeting, "Atmospheric ammonia from field studies to better understand air quality, climate, and the nitrogen cycle", Princeton, New Jersey, May 4, 2023 (INVITED).

California Air Resources Board, Greenhouse Gas, Short-Lived Climate Pollutants Policy Section, "Nitrous oxide and ammonia emissions from dairies", Sacramento, California, November 17, 2022 (INVITED).

Optica Optical Sensors and Sensing 2022, "Atmospheric ammonia from field studies to better understand air quality, climate, and the nitrogen cycle", AQ4H.4, Vancouver, BC, Canada, July 13, 2022 (INVITED).

East Bay Municipal Utility District, "Carbon and nitrogen emissions from wastewater treatment plants", Oakland, California, May 11, 2022 (INVITED).

DOE Agriculture Portfolio Meeting, "NitroNet: A system to quantify spatiotemporal patterns of nitrous oxide fluxes from croplands", San Francisco, California, April 23, 2022 (INVITED).

Navajo Nation, "Air quality and health exposure to oil and gas emissions", Bluff, Utah, March 23, 2022 (INVITED).

DOE Advanced Research Projects - Energy, SMARTFARM 2021, "NitroNet: Smart System to Quantify Nitrous Oxide Emissions", February 2, 2021 (INVITED).

American Physics Society, Mid-Atlantic Section Fall Meeting 2020, "Mid-infrared sensing of atmospheric ammonia: linking farms, cities, and ecosystems", December 5, 2020 (INVITED).

Agriculture and Air Quality in India: Science and Solutions, M.S. Chadha Center for Global India, Princeton University, "Emissions of aerosol precursors and greenhouse gases in India: toward top-down and bottom up constraints", October 19, 2020 (INVITED).

NASA Health and Air Quality Applied Sciences Team Final Showcase, "What, When, Where?: How HAQAST Has Helped Quantify Uncertain Emissions Sources", July 22, 2020 (INVITED).

NASA Health and Air Quality Applied Sciences Team Final Showcase, "Ammonia Measurements from Satellites: Constraints on Emissions, Implications for Ground-Based Networks, and Future Opportunities", July 21, 2020 (INVITED).

Drexel University, Dept. of Chemistry, "Constraining atmospheric ammonia through bottom-up and top-down observations", April 17, 2020 (INVITED).

Conference on Lasers and Opto-Electronics, "Sensors for climate change and air quality: the path from the lab to the stratosphere", May 12, 2020 (INVITED).

M.S. Chadha Center for Global India, "Air Quality, Climate, and Health", March 27, 2020 (INVITED, panelist).

National Atmospheric Deposition Program Total Deposition Science Committee workshop, Boulder, Colorado, November 2, 2019 (INVITED).

6th International Workshop on Infrared Technologies, "Fiber-coupled QCL for open-path sensing of ammonia", Princeton, New Jersey, Oct. 29, 2019 (INVITED).

Dept. of Geosciences, Princeton University, "New insights into ammonia from satellites: implications for emissions and future surface networks", October 10, 2019 (INVITED).

USDA Forest Service (WI/MN/MI region) and Minnesota Pollution Control Agency "New insights into ammonia from satellites: implications for emissions and future surface networks", webinar, August 8, 2019 (INVITED).

Gordon Research Conference on Atmospheric Chemistry, “New instruments for the nitrogen cycle: new tools for observing nitrogen and ideas emerging from their use”, discussion leader, Newry, Maine, July 31, 2019 (INVITED).

Optical Society of America / Optical Sensors and Sensing Congress, “Open-Path Ammonia Measurements on the NASA DC-8 Aircraft Using a Fiber-coupled, Quantum Cascade Laser”, San Jose, California, June 27, 2019 (INVITED).

Air and Waste Management Association Annual Conference, “New insights into NH₃ from satellites: implications for emissions and future surface networks” for session on “Answering Critical Challenges Facing our Planet in Air Quality by Using NASA’s Current and Future Earth Observing Satellites”, Québec City, Québec, Canada, June 26, 2019 (INVITED).

Mid-Atlantic Regional Air Management Association / Northeastern states emissions inventory work group, “Constraining ammonia emission inventories from space-based observations”, webinar, April 1, 2019 (INVITED).

NASA Health and Air Quality Applied Sciences Team Meeting-5, “Bridging scales with satellite and in-situ data: from agricultural ammonia to volcanic emissions”, Phoenix, Arizona, January 4, 2019 (INVITED).

NOAA Earth Systems Laboratory FIREX-AQ science team meeting, “Ammonia measurements during FIREX-AQ”, Boulder, Colorado, October 24, 2018 (INVITED).

California Air Resources Board, “Ammonia fluxes in dairies and natural systems: insights from eddy covariance measurements”, Sacramento, California, October 19, 2018 (INVITED).

Western Regional Air Partnership Regional Technical Operations Working Group, “Ammonia in Colorado: insights from in-situ, mobile, and satellite data”, webinar, September, 20, 2018 (INVITED).

NASA Health and Air Quality Applied Sciences Team Meeting-4, “From Agricultural Ammonia to Volcanic Sulfur – Satellite Measurements to Improve Emissions Inventories”, Madison, Wisconsin, July 17, 2018 (INVITED).

Northeastern Legislative Climate and Energy Summit, Council of State Governments “Measuring greenhouse gas emissions and air quality in urban communities”, Princeton, New Jersey, May 11, 2018 (INVITED).

NASA Health and Air Quality Applied Sciences Team Meeting-3, “Satellite measurements of spatiotemporal variability and comparison to emission inventories”, Palisades, New York, November 29, 2017 (INVITED).

Federation of Analytical Chemistry and Spectroscopy Societies SCI-X 2017, “Open-path, quantum cascade laser spectroscopy for atmospheric measurements in power-constrained platforms”, Reno, Nevada, October 9, 2017.

SPIE Defense and Commercial Sensing industry panel, “Miniaturized and Mobile Spectroscopy and Optical Sensor Applications”, Anaheim, California, April 12, 2017 (INVITED).

NASA Health and Air Quality Applied Sciences Team Meeting-2, “Air quality at the urban/agriculture interfaces”, Seattle, Washington, February 27, 2017 (INVITED).

Colorado Department of Public Health and the Environment, “Understanding ammonia emissions in northeast Colorado through satellite and in-situ measurements”, Denver, Colorado, September 23, 2016 (INVITED).

Symposium on Regional Air Quality, Monitoring, and Urban Sensing in Safety and Security Applications, “Role of drones in air quality monitoring and natural gas leak detection”, New York, New York, Oct. 4, 2016 (INVITED).

European Geophysical Union General Assembly, “Ammonia emissions, transport, and deposition downwind of agricultural areas at local to regional scales”, Vienna, Austria, April 18, 2016.

Infrared Atmospheric Sounding Interferometer Conference, “Validation of IASI NH₃ columns at the single-pixel scale from airborne- and ground-based measurements”, Antibes Juan-Les-Pins, France, April 14, 2016.

Physiklatisch-Technische Bundesanstalt (PTB), “Mid-infrared sensor development for quantifying fugitive emissions from gas/oil extraction”, Braunschweig, Germany, Dec. 10, 2015 (INVITED).

European Geophysical Union General Assembly, “Laser-based sensors on UAVs for quantifying local emissions of greenhouse gases”, Vienna, Austria, April 16, 2015 (INVITED).

MIRTHE Summer Workshop, “Why does commercialization of mid-infrared, environmental sensors lag behind other markets”, August 8, 2014 (INVITED).

16th Global Emissions Initiative Conference, “Ammonia emissions from agricultural and vehicular sources”, Boulder, Colorado, June 10, 2014.

Department of Geosciences, Princeton University, “Ammonia, automobiles, and agriculture: new insights into precursor emissions of fine particulate matter”, Princeton, New Jersey, March 4, 2014 (INVITED).

Optical Society of America Workshop on Precision Monitoring of Human Metabolism, “Ambient pressure detection to overcome breath ammonia sampling challenges”, Princeton, New Jersey, February 17, 2014 (INVITED).

Environmental Defense Fund Barnett Coordinated Campaign Science Team meeting, “Near-field measurements of CH₄ from the Ponder compression station area”, Denver, Colorado, January 23, 2014 (INVITED).

Laser Focus World Webinar, “Fracking, climate change, and lasers: new tools to reduce fugitive methane emissions”, October 30, 2013 (INVITED).

MIRTHE Workshop on Air Monitoring in Energy Extraction, also panelist for discussion, “Shale gas methane emissions from UAV- and vehicle-based systems”, August 9, 2013 (INVITED).

New York City Regional Innovative Node and I-Corps Kickoff Event, panelist, July 24, 2013.

College of Environmental Science and Engineering, Peking University, “From the surface to the stratosphere: microscale processes of cloud formation, air pollutants, and greenhouse gases”, Beijing, China, July 2, 2013 (INVITED).

Environmental Defense Fund Barnett Shale Coordinated Campaign, “Methane emissions from near-field sources using a model electric aircraft”, Richardson, Texas, June 24, 2013 (INVITED).

William E. Heraeus Seminar on "Water Vapor and Ice in the Atmosphere", “Measuring water vapor in the UT/LS: Challenges, advances, and outstanding issues”, Bad Honnef, Germany, June 11, 2013 (INVITED).

Environmental Defense Fund Methane Monitoring Workshop, “Primer on laser-based CH₄ sensors”, Houston, Texas, June 6, 2013 (INVITED).

HIAPER HALO Workshop, “Water vapor variability and cirrus cloud formation from NSF/NCAR G-V field campaigns”, Mainz, Germany, April 16, 2013 (INVITED).

California Air Resources Board, “Ammonia emissions and variability through mobile mapping with a suite of chemical tracers”, Sacramento, California, January 31, 2013 (INVITED).

Department of Geophysical Sciences, University of Chicago, “Water vapor variability and cirrus cloud formation from global field experiments”, January 11, 2013 (INVITED)

American Geophysical Union Fall Meeting, “Fugitive methane emissions from gas/oil activities near Dish, Texas”, San Francisco, California, Dec. 5, 2012.

EUMETRISPEC Stakeholder Workshop, “Atmospheric trace gas sensing: Community needs with respect to spectral line data”, Wolfenbüttel, Germany, November 15, 2012 (INVITED).

International Breath Analysis Meeting, “Overcoming the Sampling Challenges of Ammonia in Exhaled Breath”, Sonoma, California, October 29, 2012 (INVITED).

TORERO Science Team Mtg. “Water vapor, ice supersaturation, and stratospheric mixing in TORERO”, July 24, 2012 (INVITED).

Department of Chemistry, University of British Columbia, “Ice supersaturated regions from global aircraft observations: new insights into cirrus cloud formation”, July 19, 2012 (INVITED).

CMOS Conference on Emerging Technologies, “Laser-Based Sensors From the Surface to the Stratosphere: New Insights Into Air Pollution and Global Climate Change”, Vancouver, Canada, July 18, 2012 (INVITED).

EPA Apps and Sensors for Air Pollution (ASAP) Workshop, “Compact and lightweight sensors for air quality and greenhouse gas measurements”, Research Triangle Park, North Carolina, March 26, 2012 (INVITED).

DOE Advanced Research Projects Energy, Workshop on “Ubiquitous methane leak detection through novel sensors and sensing platforms”, “UAV methane measurements using VCSELs, fast sampling QCLs”, Washington, DC, March 29, 2012 (INVITED).

School of Engineering and Applied Sciences Colloquium in Climate Science (SCiCS), Columbia University, “Ice supersaturated regions from global aircraft observations: new insights into cirrus cloud formation”, Feb. 23, 2012 (INVITED).

2012 Earth and Planetary Sciences Lecture Series, Massachusetts Institute of Technology, “Atmospheric field studies: Atmospheric chemistry field experiments from UAVs to stratospheric aircraft”, Cambridge, Massachusetts, January 9, 2012 (INVITED).

The National Academies Keck Futures Initiative, Ecosystem Services: Charting a Path to Sustainability, “Quantifying ammonia and nitrous oxide emissions from agricultural activities”, Irvine, California, November 11 (INVITED).

TORERO Science Team Meeting, “Cloud formation in the tropics: insights from HIPPO and PREDICT”, Boulder, Colorado, November 1, 2011 (INVITED).

Field Laser Applications in Industry and Research (FLAIR), “Open-path atmospheric detection: new insights into cloud and aerosol formation”, Murnau, Germany, September 16, 2011 (INVITED).

University of Alaska-Fairbanks, “Low power trace gas sensors for clouds, climate, and air quality”, Fairbanks, Alaska, August 23, 2011 (INVITED).

MIRTHE Summer Workshop, “Sensing the Atmosphere”, Princeton, New Jersey, August 1, 2011 (INVITED).

Gordon Research Conference on Atmospheric Chemistry, “Fine-scale ice supersaturated regions observed from airborne campaigns”, Mount Snow, Vermont, July 23, 2011 (poster).

HIPPO Science Team Meeting, “Supersaturations during HIPPO”, Boulder, Colorado, March 18, 2011 (INVITED).

NASA Sounder Science Team Meeting, “Ice supersaturations with AIRS and NSF G-V VCSEL hygrometer”, Greenbelt, Maryland, Nov. 3, 2010 (INVITED).

USDA Air Quality Project Directors Meeting, “Nitrous oxide emissions with a 4.54 μm quantum cascade laser”, Amarillo, Texas, August 23, 2010 (INVITED).

Department of Atmospheric Sciences, Texas A&M University, “Characteristics of ice supersaturation in the upper troposphere”, College Station, Texas, Aug. 3, 2010 (INVITED).

HIPPO Science Team Meeting, “Ice supersaturations during HIPPO Global”, May 25, 2010 (INVITED).

NOAA GFDL, “Climatologies of ice supersaturated regions”, Princeton, New Jersey, December 2, 2009 (INVITED).

NASA Sounder Science Team Meeting, “Comparison of water vapor from AIRS and VCSEL hygrometer during START08/HIPPO Global”, Greenbelt, Maryland, Oct. 14, 2009.

CEE Brown Bag Seminar, “Laser spectroscopy for understanding air quality and global climate change”, Princeton, New Jersey, Sept. 25, 2009.

Dept. of Environmental Sciences, Rutgers University, “When clouds should be present but are not: the puzzle of ice supersaturation”, New Brunswick, New Jersey, Sept. 18, 2009 (INVITED).

Field Applications in Laser Research (FLAIR), “Ice supersaturations during START08 and HIPPO Global from the NSF VCSEL hygrometer”, Grainau, Germany, September 10, 2009.

Gordon Research Conference on Radiation and Climate, “Ice supersaturations and global transport of water vapor from recent field campaigns”, New London, New Hampshire, July 8, 2009 (poster).

START08 Science Team Meeting, “Ice supersaturations during START08”, Boulder, Colorado. March 5, 2009.

School of Engineering and Applied Sciences and NOAA GFDL workshop, “New measurement technologies for understanding cloud microphysics and aerosol chemistry”, Princeton, New Jersey October 29, 2008 (INVITED).

MIRTHE summer workshop (tutorial), “Atmospheric laser-based spectroscopy”, Baltimore, Maryland, August 4, 2008 (INVITED).

Supélec-Princeton workshop on Wireless Sensors and the Environment, “Low power sensors in atmospheric research and the need for low power communication”, June 23, 2008.

Aqua-VIT Data Workshop, Zurich, “NSF G-V VCSEL hygrometer during AquaVIT: description, performance, and calibrations”, Switzerland, May 29, 2008.

IBM-Princeton Energy and the Environment Day, “Global field experiments using laser-based sensors onboard the NSF G-V research aircraft”, Princeton, New Jersey, May 23, 2008.

NOAA Geophysical Fluid Dynamics Laboratory, Aerosol Pause Café, “Ice supersaturations: how high can they be?”, Princeton, New Jersey, April 28, 2008.

PRISM/PCCM/MIRTHE/CNSA University and Industry Annual Research Symposium, “Laser spectroscopy from the laboratory to the stratosphere: new instrumentation for understanding global climate change”, March 17, 2008

The Boeing Company, "Assessment of aircraft-based water vapor instruments", Everett, Washington, March 5, 2008 (INVITED).

MIRTHE Industrial Advisory Board, "Toward a new understanding of cirrus cloud and aerosol chemistry with laser-based sensors", January 28, 2008.