

Mark Andrew Zondlo

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Education:

Ph. D., Chemistry (physical), 1999

University of Colorado, Boulder
Program in Atmospheric and Oceanic Sciences
Atmospheric Chemistry Program
Boulder, Colorado

B.A., Chemistry, 1994

Rice University
Houston, Texas

Research positions held:

2014- **Associate Professor**, Dept. of Civil and Environmental Engineering, Princeton Univ.

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

Research activities focus on the sources, sinks, and distributions of trace gases important for atmospheric chemistry and composition. My group develops and deploys new optical-based sensors to make innovative measurements in air quality and climate and to bridge spatiotemporal scales from in-situ to remote sensing measurements.

2008-2014 **Assistant Professor**, Dept. of Civil and Environmental Engineering, Princeton Univ.

2002-2007 **Senior Research Scientist**, Southwest Sciences, Inc., Santa Fe, New Mexico. Examined the feasibility of laser-based detection of atmospheric trace gases using vertical cavity surface emitting lasers, quantum cascade lasers, and interband cascade lasers. Principal Investigator for the development of the VCSEL hygrometer on the NSF Gulfstream-V research aircraft.

1999-2002 **Advanced Study Program Postdoctoral Fellow**, National Center for Atmospheric Research, Boulder, Colorado. An aircraft-based, tropospheric nitric acid instrument was developed and deployed during the NASA TRACE-P field experiment in spring 2001. The partitioning of nitric acid to total nitrogen including aerosol was investigated.

1994-1999 **Graduate research assistant**, University of Colorado, Boulder (advisor: Professor Margaret A. Tolbert). Doctoral studies involved laboratory measurements of heterogeneous reaction rates, mechanisms, and condensed phase products of nitrogen-species and acids on thin films representative of polar stratospheric clouds and cirrus clouds.

1992-1993 Summer undergraduate research assistant, University of California, Irvine (advisor: Professor F. Sherwood Rowland). Estimated the biomass burning source strength of methyl bromide from air samples taken from field campaigns.

Funding at Princeton (lead PI unless explicitly noted):

PEI Grand Challenge Water, "Assessing wastewater emissions of greenhouse gases and air pollutants and their impacts", May 1, 2019-April 30, 2020 (\$75,000).

ACEE/EMRE, "Understanding Atmospheric Ammonia and its Impacts on Air Quality and Climate Using Satellites and Models", June 1, 2018-May 31, 2020 (\$316,281).

NASA NNH17ZDA001N, "Tropospheric ammonia measurements onboard the DC8 in FIRE-CHEM", Mar. 1, 2018-Feb. 28, 2021 (\$750,000).

SEAS Innovation Funds (Princeton Univ.), "Nitrogen fluxes at the New Jersey Meadowlands", January 1, 2018-February 28, 2019 (\$100,000).

NASA 80NSSC17K0377, "Understanding tropospheric ammonia through remote sensing measurements: student Xuehui Guo", Sept. 1, 2017-Aug. 31, 2020 (\$135,000).

DOD Navy N68335-17-C-0359, "US Navy SBIR Phase I: UAV-Compatible Secondary Payload for Meteorological Profiling", Oct. 11, 2017 -Nov. 27, 2017 (\$12,000).

DOE DE-SC0015104, "STTR Phase II: Compact Laser Hygrometer for In-Situ Measurements of Water Vapor from Small Unmanned Aerial Vehicles", April 1, 2017-March 31, 2019 (\$449,993).

DOE DE-SC0011288, "Fast nitrous oxide sensor for continuous flux measurements", April 1, 2017-March 31, 2019 (\$400,000).

DOE DE-FE0029059, "Remote methane sensor for emissions from pipelines and compressor stations using Chirped-laser Dispersion Spectroscopy", October 1, 2016-March 31, 2020 (\$1,141,204).

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).

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 DE-SC00021004, "Compact laser hygrometer for in-situ measurements of water vapor from small unmanned aerial vehicles", February 19, 2016-December 1, 2016 (\$82,000).

DOE ARPA-E SC67232-1867 (co-I), "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 (co-I share of \$432,876).

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 (co-I share \$53,364).

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).

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).

DOE Biological and Environmental Research, DE-SC0011288, “Portable nitrous oxide sensor for understanding agricultural and soil emissions”, February 17, 2014-November 16, 2016 (\$828,334).

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 EEC-0540832, “Urban emissions of greenhouse gases and air pollutants”, May 1, 2013-April 30, 2014 (\$87,011).

NSF EEC-0540832, “Fugitive Methane Sensing from Petrochemical Activities”, May 1, 2013-April 30, 2014 (\$86,927).

Utah State University, “Demonstration of MIRTHE mobile sensing”, May 1, 2013-August 31, 2013 (\$22,523).

Princeton Council for International Teaching and Research (co-I; lead Prof. Denise Mauzerall, CEE/WWS), “Collaboration between Princeton University and Beijing University for air quality measurements” (\$99,100 co-I share).

Office of Technology Licensing, Princeton University, Intellectual Property Accelerator Fund, “Portable nitrous oxide sensor for understanding greenhouse gas emissions”, Dec. 17, 2012-Dec. 31, 2013 (\$80,625).

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 EEC-0540832, “Breath analyses of ammonia for disease detection”, May 1, 2012-April 30, 2013 (\$15,932).

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 (\$151,198 awarded but returned to NSF due to cancellation of NSF involvement in the NASA SEAC4RS field study).

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).

Thomas and Lynn Ou Foundation, “New advances in urban air quality monitoring: A China-Princeton collaboration”, April 1, 2011-March 31, 2014 (\$166,666).

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).

NSF EEC-0540832, “Nitrous oxide measurements using a quantum cascade laser near 4.54 microns”, May 1, 2010-Apr. 30, 2013 (\$247,895).

Office of the Dean of Research, Princeton University, “Development of a high-performance trace gas sensor for unoccupied aerial vehicles”, Lead PI, April 22, 2010-April 21, 2011 (\$100,000).

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).

NSF EEC-0540832, “Ultrasensitive ammonia sensor for urban air quality”, May 1, 2009-Apr. 30, 2013 (\$359,718).

NSF EEC-0540832 (co-I, lead PI Elie Bou-Zeid), “Integrating MIRTHER sensors into wireless meteorological networks”, May 1, 2009-Apr. 30, 2010 (\$101,889, co-PI amount: 6 mos. postdoc support + \$10,000 materials/supplies).

High Meadows Sustainability Fund (co-PI, lead PI Elie Bou-Zeid), Princeton University, “A Sensor Network over Princeton”, Apr. 1, 2009-Mar. 31, 2011 (\$200,400, co-PI amount: 6 mos. grad. student support + \$5000 materials/supplies).

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).

Teaching Experience / Curriculum Development:

CEE/CHM/GEO 311, “Global Air Pollution” (Spring 2009, Fall 2010, Spring 2012-2015, Spring 2017-2019), Princeton University.

ELE/CEE/MAE/MSE 455, “Mid-Infrared Technologies for Health and the Environment” (Spring 2011, Fall 2012, Fall 2013), Princeton University.

CEE/AOS 593, “Aerosol Observations and Modeling” (Fall 2009 (CEE 599B), Fall 2011, Fall 2014, Fall 2018), Princeton University.

CEE 501, “Environmental Engineering Fundamentals I: Atmospheric and Surface Processes” (Fall 2008-2011), Princeton University. Designed and developed the course in collaboration with other faculty members, taught 12 of 26 classes in 2008; 13 of 24 classes in 2009; 12 of 24 classes in 2010; 11 of 24 classes in 2011.

CEE 445/578, “Air Quality and Aerosol Processes” (Spring 2009), Princeton University.

Santa Fe Community College, HB 365, “Understanding Global Climate Change”, Continuing Education. Developed and taught a new course offering for Continuing Education. Course offering started in Spring 2006, Spring 2007, and Fall 2007.

University of Colorado, Boulder, teaching assistant, Physical Chemistry laboratory and lecture, 1994-1995.

PI Awards/Honors:

- 2015-2016 Visiting Scientist, EUMETSAT Satellite Application Facility on Atmospheric Composition Monitoring, Brussels, Belgium
- 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

Student Advising:

current:

- Da Pan (7th year Ph.D. candidate, Dept. of Civil and Environmental Engineering)
- Xuehui Guo (5th year Ph.D. candidate, Dept. of Civil and Environmental Engineering)
- Rui Wang (4th year Ph.D. candidate, Dept. of Civil and Environmental Engineering)
- Nathan Li (3rd year Ph.D. candidate, Dept. of Civil and Environmental Engineering)
- Daniel Moore (1st year Ph.D. candidate, Dept. of Civil and Environmental Engineering)

past:

Levi M. Golston, Ph.D., Civil and Environmental Engineering, 2019 (now NASA Postdoctoral Fellow, NASA Ames Research Center)
Kang Sun, Ph.D., Civil and Environmental Engineering, 2015 (now assistant professor, University at Buffalo)
David Miller, Ph.D., Civil and Environmental Engineering, 2014 (now Senior Scientist, Environmental Defense Fund)
Minghui Diao, Ph.D., Civil and Environmental Engineering, 2013 (now assistant 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:

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

Senior Thesis Advisor:

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:

- 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 research students advised:

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

Research advisor for high school teacher (summers + fall 2017 sabbatical):

2013-2019: Lars Wendt, Hunterdon Central Regional High School, Flemington, NJ

Departmental Service:

Director of Graduate Studies, Dept. of Civil and Environmental Engineering, 2019-present
CEE Climate and Water Search Committee, 2018-2019
CEE/SEAS Building Subcommittee, 2018-2019
Undergraduate advisor, Environmental-track majors, Dept. of Civil and Environmental Engineering, 2013-2014
Coordinator, seminar series, Dept. of Civil and Environmental Engineering, 2008-2010

University Service:

Associate Director of External Partnerships, Andlinger Center for Energy and the Environment, 2016-2019
Princeton E-affiliates Partnership (director), 2016-2019
ACEE Executive Committee, 2016-2019
SEAS Robotics and Cyber Physical Systems Search Committee, 2017-2019
Environmental Studies and SEAS Building Planning Committee, 2017-2019
SEAS BSE Freshman Advisor, 2013-2014, 2017-2018 and 2019-2020
Chair, SEAS Self-Study: Relationships with External Entities Committee, 2014-2015
Member, Committee on Library and Computing, 2013

Outside Professional Activities:

NASA Health and Air Quality Applied Sciences Team, 2016-2020
Chair, Conference on Lasers and Optics A&T 4: Photonic Instrumentation for Energy and Environment, 2014-2019
European Organisation for the Exploitation of Meteorological Satellites, Satellite Application Facility on Atmospheric Composition Monitoring, panelist/reviewer, 2018
Scientific Steering Committee, NSF DOWNSTREAM field experiment in 2016 on NSF Gulfstream-V research aircraft ("Dynamics and Observations of the Waveguide: North-South Transport and Rossby wave Excitation over Atlantic Midlatitudes")
EUMETRISPEC, Member, European Spectral Data for Metrology Analyses, 2012-2017
Program Committee, Energy and Environment, CLEO: Applications and Technology, 2011-2013
Coordinator, Dept. of Civil and Environmental Engineering, 2008-2010

NSF Facilities Users Workshop, Session Chair and Discussion leader, Upper Tropospheric and Lower Stratospheric Science, Sept. 24-26, 2007
Environmental Technology Advisory Committee, Santa Fe Community College, 2007.
NSF Facilities Users Workshop, Session Chair and Discussion leader, Upper Tropospheric and Lower Stratospheric Science, Sept. 24-26, 2007
Expert Working Group on Turbulence and Thermodynamics, European Fleet for Airborne Research, December 2006 – present
Electricity and Chemistry Working Group, NSF Storm Penetrating Aircraft workshop, October 23-25, 2006, Rapid City, South Dakota
Co-chair, “Dynamics and Chemistry of the Upper Troposphere and Lower Stratosphere, A31G”, AGU Fall Meeting, December 10, 2005
Convener, Organizer, and Chair, Special Session, “Cloud Chemistry and Processing”, Fall AGU Meeting, December 13-17, 2004
Chair, NCAR Advanced Study Program 2000-2001 Seminar Series
Reviewer for *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*, *J. Breath Research* in the past two years; also reviewer for NASA Science Mission Directorate, DOE Biological and Environmental Research, NOAA Atmospheric Composition and Climate program, and NSF Geosciences Directorate proposals in the past two years

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)

Principal Investigator for Field Experiments:

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)
AquaVIT International Water Vapour Intercomparison, Karlsruhe, Germany, PI for VCSEL hygrometer (2008)

Professional Organizations:

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

Public Relations / Media:

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, 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>

Article, *Daily Princetonian*, “University researchers receive grant from Department of Energy”, Oct. 10, 2016.

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/S36/36/42I53/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

Peer-reviewed Publications:

62. Caulton, D.R., J.M. Lu, H.M. Lane, B. Buchholz, J.P. Fitts, L.M. Golston, X. Guo, Q. Li, J. McSpiritt, D. Pan, L. Wendt, E. Bou-Zeid, and **M.A. Zondlo** (2019), “Importance of superemitter natural gas well pads in the Marcellus Shale”, *Envi. Sci. Technol.*, *53*, 4747-4754, doi:10.1021/acs.est.8b06965.
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Guo, Y., Y. Chen, M. Zhou, J. Yang, D. Pan, L. Wu, Z. Cui, W. Zhang, F. Zhang, L. Ma, Y. Sun, **M. Zondlo**, T.D. Searchinger, L. Zhang, D.L. Mauzerall, "Improving air quality, nitrogen use efficiency and food security in China via cost-effective agricultural nitrogen management", submitted to *Nature Food*, NATFOOD-19110416.

Pan, D., L. Tao, K. Sun, L.M. Golston, D.J. Miller, T. Zhu, Y.Y. Yang, D.L. Mauzerall, and **M.A. Zondlo**, "Methane Emissions from Natural Gas Vehicles in China", in revision, *Nature Communications*, NCOMMS-19-507228.

Golston, L.M., D. Pan, K. Sun, L. Tao, **M.A. Zondlo**, S.J. Eilerman, J. Peischl, J.A. Neuman, and C. Floerchinger, "Variability of ammonia and methane emissions from animal feeding operations in northeastern Colorado", submitted to *Envi. Sci. Technol.*, es-2020-00301u.

Manuscripts in preparation:

Wang, R., X. Guo, D. Pan, J. Kelly, J. Bash, K. Sun, F. Paulot, L. Clarisse, M. van Damme, S. Whitburn, P.-F. Coheur, and **M.A. Zondlo**, "Spatiotemporal variability of NH₃ across the contiguous U.S.", to be submitted to *Geophys. Res. Lett.*

Guo, X., **M.A. Zondlo**, L. Clarisse, R. Wang, M. van Damme, S. Whitburn, P.-F. Coheur, C. Clerbaux, B. Franco, D. Pan, L.M. Golston, L. Wendt, K. Sun, L. Tao, D.J. Miller, A. Wisthaler, J. Murphy, S. Brown, C. Floerchinger, S.J. Eilerman, J. Peischl, J.A. Neuman, J. Nowak, A. Thompson, R. Cohen, J. Berek, R. Volkamer, Validation of IASI satellite ammonia observations at the pixel scale using in-situ vertical profiles, to be submitted to *J. Geophys.-Atmos.*

Caulton, D.R., J.M. Lu, H.M. Lane, B. Buchholz, J. Fitts, L. Golston, X. Guo, Q. Li, J. McSperritt, D. Pan, L. Wendt, E. Bou-Zeid, and **M.A. Zondlo**, “On the temporal variation and predictability of natural gas well-pad methane emissions”, to be submitted to *Proc. Natl. Acad. Sci.*

Pan, D., K.B. Benedict, L.M. Golston, L. Tao, K. Sun, X. Guo, R. Wang, J. Ham, A.J. Prenni, B.A. Schichtel, J.L. Collett Jr., and **M.A. Zondlo**, “Impacts of ammonia emission hotspots on reactive nitrogen deposition: a case study of Rocky Mountain National Park”, to be submitted to *Global Change Biology*.

Pan, D., L. Tao, I. Gelfand, M. Abraha, K. Sun, X. Guo, J. Chen, G.P. Roberston, and **M.A. Zondlo**, “Nitrous oxide fluxes over a corn field from an open-path laser-based eddy covariance system and static chambers”, to be submitted to *Ag. Forest. Meteorol.*

Intellectual Property:

Patent

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 application

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”, Provisional patent application 62/809,249 filed February 22, 2019.

Invention disclosures

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.

Sun, K., L. Tao, D.J. Miller, M.A. Khan, and **M.A. Zondlo**, Invention # 13-2845-1, “Multi-Harmonic Inline Reference Cell for Optical Trace Gas Sensing”, Office of Technology Licensing and Intellectual Property, Princeton University, August 6, 2012.

Significant Presentations:

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

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.

Physikalisches-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.