
Anna P. M. Michel

Assistant Scientist
Department of Applied Ocean Physics and Engineering
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Education

- 1998 S.B. Chemical Engineering, S.B. Biology, Minor French Language, Massachusetts Institute of Technology
2002 M.S. Ocean Engineering, Massachusetts Institute of Technology
2007 Ph.D. Mechanical and Oceanographic Engineering, Massachusetts Institute of Technology /Woods Hole Oceanographic Institution Joint Program

Professional Experience

- 2012 - ... Assistant Scientist, Department of Applied Ocean Physics and Engineering, Woods Hole Oceanographic Institution
2012 - 2014 Visiting Research Collaborator, Center for Mid-Infrared Technologies for Health and the Environment, Princeton Institute for the Science and Technology of Materials, Princeton University
2011 - 2012 Guest Investigator, Department of Applied Ocean Physics and Engineering, Woods Hole Oceanographic Institution
2010 – 2012 Associate Research Scholar, Center for Mid-Infrared Technologies for Health and the Environment, Princeton Institute for the Science and Technology of Materials, Princeton University
2007 – 2010 Post-Doctoral Research and Teaching Fellow, Center for Mid-Infrared Technologies for Health and the Environment, Princeton Institute for the Science and Technology of Materials, Princeton University
2007 – 2008 Guest Investigator, Department of Applied Ocean Physics and Engineering, Woods Hole Oceanographic Institution
2007 Post-Doctoral Associate, Department of Applied Ocean Physics and Engineering, Woods Hole Oceanographic Institution
2003, 2004 Visiting Student, Department of Chemistry and Biochemistry, University of South Carolina

Honors and Awards

- 2011 Speaker Award, MIRTHE Summer Workshop
2009 Outstanding Research Contribution Award, MIRTHE NSF-Engineering Research Center
2007-2010 MIRTHE Postdoctoral Research and Teaching Fellowship, Princeton University
2006 LIBS Conference: 1st Place - Student Poster Competition
2005 IEEE-OES/MTS Oceans Conference: 1st Place - Student Poster Competition
2005 Ocean Ventures Student Research Grant, Woods Hole Oceanographic Institution
2004 Martin A. Abkowitz International Fellowship
2002 IEEE-OES/MTS Oceans Conference: Student Poster Award
2002 Marine Technology Society: Student Scholarship
2002 Society of Naval Architects and Marine Engineers: Student Paper Prize - 1st Place
2001 New England Chapter of the Marine Technology Society Scholarship
2001 IEEE-OES/MTS Oceans Conference: Student Poster Award
2001-2004 National Defense Science and Engineering Graduate Fellowship
2001 Link Foundation Ocean Engineering and Instrumentation Fellowship
2001 MIT Presidential Fellowship

Professional Affiliations

American Geophysical Union, Marine Technology Society

Professional Activities and Committees

- 2014 - ... Conference on Lasers and Electro-Optics: Committee on Laser & Photonics Applications for Energy & Environment
- 2007-2014 Reviewer for: WHOI Internal Award (2014), National Science Foundation (2013, 2014), Analyst (2014), ARPA-E (2014), Journal of Analytical Atomic Spectrometry (2013), Spectrochimica Acta Part B: Atomic Spectroscopy (2013), Energy & Fuels (2013), Optics Express (2012), Applied Spectroscopy (2007, 2013), Optics Letters (2010), Analytical Letters (2010), Applied Surface Science (2010), Talanta (2010), Optical Engineering (2010), Analytical Letters (2009, 2010), Chemical Physics Letters (2008, 2009), Department of Energy SBIR/STTR (2007-2010).
- 2008-2010 LIBS International Scientific Committee

WHOI Service and Committees

- 2012-... AOPE Seminar Co-Organizer
- 2004 WHOI Women's Committee
- 2004 WHOI Search Committee for the Vice President for Academic Programs and Dean

Educational Activities: Teaching

- 2014 TREET Online Seminar for Undergraduate Students (Presented 1 seminar and participated in full seminar series)
- 2012, 2013 "Oceanographic Chemical Sensing" Lecture: MIT/WHOI Joint Program Class: 2.688 Principles of Oceanographic Instrument Systems: Sensors & Measurements
- 2007-2010 Princeton University MIRTHE Teaching Fellowship 2007-2010; Co-developer and co-instructor of ELE/CEE/MAE455, "Mid-infrared Technologies for Health and the Environment" a cross-disciplinary engineering course at Princeton University to provide students with a comprehensive and interdisciplinary introduction into mid-infrared sensing, its applications, and its technological foundations. (Fall 2007, Fall 2008, Spring 2010, Spring 2011)
- 2006 "Chemical Sensing in the Ocean," Introduction to Ocean Science and Engineering Class, Department of Mechanical Engineering, Massachusetts Institute of Technology, May 2006.
- 2002 Laboratory Teaching Assistant: Design Principles for Ocean Vehicles, Massachusetts Institute of Technology, Cambridge, MA, Fall 2002.

Educational Activities: Outreach and Mentoring

- 2014 WHSTEP Annual Meeting – Presentation on Ocean Science Saturdays, Woods Hole, MA
- 2014 Developed and led a two day "Ocean Science Saturdays" workshop for middle school girls on ocean science and engineering, Waquoit Bay National Estuarine Research Reserve, MA
- 2013 JASON Live STEM Role Model – Online Seminar for K-12 on STEM Careers
- 2008-2012 Program mentor to broaden participation for underrepresented groups in science: MIRTHE REU and RET Programs and Young Science Achiever's Program. Mentor for undergraduate and high school students and teachers. Lead mentor for students in several field experiences including in Beijing, China and at Toolik Field Station, Alaska.
- 2008-2012 Mentor for undergraduate research students both during the academic year and in the MIRTHE - REU summer program, teachers in the summer RET program, and summer high school students.
- 2008 Mentor for Princeton University undergraduate and graduate engineering students during the MIRTHE in Beijing Project, Beijing, China June – August 2008.
- 2010 Science and Engineering Expo (Princeton, NJ)
- 2009 Invited Speaker at Kipp Summitt School (San Lorenzo, CA) on Engineering
- 2007-2012 Mentor and Organizer for middle and high school visits to MIRTHE center
- 2008-2010 Young Science Achiever's Program Mentor (Princeton, NJ)
- 2008 Young Women's Conference, Princeton Plasma Physics Lab (Princeton, NJ)
- 2008 Science Olympiad Judge, Princeton University, Princeton, NJ
- 2006, 2007 Keynote speaker Introduce a Girl to Engineering Day (Argonne National Laboratory)

- 2005-2007 MIT Women's Initiative, Program director and presenter (Cambridge, MA)
- 2006 2006 National Engineers Week: Introduce a Girl to Engineering Day- ad hoc committee.
- 2006 MIT-WHOI Course on Communicating Ocean Science, (Woods Hole, MA)
Developed and taught oceanography lessons to a 4th grade class.
- 2000-2002 Research supervisor for MIT undergraduate engineering students, (Cambridge, MA)

Educational Activities: Students Supervised at WHOI

- 2014 Emily Chua – Summer Student Fellow, Dalhousie University
- Matthew Gschwend – Guest Student, Harvard University
- Alexandra Padilla – University of Puerto Rico

Oceanographic Cruises and Instrument Field Deployments

- 2014 Sediment Sampling – New Bedford Harbor, R/V Lucky Lady
- 2013 Methane Sensor Intercomparison Field Test, Broadmead Field Site, Princeton University (February 2013)
- 2012 UNOLS Chief Scientist Training Cruise R/V New Horizon 10 Days, (November 2012)
- 2012 MIRTHE SLIP Field Campaign, Broadmead Field Site, Princeton University (October 2012)
- 2012 MIRTHE Field Campaign, Methane sensing across an Arctic Lake, Toolik Lake, Alaska (August 2012)
- 2012 MIRTHE SLIP Field Campaign, Quantum Cascade Laser-based water vapor isotope sensing Beltsville, MD (April 2012)
- 2008 MIRTHE Field Campaign, Beijing, China. Collaborative work between the Institute of Atmospheric Physics - Chinese Academy of Sciences, Princeton University, and Rice University. Quantum cascade laser open-path system for the measurements of ozone.
- 2003 R/V Thomas Thompson, with ROV Jason-2 (4 weeks). Hawaii-2 Ocean Observatory, Pacific Ocean.
- 2003 R/V Thomas Thompson, with ROV Jason-2 (3 weeks), Hawaii-2 Ocean Observatory, Pacific Ocean.

Meetings/Conferences Attended

- 2012 Environmental Sensors 2012, Anglet, France, September 2012
- 2012 Conference on Lasers and Electro-Optics (CLEO), San Jose, CA, May 2012
- 2011 NSF Engineering Research Center Annual Meeting, Bethesda, MD, December 2011
- 2011 Intersubband Transitions in Quantum Wells, Sardinia, Italy, September 2011
- 2011 Conference on Lasers and Electro-Optics (CLEO), Baltimore, MD, May 2011
- 2010 NSF Engineering Research Center Annual Meeting, Bethesda, MD, December 2010
- 2010 Eastern Analytical Symposium, May 2010
- 2010 Conference on Lasers and Electro-Optics (CLEO), San Jose, CA, May 2010
- 2009 NSF Engineering Research Center Annual Meeting, Bethesda, MD, December 2009
- 2009 The New Jersey Entrepreneurial Network Meeting, Princeton, NJ, November 2009
- 2009 BioTech 2009, Philadelphia, PA, November 2009
- 2009 Eastern Analytical Symposium, Somerset, NJ, November 2009
- 2009 Conference on Lasers and Electro-Optics (CLEO), Baltimore, MD June 2009
- 2009 AGU Joint Assembly The Meeting of the Americas, Toronto, Canada May 2009
- 2009 OPTOmism, Santa Clara, CA May 2009.
- 2008 Princeton Research Symposium, Princeton University, November 2008.
- 2007 NSF Engineering Research Center Annual Meeting, Bethesda, MD, December 2007
- 2008 NSF Engineering Research Center Annual Meeting, Bethesda, MD, December 2008
- 2008 Conference on Lasers and Electro-Optics (CLEO), San Jose, CA, May 2008
- 2007 North American Symposium on Laser Induced Breakdown Spectroscopy (NASLIBS), New Orleans, LA, October 2007
- 2006 IEEE/MTS Oceans2006, Boston, MA, September 2006
- 2006 LIBS2006, Montreal, Canada, September 2006
- 2005 IEEE/MTS Oceans2005, Washington D.C., September 2005
- 2004 LIBS2004, Malaga, Spain, September 2004
- 2002 IEEE/MTS Oceans2002, Biloxi, MS, October 2002

2001 IEEE/MTS Oceans2001, Honolulu, HI, November 2001

Workshops and Schools Attended

- 2013 MIRTHE Summer Workshop, Princeton, NJ, August 2013
- 2013 Earth Science Women's Network – Building Leadership and Management Skills for Success Workshop, Brown University, June 2013
- 2013 Collaborative on Oceanographic Chemical Analysis (COCA), Honolulu, HI, March 2013
- 2012 MIRTHE Summer Workshop, Baltimore, MD, August 2012
- 2011 Mid-infrared Spectroscopy Workshop Pontificia Universidade Católica (PUC) do Rio de Janeiro, Brazil, December 2011
- 2011 MIRTHE Summer Workshop, Princeton, NJ, August 2011
- 2010 MIRTHE Summer Workshop, Houston, TX, August 2010
- 2007 MIRTHE Summer Workshop, Princeton, NJ, August 2007
- 2008 International Quantum Cascade Laser School and Workshop (IQCLSW), Ascona, Switzerland, September 2008
- 2008 15th International Winter School on New Developments in Solid State Physics, Bad Hofgastein, Austria, February 2008
- 2005 RIDGE2000/Interridge Field School, Cyprus, May 2005

Refereed Publications

- 2014 W. E. Wang*, A. P. M. Michel, L. Wang, T. Tsai, M. L. Baeck, J. A. Smith, and G. Wysocki, A quantum cascade laser-based water vapor isotope analyzer for environmental Monitoring, *Review of Scientific Instruments* 85, 093103 (2014). (<http://dx.doi.org/10.1063/1.4894161>)
- 2013 Liakat, S.*, Bors, K. A., Huang, T.-Y., Michel, A. P. M., Zanghi, E., and C. F. Gmachl, In vitro measurements of physiological glucose concentrations in biological fluids using mid-infrared light, *Biomed. Opt. Express*, 4, 1083-1090. (<http://dx.doi.org/10.1364/BOE.4.001083>)
- 2012 Michel, A. P. M., S. Liakat, K. Bors, and C. F. Gmachl. In Vivo measurement of mid-infrared light scattering from human skin, *Biomedical Optics Express*, 4, 520-530. (<http://dx.doi.org/10.1364/BOE.4.000520>).
- 2012 Liakat, S.*, A. P. M. Michel, K. Bors, and C. F. Gmachl. Mid-infrared ($\lambda=8.4-9.9 \mu\text{m}$) light scattering from porcine tissue, *Appl. Phys. Lett.* 101, 093705. (<http://dx.doi.org/10.1063/1.4748331>).
- 2010 Michel, A. P. M., P. Q. Liu, J. K. Yeung, P. Corrigan, M. L. Baeck, Z. Wang, T. Day, F. Moshary, and C. F. Gmachl. Quantum cascade laser open-path system for remote sensing of trace gases in Beijing, China, *Optical Engineering*, 49, 111125. (<http://dx.doi.org/10.1117/1.3509316>).
- 2010 Michel, A. P. M., A review of single-shot laser-induced breakdown spectroscopy, *Spectrochimica Acta Part B*, 65B, 185-191 (<http://dx.doi.org/10.1016/j.sab.2010.01.006>)
- 2008 Michel, A. P. M., and A. D. Chave. Single pulse laser-induced breakdown spectroscopy of bulk aqueous solutions at oceanic pressures: interrelationship of gate delay and pulse energy, *Applied Optics*, 47, 122-130. (<http://dx.doi.org/10.1364/AO.47.00G122>)
- 2008 Michel, A. P. M., and A. D. Chave. Double pulse laser-induced breakdown spectroscopy of bulk aqueous solutions at oceanic pressures: interrelationship of gate delay, pulse energies, interpulse delay, and pressure, *Applied Optics*, 47, 131-143. (<http://dx.doi.org/10.1364/AO.47.00G131>)
- 2007 Michel, A. P. M., and A. D. Chave, Analysis of laser-induced breakdown spectroscopy (LIBS) spectra: The case for extreme value statistics, *Spectrochimica Acta Part B*, 62, 1370-1378. (<http://dx.doi.org/10.1016/j.sab.2007.10.027>)
- 2007 Michel, A. P. M., M. Lawrence-Snyder, S. M. Angel, and A. D. Chave, Laser-induced Breakdown Spectroscopy of Bulk Aqueous Solutions at Oceanic Pressures: Evaluation of Key Measurement Parameters, *Applied Optics*, 46, 2507-2515. (<http://dx.doi.org/10.1364/AO.46.002507>)
- 2007 Lawrence-Snyder, M.*, J. Scaffidi, S. Michael Angel, A. P. M. Michel, and A. D. Chave, Sequential-Pulse Laser-Induced Breakdown Spectroscopy of High-Pressure Bulk Aqueous Solutions, *Applied Spectroscopy*, 61, 171-176. (<http://www.opticsinfobase.org/as/abstract.cfm?URI=as-61-2-171>)

- 2006 Lawrence-Snyder, M.* , J. Scaffidi, S. Michael Angel, A. P. M. Michel, and A. D. Chave, Laser-Induced Breakdown Spectroscopy of High-Pressure Bulk Aqueous Solutions, *Applied Spectroscopy*, 60, 786-790. (<http://www.opticsinfobase.org/as/abstract.cfm?URI=as-60-7-786>)
- 2003 Weiss, D.* , E. A. Boyle, J. Wu, V. Chavagnac, A. Michel, and M. K. Reuer, Spatial and temporal evolution of lead isotope ratios in the North Atlantic Ocean between 1981 and 1989, *J. Geophys. Res.*, 108(C10), 3306. (<http://dx.doi.org/10.1029/2000JC000762>)

* indicates a student is lead author

Conference Proceedings/Abstracts

- 2014 Michel, A. P. M., M. Gschwend, A. Padilla, and F. Sonnichsen, Laser Induced Breakdown Spectroscopy for In Situ Heavy Metal Analysis of Ocean Sediments, *Oceans 2014*, New Foundland, September 2014.
- 2013 Michel, A. P. M., D. Miller, L. Stanton, V. Fu, K. Sun, and M. A. Zondlo, Development of an Open-Path 8 μm Quantum Cascade Laser-Based Methane Sensor, Collaborative on Oceanographic Chemical Analysis (COCA), Honolulu, HI, March 2013.
- 2013 Liakat, S.* , K. A. Bors, T.-Y. Huang, A. Michel, E. Zanghi, and C. Gmachl. Use of Partial Least Squares Regression Analysis to Predict Physiological Glucose Concentrations in vitro, *Fourier Transform Spectroscopy, Comb and Medical Application (FTu2D)*, Arlington, Virginia, June 2013, (<http://dx.doi.org/10.1364/FTS.2013.FTu2D.3>).
- 2013 Liakat, S.* , K. Bors, T. Huang, A. Michel, E. Zanghi, and C. Gmachl, In Vitro Measurements of Physiological Glucose Concentrations in Biological Fluids Using Mid-Infrared Spectroscopy, in *CLEO: 2013, OSA Technical Digest (online)* (Optical Society of America, 2013), paper CW1L.2. (http://dx.doi.org/10.1364/CLEO_SI.2013.CW1L.2)
- 2013 Miller, D. J.* , A. P. M. Michel, L. Stanton, K. Sun, L. Tao, and M. Zondlo, Long open-path high precision quantum cascade laser methane sensing at Toolik Lake, Alaska, in *CLEO: June 2013, OSA Technical Digest*, (Optical Society of America), paper ATH11.4, (2013). (http://dx.doi.org/10.1364/CLEO_AT.2013.ATH11.4).
- 2013 Wang, W.* , A. P. M. Michel, M. L. Baeck, J. A. Smith, and G. Wysocki, Measurement of Water Vapor Isotopes in the Urban Environment Using a Quantum Cascade Laser-Based Analyzer, in *CLEO: June 2013, OSA Technical Digest*, (Optical Society of America), paper JW2A.79, (2013). (http://dx.doi.org/10.1364/CLEO_AT.2013.JW2A.79).
- 2012 Michel, A. P. M., W. E. Wang, L. Wang, M. Nikodem, T. Tsai, M. L. Baeck, J. Smith, and G. Wysocki, A QCL-based Water Vapor Isotope Analyzer for Environmental Monitoring, *Environmental Sensors September 2012*
- 2012 Michel, A. P. M., W. E. Wang, L. Wang, M. Nikodem, T. Tsai, M. L. Baeck, J. Smith, and G. Wysocki, A Quantum cascade laser spectrometer for measurement of water vapor isotopes in the urban environment, in *Conference on Lasers and Electro-Optics, (CLEO)*, (Optical Society of America), paper ATH3L.2, (2012). (<http://ieeexplore.ieee.org/stamp/stamp.jsp?tp=&arnumber=6325363&isnumber=6325355>)
- 2011 Michel, A. P. M., S. Ma, K. Ostrander, K. Vogel, and C. Gmachl, "Mid-Infrared Transmission and Reflection of Porcine Skin," in *CLEO:2011 - Laser Applications to Photonic Applications*, *OSA Technical Digest*, (Optical Society of America), paper JWA104, (2011). (http://dx.doi.org/10.1364/CLEO_AT.2011.JWA104)
- 2011 Bentil, E. N.* , C. Amuah, A. P. M. Michel, M. J. Eghan, J. A. Smith, and C. F. Gmachl, Deployment of a Quantum Cascade Laser Open- Path Gas Sensor for Water Vapor and Wood Smoke Analysis, in *CLEO:2011 - Laser Applications to Photonic Applications*, *OSA Technical Digest*, (Optical Society of America), paper JMC6, (2011) (http://dx.doi.org/10.1364/CLEO_AT.2011.JMC6)
- 2011 Michel, A. P. M., S. Liakat, S. Ma, K. Ostrander, K. Vogel, E. Zanghi, and C. F. Gmachl, Mid-Infrared Spectroscopy of Tissue Using Quantum Cascade Lasers, *International Conference on Intersubband Transitions in Quantum Wells (ITQW)*, Sardinia, Italy, September 2011.
- 2011 Liakat, S.* , A. P. Michel, K. Bors and C. F. Gmachl, Study of Mid-Infrared Light Interaction with Skin for the Realization of a Non-Invasive Glucose Monitor, *International Conference on Intersubband Transitions in Quantum Wells (ITQW)*, Sardinia, Italy, September 2011

- 2010 Michel, A. P. M. and C. F. Gmachl, A non-invasive glucose sensor for diabetics," Eastern Analytical Symposium, Somerset, NJ, November 2010.
- 2010 Bentil, E. N.*, C. Amuah, A. P. M. Michel, M. J. Eghan, J. A. Smith, and C. F. Gmachl, Gas Sensing using mid-infrared technology in 2010 in Cape Coast, Ghana," Eastern Analytical Symposium, Somerset, NJ, November 2010.
- 2010 Michel, A. P., T. P. Chen, T. S. Ko, N. V. Raj, M. E. Inyang, B. T. Bosworth, M. D. Escarra, and C. F. Gmachl, Development of a Quantum Cascade Laser-Based Sensor for Non-Invasive CO₂ Monitoring, in *Conference on Lasers and Electro-Optics*, (Optical Society of America), paper AMC6, (2010). (http://www.opticsinfobase.org/abstract.cfm?URI=CLEO_Apps-2010-AMC6)
- 2010 Paschke, K., P. Q. Liu, A. P. M. Michel, J. Smith, F. Moshary, and C. Gmachl, "Quantum Cascade Laser for Elastic-Backscattering LIDAR Measurement," in Conference on Lasers and Electro-Optics 2010, OSA Technical Digest, (Optical Society of America), paper JThJ3, (2010). (<http://dx.doi.org/10.1364/CLEO.2010.JThJ3>)
- 2009 Zhang, Y.*, J. A. Smith, A. P. Michel, M. L. Baeck, Z. Wang, J. D. Fast, C. Gmachl, Coupled Monitoring and Modeling of Air Quality and Regional Climate during the 2008 Beijing Olympic Games, AGU Fall Meeting, 2009
- 2009 Michel, A. P. M., T. Ko, N. Raj, M. Inyang, B. Bosworth, M. Escarra, and C. F. Gmachl, Development of a quantum cascade laser-based sensor for detection of CO₂ in the human fingertip, Biotech2009, Philadelphia, PA, November 2009.
- 2009 Michel, A. P. M., P. Q. Liu, J. Yeung, P. Corrigan, M. Baeck, X. Pan, H. Dong, Z. Wang, T. Day, J. Smith, F. Moshary, and C. Gmachl, "Design and Deployment of a Quantum Cascade Laser Absorption Spectrometer in an Open-Path Sensor System For Trace Gas Analysis," in Conference on Lasers and Electro-Optics/International Quantum Electronics Conference, OSA Technical Digest, (Optical Society of America), paper CMS3, (2009). (<http://ieeexplore.ieee.org/xpl/articleDetails.jsp?arnumber=5224475>)
- 2009 Michel, A. P. M., T. Ko, N. Raj, M. Inyang, B. Bosworth, M. Escarra, and C. F. Gmachl, Development of a quantum cascade laser-based sensor for detection of CO₂ in the human fingertip, NJEN, Princeton, NJ, November 2009.
- 2009 Michel, A. P. M., E. Bentil, P. Q. Liu, J. K. Yeung, Y. Zhang, M. L. Baeck, Z. Wang, J.A. Smith, and C. F. Gmachl, Design and Field Trials of an Open-Path Quantum Cascade Laser Absorption Spectrometer, Eastern Analytical Symposium, Somerset, NJ, November 2009.
- 2009 Bentil, E. N.*, C. Amuah, A. P. M. Michel, M. J. Eghan, J. A. Smith, and C. F. Gmachl, Gas Sensing using robust and portable mid-infrared technology in Cape Coast, Ghana," Eastern Analytical Symposium, Somerset, NJ, November 2009.
- 2009 Michel, A. P. M., P. Q. Liu, J. K. Yeung, Y. Zhang, M. L. Baeck, X. Pan, H. Dong, Z. Wang, J. A. Smith, and C. F. Gmachl, Measurement of Urban Air Quality by an Open- Path Quantum Cascade Laser Absorption Spectrometer in Beijing During Summer 2008, AGU Joint Assembly The Meeting of the Americas, Toronto, Canada May 2009.
- 2009 Zhang, Y.*, J. A. Smith, Z. Wang, J. D. Fast, E. G. Chapman, Q. Wu, M. L. Baeck, A. P. Michel, J. Yeung, W. I. Gustafson, Impacts of Emission Reduction Scenarios on Regional Climate and Local Air Quality for the 2008 Beijing Olympic Games, 2009 AGU Spring Meeting Abstracts.
- 2009 Michel, A. P. M., Design and Deployment of an Open-Path Quantum Cascade Laser Absorption Spectrometer For Trace Gas Analysis, OPTOmism, Santa Clara, CA, May 2009
- 2008 Michel, A. P. M., Q. Liu, J. A. Smith, M. L. Baeck, and C. F. Gmachl, Air quality monitoring in Beijing, China using a novel sensor, Princeton Research Symposium, Princeton University, November 2008.
- 2008 Michel, A. P. M., J. K. Yeung, Y. Zhang, P. Corrigan, Q. Liu, J. A. Smith, M. L. Baeck, F. Moshary, and C. F. Gmachl, Open path quantum cascade laser spectrometer for air quality monitoring, International Quantum Cascade Laser School and Workshop, Ascona, Switzerland, September 2008.
- 2008 Michel, A. P. M., J. K. Yeung, Y. Zhang, P. Corrigan, J. A. Smith, M. L. Baeck, F. Moshary, and C. F. Gmachl, Quantum cascade laser open-path system for trace gas concentration measurements in the urban environment, 2008 International Symposium on Spectral Sensing Research, Hoboken, NJ, June 2008.

- 2008 Michel, A. P. M., P. Corrigan, J. Yeung, M. L. Baeck, J. A. Smith, F. Moshary, C. F. Gmachl, Quantum cascade laser open path system for ammonia detection: preliminary results, 15th International Winter School on New Developments in Solid State Physics, Bad Hofgastein, Austria, February 2008.
- 2007 Michel, A. P. M. and A. D. Chave, Laboratory evaluation of laser-induced breakdown spectroscopy as a new in situ chemical sensing technique for the deep ocean, NASLIBS, New Orleans, LA, October 2007.
- 2006 Michel, A. P. M., N. E. Farr, and A. D. Chave, Evaluation of laser-induced break-down spectroscopy (LIBS) as a new in situ chemical sensing technique for the deep ocean, IEEE/MTS Oceans2006, Boston, MA, September 2006.
- 2006 Michel, A. P. M., N.E. Farr, and A. D. Chave, Data analysis of LIBS spectra: the case for using a generalized extreme value distribution (GEVD), LIBS2006, Montreal, Canada, September 2006.
- 2006 Michel, A. P. M., N.E. Farr, and A. D. Chave, Laboratory evaluation of LIBS for in situ chemical sensing in the high pressure aqueous environment of the deep ocean, LIBS2006, Montreal, Canada, September 2006.
- 2006 White, S. N. R. Camilli, A. P. M. Michel, and J. Whelan, Spectroscopic sensor technology for in situ seafloor analyses, Scientific Submarine Cable Conference, Dublin, Ireland, Feb.2006.
- 2005 Michel, A. P. M., M. J. Lawrence-Snyder, S. M. Angel, and A. D. Chave, Oceanic applications of laser induced breakdown spectroscopy: laboratory validation, IEEE/MTS Oceans2005, Washington D.C., September 2005.
- 2005 Michel, A. P. M., M. J. Lawrence-Snyder, S. M. Angel, and A. D. Chave, Development of an oceanographic sensor for in situ chemical analysis of hydrothermal vents: preliminary laboratory results using Laser Induced Breakdown Spectroscopy, Proceedings of the RIDGE2000/Interridge Field School on Troodos Ophiolite, Cyprus, May 2005.
- 2004 Angel, S. M., W. Pearman, M. Lawrence, J. Scaffidi, A. Michel, and A. D. Chave, Sequential and ultra-short pulse LIBS: application to high pressure solution measurements, Pittcon, March 2005.
- 2004 Lawrence, M.* , A. P. M. Michel, S. E. Beardsley, J. Scaffidi, and S. M. Angel, Laser-induced breakdown spectroscopy of bulk aqueous solutions at elevated pressures, LIBS2004, Malaga, Spain, September 2004.
- 2004 Michel, A. P. M., S. M. Angel, M. Lawrence, and A. D. Chave, Laser induced breakdown spectroscopy (LIBS) of liquids in a high pressure environment, LIBS2004, Malaga, Spain, September 2004.
- 2002 Michel, A. P. M. and K.L. Croff, A remote monitoring system for open ocean aquaculture, IEEE/MTS Oceans2002, Biloxi, MS, October 2002.
- 2002 Michel, A. P. M. Experimental flow characterization of anguilliform swimming motion, IEEE/MTS Oceans Conference, Honolulu, HI, November 2001.

* indicates a student is lead author

Invited Presentations

- 2013 Michel, A.P.M., D. J. Miller, L. Stanton, K. Sun, L. Tao, and Mark A. Zondlo Open-Path Methane Sensing Across an Arctic Lake, Workshop on Air Quality Monitoring related to energy extraction MIRTHE Summer Workshop, Princeton, NJ, August 2013
- 2013 Michel, A. P. M., D. Miller, L. Stanton, V. Fu, K. Sun, and M. A. Zondlo, Development of an Open-Path 8 μ m Quantum Cascade Laser-Based Methane Sensor, Collaborative on Oceanographic Chemical Analysis (COCA), Honolulu, HI, March 2013.
- 2012 Michel, A. P. M. Building and Deploying Environmental Sensors: Goals, Challenges, and Successes, MIRTHE Summer Workshop, Baltimore, MD August 2012
- 2011 Michel, A. P. M. Series of three Invited Tutorials: 1. Quantum Cascade Lasers & Detectors 2. Sensors, Applications, and Design Considerations 3. Quantum Cascade Laser-Based Sensing, Mid-infrared Spectroscopy Workshop, Pontificia Universidade Católica (PUC) do Rio de Janeiro, Brazil, December 2011
- 2010 Michel, A. P. M. and C. F. Gmachl, A non-invasive glucose sensor for diabetics, Eastern Analytical Symposium, Somerset, NJ, November 2010

- 2009 Michel, A. P. M., Design and Deployment of an Open-Path Quantum Cascade Laser Absorption Spectrometer For Trace Gas Analysis, OPTOMism, Santa Clara, CA, May 2009

Contributed Presentations

- 2012 Michel, A. P. M., W. E. Wang, L. Wang, M. Nikodem, T. Tsai, M. L. Baeck, J. Smith, and G. Wysocki, A QCL-based Water Vapor Isotope Analyzer for Environmental Monitoring, Environmental Sensors 2012
- 2011 Michel, A. P. M., S. Liakat, E. Zanghi, K. Ostrander, and C. F. Gmachl, A Pain-Free Glucose Sensor for Diabetics, MIRTHE Investment Focus Group, Princeton University, October 2011
- 2011 Michel, A. P. M., S. Liakat, S. Ma, K. Ostrander, K. Vogel, E. Zanghi, and C. F. Gmachl, Mid-Infrared Spectroscopy of Tissue Using Quantum Cascade Lasers, Intersubband Transitions in Quantum Wells (ITQW), Sardinia, Italy, September 2011
- 2011 Michel, A. P. M., S. P. Ma, K. Ostrander, K. Vogel, and C. F. Gmachl, Mid-Infrared Transmission and Reflection of Porcine Skin, Conference on Lasers and Electro-Optics (CLEO), Baltimore, MD, May 2011
- 2010 Michel, A. P. M., A Non-invasive Glucose Monitor for Diabetics, MIRTHE Investment Focus Group, Princeton University, October 2010
- 2010 Michel, A. P. M., The Development of a Non-invasive Glucose Monitor, MIRTHE Summer Workshop, Rice University August 2010
- 2010 Michel, A. P. M., T. P. Chen, T. S. Ko, N. V. Raj, M. E. Inyang, B. T. Bosworth, M. D. Escarra, C. F. Gmachl, Development of a Quantum Cascade Laser-Based Sensor For Non-Invasive CO₂ Monitoring. Conference on Lasers and Electro-Optics (CLEO), San Jose, CA May 2010
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