

*CURRICULUM VITAE*

*February 14, 2020*

**RONALD G. PRINN**

**Education:**

University of Auckland, New Zealand;  
B.Sc. in Chemistry and Pure and Applied Mathematics 1967  
University of Auckland, New Zealand;  
M.Sc. with first class honors in Chemistry 1968  
Massachusetts Institute of Technology;  
Sc.D. in Chemistry 1971

**Professional Positions:**

Teaching Assistant, MIT Department of Chemistry 1968-1970  
NASA Graduate Assistant, MIT Department of Chemistry 1970-71  
Assistant Professor, MIT Department of Meteorology 1971-76  
Faculty resident, Baker House, MIT 1974-77  
Associate Professor, MIT Department of Meteorology  
and Physical Oceanography 1976-82  
Visiting Associate Professor, Caltech, Division of  
Geological and Planetary Sciences 1981  
Professor, MIT Department of Meteorology and Physical Oceanography 1982-83  
Professor, MIT Department of Earth, Atmospheric, and Planetary Sciences 1983-1992  
Founder & Director, MIT Center for Global Change Science 1990-present  
Co-Founder & Co-Director, MIT Joint Program on the Science and Policy  
of Global Change 1991-present  
TEPCO Professor of Atmospheric Science, MIT 1993-present  
Head, Department of Earth, Atmospheric and Planetary Sciences, MIT 1998-2003

**Honors:**

University of New Zealand Junior Scholar 1964, 65, 66  
University of New Zealand Fowlds Prize for the most distinguished  
student in the faculty of science 1967  
University of New Zealand Postgraduate Scholar in Science 1968  
American Geophysical Union James B. Macelwane Medal for  
significant contributions to the Geophysical Sciences by  
a young scientist of outstanding ability 1981  
Elected a Fellow of the American Geophysical Union 1981  
V.I. Vernadsky Memorial Lecturer, V.I. Vernadsky Institute,  
USSR Academy of Sciences 1984  
Energy Journal Best Paper Award 1997  
Elected a Fellow of the American Association for the  
Advancement of Science 2001  
Bose Institute Centenary Lecturer, 100<sup>th</sup> Anniversary of the Bose Institute,  
Kolkata, India, 2017

## MIT Academic & Service Summary

Professor Prinn currently teaches two subjects in Atmospheric and Climate Sciences at MIT: “Atmospheric Physics and Chemistry” (12.806G, 12.306U), and “Experimental Atmospheric Chemistry” (12.335U/12.835G). In the past he has taught courses in “Global Climate Change: Economics, Science and Policy” (12.848G/12.348U), “Atmospheric Radiation” (12.815G), “Global Change Science”, “Physical Meteorology”, “Chemistry and Dynamics of Upper Atmospheres”, “A guided Tour of the Planets”, and “Atmospheric Chemistry and Radiation”. He served as a freshman advisor from 1971 to 1976 and as a faculty resident at Baker House from 1974 to 1977.

In 1990 he founded, and since then has directed, the MIT Center for Global Change Science. In 1991 he co-founded (with Henry Jacoby), and since then has co-directed, the MIT Joint Program on the Science and Policy of Global Change. He headed the Department of Earth, Atmospheric and Planetary Sciences from 1998 to 2003.

He was a member of the MIT Environmental Research Council, the Editorial Board of the MIT Faculty Newsletter, the Editorial Board of the MIT Press, and the Executive Committee of the MIT Council on the Global Environment. He is a past member of MIT’s J.R. Killian Award Selection Committee, MIT’s Committee on Graduate School Policy, and MIT’s Committee on Toxic Chemicals. He currently chairs the Henry Kendall Lecture selection committee and the Mario and Luisa Molina Postdoctoral Fellow selection committee, and is a member of the MIT DOE Faculty Engagement Group.

## Graduate Advising

Completed Doctoral Students (31): Matthew Alvarado, Robert Boldi, Mary Anne Carroll, Yu-Han Chen, Jason Cohen, Dale Durran, Neil Donahue, Anita Ganesan, Amram Golombek, John Graham, Baskhar Gunturu, Dana Hartley, Elke Hodson, Jin Huang, Diane Ivy, Gary Kleiman, Jimmy Gasore, Eunjee Lee, Yuexin Liu, Don Lucas, Natalie Mahowald, Michael McClellan, Laura Meredith, Jay Olaguer, Wenwei Pan, Arnico Panday, Katherine Potter, Stephanie Shaw, Michelle Sprengnether, Donnan Steele and Xue Xiao.

Completed Master’s Students (12): Robert D’Entremont, Kevin Gurney, Gary Holian, Chris Jensen, Arthur Katz, Michael Kirkish, Ryan Merkin, Gary Moore, Jay Olaguer, Robert Posey, Debra Weisenstein, Brenda Walker.

Current Graduate Students (1): Charles Gertler.

## Research Summary

Dr. Prinn’s principal general research interests involve the chemistry, dynamics and physics of the atmospheres and climates of the Earth and other planets, and the interactions among science, economics and technology that guide sound policy. Dr. Prinn is currently Principal Investigator on a wide range of projects in atmospheric chemistry, biogeochemistry, climate science, and integrated assessment of science and policy regarding climate change and air pollution that are carried out in the Center for Global Change Science and the Joint Program on the Science and Policy of Global Change. Support for these projects has come from several U.S. Federal agencies (DOE, DOT, EPA, FAA, NASA, NSF, NOAA, NREL, EIA, USDA), national and international industrial sponsors (Alstom Power, American Electric Power, BP, Cargill, Caterpillar, Chevron, CONCAWE & EUROPIA, ConocoPhillips, CLP Holdings, Deutsche Asset Management, Dow Chemical, Duke Energy, EPRI, Electricité de France, Eni, Exelon, Exxon Mobil, GDF SUEZ, J-Power, Lockheed Martin, Marathon Oil, Murphy Oil, Nike, Oglethorpe Power, Repsol, RWE Power, Shell International Petroleum, Southern Company, Statoil, Suncor Energy, Suncor, Tokyo Electric Power Company, Total, Toyota Motor North America, Weyerhaeuser Company), the Centro Mario Molina, the Norwegian Ministry of Petroleum and Energy, the Clear Path Foundation and the J. Unger Vetlesen Foundation. The grants or recurring gifts from these various

sources to the Center for Global Change Science and the Joint Program on the Science and Policy of Global Change total about \$10 million per year.

### **Principal Research Accomplishments**

\* In 1978, Dr. Prinn founded and still leads the Advanced Global Atmospheric Gases Experiment (AGAGE) and its predecessors, in which the rates of increase of now over 50 environmentally harmful trace gases have been measured continuously over the globe at high frequency.

AGAGE includes all the important gases containing Cl and Br involved in ozone depletion (Montreal Protocol) and all the important non-CO<sub>2</sub> gases involved in the greenhouse effect (Kyoto Protocol). AGAGE now involves 11 stations and 12 nations around the world (USA, Japan, China, South Korea, Australia, UK, Switzerland, Norway, Italy, Ireland, Barbados, Samoa) and has produced over 200 peer-reviewed publications that are widely cited in WMO Ozone and IPCC Climate Assessments. In the 1980's and 1990's, he pioneered the application of Bayesian inverse methods and accurate atmospheric circulation models driven by analyzed observed meteorology, to interpret the AGAGE measurements. He and his colleagues have determined the atmospheric lifetimes and emissions of AGAGE gases. These lifetimes enabled calculation of Global Warming Potentials (GWPs) under the Kyoto Protocol, and Ozone Depletion Potentials (ODPs) under the Montreal Protocol. The estimated emissions are used to verify reported emissions by nations under the Kyoto and Montreal Protocols. He has led determination of the concentrations of the atmosphere's major oxidizing agent, the OH free radical, using AGAGE measurements of trichloroethane. The global average OH concentration, first estimated in 1987 ( $\sim 10^6$  radicals/cm<sup>3</sup>), remains the accepted estimate today. The small inferred long-term OH trend indicates the stability since 1978 of the lifetimes of all the major gases that are removed by OH.

\* Dr. Prinn developed with colleagues the first comprehensive global 3-dimensional dynamical-chemical-radiation model of the stratospheric ozone layer.

The model was applied in the 1970's to elucidating the deleterious effects on ozone of the proposed fleet of Boeing 2707 supersonic aircraft (that would fly through the stratosphere). In the 1980's it was applied to study the stratospheric impacts of chlorofluorocarbons.

\* From the 1990s onwards Dr. Prinn has developed with colleagues the Integrated Global System Model (IGSM).

This model couples sub-models of: (1) economic, demographic, trade, and technological processes involved in emissions relevant to climate and air pollution by sector and country, (2) dynamics, physics and chemistry of the atmosphere, ocean and climate, (3) bio-geochemistry and bio-geophysics of the land and ocean, and (4) physics of the ocean and land cryospheres. As reported in over 530 peer-reviewed publications, this unique modeling capability has been applied to: (1) investigate complex interactions among the human and natural components of the earth system, (2) develop and apply methods for examining uncertainty in economic and environmental projections, (3) investigate mitigation and adaptation strategies at the global and regional levels, and (4) analysis of the climate, air pollution, human health and ecosystem benefits of policies.

\* Dr. Prinn did pioneering studies in the 1970's and 1980's of the chemistry and evolution of planetary atmospheres, and in the 1980's and 1990's of the chemistry and evolution of the gaseous circumsolar disc in which the planets originated.

He proposed the theory of "transport-induced kinetic inhibition" that explains the observed non-equilibrium atmospheric gases containing C, Si, Ge, P, and As in the giant planets, and by inference, the gases containing C, N and O in the circum-solar and circum-stellar proto-discs. He performed pioneering studies of the photochemistry of the observed atmospheric gases and aerosols containing

S and Cl on Venus, and P and S on Jupiter, to explain their chemical cycles and their roles in cloudcolorations.

\* Dr. Prinn has played leadership roles in developing some major national and international scientific research programs.

He was the first Chairman of the Steering Committee of the International Global Atmospheric Chemistry (IGAC) Project from 1988-1995. IGAC quickly became the largest international project in atmospheric chemistry. He was Chairman of the Committee on Earth Sciences of the US-NAS Space Science Board from 1982-1984. The committee's report "A Strategy for Earth Science from Space, Part 2", provided a strong scientific foundation for the later study of the atmosphere and its interactions with the land, oceans and biota from the Earth Observing System.

### National & International Advisory Activities

Dr. Prinn has twice given invited testimony to Congress regarding climate change:

Prinn, R.G., Climate Change: State of the Science and Implications for Policy, Invited testimony to the Committee on Science, U.S. House of Representatives, 105th Congress, Countdown to Kyoto (U.S. Government Printing Office), Part I, Vol. 1, pgs. 42–68, 1998.

Prinn, R.G., Climate Change: A Growing Scientific Impetus for Policy, Invited testimony to the Committee on Ways and Means, Hearing on Energy and Tax Policy, U.S. House of Representatives, Record of the 110th Congress, 2007.

Dr. Prinn is a member of the editorial board of the *International Journal of Environment and Pollution*. He has previously served as Editor for atmospheric sciences for *EOS* (AGU), Associate Editor of *Global Biogeochemical Cycles* (AGU), and Associate Editor for the *Journal of Geophysical Research: Atmospheres* (AGU).

He has served or is currently serving on the following scientific advisory committees:

UCAR University Relations Committee	1974–1977
NASA Outer Planetary Probes Science Study Group	1974–1975
DOT/CIAP Panel on the Perturbed Stratosphere	1975
NASA Terrestrial Planets Science Study Group	1976–1977
AGU Planetology Section Nominations Committee	1977–1978
NAS/NRC Committee on Planetary and Lunar Exploration	1977–1981
IUGG/IAMAP International Commission on Planetary Atmospheres and their Evolution	1978–1995
NASA Advisory Council Innovation Subcommittee	1979
NAS/NRC Space Science Board	1981–1984
Chairman, NAS/NRC Committee on Earth Sciences	1982–1984
NASA Steering Committee for the Global Habitability Study	1982
NASA Biogenic Elements Science Study Group	1981–1982
NASA/SSEC Working Group for Terrestrial Planet Atmospheres	1982
UCAR Scientific Programs Evaluation Committee Panel for Review of NCAR Atmospheric Chemistry and Aeronomy Division	1983
NASA University Relations Study Group	1983–1985
American Meteorology Society Committee on Atmospheric Chemistry	1983–1986
NASA Earth System Sciences Committee	1983–1987
NAS/NRC US Committee for an International Geosphere-Biosphere Program	1984–1986
NAS/NRC/SSB Task Group on Earth Sciences	1985–1986
Co-chairman, NSF/NASA/NOAA Global Tropospheric Chemistry Program Plan Steering Committee	1984–1986
NAS/NRC/COSEPUP Research Briefing Panel on Remote Sensing of the Earth	1985
NASA Space and Earth Sciences Computing Center Steering Committee	1986–1987
AGU Committee of Fellows	1986–1988

AGU Committee on Earth as a System	1986–1988
NAS/NRC Committee on Atmospheric Chemistry	1987–1989
NAS/NRC Committee on Mars Sample Return	1987–1989
IUGG/IAMAP International Commission on Atmospheric Chemistry and Global Pollution	1987–1995
Inaugural Chairman, IGBP/IAMAP International Global Atmospheric Chemistry (IGAC) Project Steering Committee	1988–1995
NAS/NRC Committee on Cooperation with the USSR in Planetary Science	1989
ICSU/IGBP Special Committee	1989–1990
NAS/NRC US National Committee for SCOPE	1990–1992
NASA Space Science and Applications Advisory Committee	1990–1992
ICSU/IGBP Scientific Committee	1990–1995
Network for Detection of Atmospheric Composition Change, Int'l Steering Committee	1990–present
Chair Elect/Chair/Retiring Chair, AAAS Atmospheric and Hydrospheric Sciences	1998–2001
AAAS Council	2000–2001

<b>AAAS</b>	American Association for the Advancement of Science	<b>NAS</b>	National Academy of Sciences
<b>AGU</b>	American Geophysical Union	<b>NASA</b>	National Aeronautics and Space Administration
<b>IAMAP</b>	International Association of Meteorology and Atmospheric Physics	<b>NRC</b>	National Research Council
<b>ICSU</b>	International Council of Scientific Unions	<b>SCOPE</b>	Scientific Committee on Problems of the Environment
<b>IGBP</b>	International Geosphere-Biosphere Programme	<b>UCAR</b>	University Corporation for Atmospheric Research
<b>IPCC</b>	Intergovernmental Panel on Climate Change	<b>UNEP</b>	United Nations Environment Program
<b>IUGG</b>	International Union of Geodesy and Geophysics	<b>WMO</b>	World Meteorological Organization
<b>JPL</b>	Jet Propulsion Laboratory	<b>WCRP</b>	World Climate Research Programme

## Workshops and Assessments

Dr. Prinn has also participated in the following studies/workshops/assessments that produced published proceedings:

1975	NASA Workshop	<i>The Stratosphere, 1975–1980</i>
1975	DOT/CIAP Workshop	<i>The Stratosphere Perturbed by Propulsion Effluents</i>
1977	NASA/JPL Workshop	<i>The Dynamics of Earth and Planetary Atmospheres</i>
1978	NAS/SSB Workshop	<i>Comets, Asteroids, and Dust</i>
1979	NASA Workshop	<i>The Stratosphere: Present and Future</i>
1980	NASA Workshop	<i>Vibrational-Rotational Spectroscopy for Planetary Atmospheres</i>
1982	NASA Workshop	<i>Global Habitability</i>
1983	NAS/NRC Workshop	<i>International Geosphere-Biosphere Program</i>
1987	Dahlem Konferenzen	<i>The Changing Atmosphere</i>
1988	UCAR/OIES Workshop	<i>Trace Gases and the Biosphere</i>
1990	UCAR/OIES Workshop	<i>Earth System Modeling</i>
1990	WCRP Workshop	<i>Global Tracer Transport Modeling</i>
1992	Chair, NATO Advanced Research Workshop	<i>Biogeochemical Ocean-Atmosphere Transfers</i>
1993	Chair, First IGAC Scientific Conference	<i>Atmospheric Biospheric Chemistry</i>
1994	UCAR/OIES Global Change Institute	<i>Integrated Assessment Modeling</i>
1998	Lead Author, WMO/UNEP	<i>Scientific Assessment of Ozone Layer Depletion: 1998</i>
2001	IGBP Workshop	<i>Nonlinear Responses to Global Environmental Change</i>
2003	ICSU/SCOPE/IGBP/WCRP	<i>Global Carbon Project</i>
2006	Lead Author, IPCC	<i>Climate Change: 2007: The Science Basis</i>
2006	Co-author, WMO/UNEP	<i>Scientific Assessment of Ozone Depletion: 2006</i>
2010	Co-author WMO/UNEP	<i>Scientific Assessment of Ozone Depletion: 2010</i>

## 1. PUBLICATIONS

- Lewis, J.S. and **R.G. Prinn**, Jupiter's clouds: structure and composition, *Science*, **169**, 472–473, 1970.
- Prinn, R.G.**, UV radiative transfer and photolysis in Jupiter's atmosphere, *Icarus*, **13**, 424–436, 1970. Lewis, J.S. and **R.G. Prinn**, Chemistry and photochemistry of the atmosphere of Jupiter, In *Theory and Experiment in Exobiology*, ed. A.A. Schwartz, Wolters-Noordhoff, Groningen, **1**, 123–142, 1971.
- Prinn, R.G.**, Photochemistry of HCl and other minor constituents in the atmosphere of Venus, *J. Atmos. Sci.*, **28**, 1058–1068, 1971.
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- Prinn, R.G.**, The atmospheres of Uranus and Neptune: a review, *Planetary and Space Science*, **21**, 1601–1603, 1973.
- Prinn, R.G.**, The upper atmosphere of Venus: a review, in *Physics and Chemistry of Upper Atmospheres*, ed. B.M. McCormac, D. Reidel, Dordrecht, 335–344, 1973.
- Prinn, R.G.**, and J.S. Lewis, Uranus atmosphere: structure and composition, *Astrophys. J.*, **179**, 333–342, 1973. Pilcher, C.B., **R.G. Prinn**, and T.B. McCord, Spectroscopy of Jupiter: 3200–11,200, *J. Atmos. Sci.*, **30**, 302–307, 1973.
- Lewis, J.S. and **R.G. Prinn**, Titan revisited. *Comments Astrophys. and Space Phys.*, **5**, 1–7, 1973.
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- Prinn, R.G.**, Venus: Chemical and dynamical processes in the stratosphere and mesosphere, *J. Atmos. Sci.*, **32**, 1237–1247, 1975.
- Prinn, R.G.**, and J.S. Lewis, Phosphine on Jupiter and implications for the Great Red Spot, *Science*, **190**, 274–276, 1975.
- Prinn, R.G.**, and T. Owen, Chemistry and spectroscopy of the Jovian atmosphere, in *Jupiter*, ed. T. Gehrels, Univ. of Arizona Press, 319–371, 1976.
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- Prinn, R.G.**, F.N. Alyea, and D.M. Cunnold, Photochemistry and dynamics of the ozone layer, *Ann. Rev. Earth Planet. Sci.*, **6**, 43–74, 1978.

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- Zhuang, Q., X. Zhuang, X. Zhu, C. Prigent, J.M. Melillo, A.D. McGuire, **R.G. Prinn** and D.W. Kicklighter, 2012: Influence of Changes in Wetland Inundation Extent on Net Fluxes of Carbon Dioxide and Methane in Northern High Latitudes from 1993 to 2004, American Geophysical Union Fall Meeting (San Francisco, Dec. 3–7), *Eos Trans.*, Abstract B24C-02.
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- Prinn, R. G.**, 2013: The MIT Integrated Global System Model: A facility for Assessing and Communicating Climate Change Uncertainty, American Geophysical Union Fall Meeting (San Francisco, Dec. 9–13), *Eos Trans.*, Abstract GC34C-01.
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- McClellan, M., E. Harris, W. Olszewski, S. Ono, **R. Prinn**, 2014: Analysis of high frequency site-specific nitrogen and oxygen isotopic composition of atmospheric nitrous oxide at Mace Head, Ireland, American Geophysical Union Fall Meeting (San Francisco, Dec. 15-19), *Eos Trans.*, Abstract A33G-3282.
- Xiang, B., P. Patra, S. Montzka, S. Miller, J. Elkins, F. Moore, E. Atlas, B. Miller, **R. Prinn**, S. Wofsy, 2014: Global emissions of refrigerants HCFC022 and HFC-134a: Unforeseen seasonal contributions, , American Geophysical Union Fall Meeting (San Francisco, Dec. 15-19), *Eos Trans.*, Abstract A42C-05.
- McClellan, M.J., E. J. Harris, W. Olszewski, S. Ono, and **R.G. Prinn**, Measurement and modeling of site-specific nitrogen and oxygen isotopic composition of atmospheric nitrous oxide at Mace Head, Ireland (Paper ID: 2289701: both oral and poster presentations), 250<sup>th</sup> American Chemical Society National Meeting (Boston, MA, August 16-20, 2015).
- DeWitt, L., J. Gasore, **R. Prinn**, and K. Potter, 2015: Measurements of Background and Polluted Air in Rural Regions of Rwanda, American Geophysical Union Fall Meeting (San Francisco, Dec. 14-18), Abstract B11A-0405, <https://agu.confex.com/agu/fm15/meetingapp.cgi/Paper/63692>.
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- Gasore, J., L. DeWitt, and **R. Prinn**, 2015: First Continuous High Frequency in Situ Measurements of CO<sub>2</sub> and CH<sub>4</sub> in Rwanda, Using Cavity Ring-down Spectroscopy, American Geophysical Union Fall Meeting (San Francisco, Dec. 14-18), Abstract, B11A-0409, <https://agu.confex.com/agu/fm15/meetingapp.cgi/Paper/71705>.
- McClellan, M., E. Saikawa, **R. Prinn**, and S. Ono, 2015: Measurement and Modeling of Site-specific Nitrogen and Oxygen Isotopic Composition of Atmospheric Nitrous Oxide at Mace Head, Ireland American Geophysical Union Fall Meeting (San Francisco, Dec. 14-18), Abstract A11I-0183, <https://agu.confex.com/agu/fm15/meetingapp.cgi/Paper/48380>.
- Rigby, M., A. Wenger, S. O'Doherty, M. Lunt, A. Ganesan, A. Manning, and **R. Prinn**, 2015: Inferring global and regional methane sources and sinks using isotopic observations and atmospheric chemical transport models American Geophysical Union Fall Meeting (San Francisco, Dec. 14-18), Abstract A11I-0178, <https://agu.confex.com/agu/fm15/meetingapp.cgi/Paper/70177>.
- Sokolov, A., S. Paltsev, H. Chen, M. Haigh, and **R. Prinn**, 2015: Climate Stabilization at 2°C and “Net Zero” Emissions, American Geophysical Union Fall Meeting (San Francisco, Dec. 14-18), Abstract GC43C-1212, <https://agu.confex.com/agu/fm15/meetingapp.cgi/Paper/66532>.
- Tian, H., C. Lu, P. Ciais, A. Michalak, J.P. Canadell, E. Saikawa, D. Huntzinger, K. Gurney, S. Sitch, B. Zhang, J. Yang, P. Bousquet, L. Bruhwiler, G. Chen, E. Dlugokencky, P. Friedlingstein, J. Melillo, S. Pan, B. Poulter, **R. Prinn**, M. Saunio, C. Schwalm, and S. Wofsy, 2015: The full budget of greenhouse gases in the terrestrial biosphere: From global C project to global GHG project, American Geophysical Union Fall Meeting (San Francisco, Dec. 14-18), Abstract B21M-03, <https://agu.confex.com/agu/fm15/meetingapp.cgi/Paper/86216>.
- Wells, K., D. Millet, N. Boussez, D. Henze, S. Chaliyakunnel, T. Griffis, E. Dlugokencky, **R. Prinn**, S. O'Doherty, R. Weiss, G. Dutton, J. Elkins, P. Krummel, R. Langenfelds, P. Steele, 2015: Evaluating Observational Constraints on N<sub>2</sub>O Emissions via Information Content Analysis Using GEOS-Chem and its Adjoint, American Geophysical Union Fall Meeting (San Francisco, Dec. 14-18), Abstract A31B-0040, <https://agu.confex.com/agu/fm15/meetingapp.cgi/Paper/79283>.
- Gertler, C.G., E. Monier and **R.G. Prinn**, 2016: The Role of Arctic Sea Ice in Last Millennium Climate Variability: Model-Proxy Comparisons Using Ensemble Members and Novel Model Experiments, American Geophysical Union Fall Meeting (San Francisco, Dec 12-16, 2016), Abstract PP41C-2260.
- Gressent, A., J. Muhle, M.L Rigby, M.F. Lunt, A. Ganesan, **R.G. Prinn**, P.B. Krummel, P.J. Fraser, P. Steele, R.F. Weiss, C.M. Harth, S. O'Doherty, D. Young, S. Park, S. Li, B. Yao, S. Reimann, M. K. Vollmer, M. Maione, I. Arduini and C.R. Lunder, 2016: Optimal Estimation of Sulfuryl Fluoride Emissions on Regional and Global Scales Using Advanced 3D Inverse Modeling and AGAGE, American Geophysical Union Fall Meeting (San Francisco, Dec 12-16, 2016), Abstract A23P-02.
- McClellan, M.J., M.L. Rigby, A. Ganesan, M.F. Lunt, E. Saikawa, S. Ono and **R.G. Prinn**, 2016: Source-Specific Nitrous Oxide Emissions in Ireland and UK from New Isotopically Resolved Measurements and Models, American Geophysical Union Fall Meeting (San Francisco, Dec 12-16, 2016), Abstract A41J-06.
- Prinn, R.G.**, 2016: Valuing and Maintaining Independent Research with Private Sector Funding, American Geophysical Union Fall Meeting (San Francisco, Dec 12-16, 2016), Abstract PA14A-02.
- Turner, A.J., C. Frankenberg, P.O. Wennberg, D. Jacob, P.B. Krummel, S. O'Doherty, **R. G. Prinn** and R.F. Weiss, 2016: On the renewed growth of atmospheric methane: implications for the oxidative capacity of the troposphere, American Geophysical Union Fall Meeting (San Francisco, Dec 12-16, 2016), Abstract A22G-08.

### 3. SELECTED INVITED LECTURES

- “Atmospheric Composition and Climate Change”, presentation at MIT Club of Nevada, University of Nevada, Las Vegas, Nevada, 30 January 2001
- “Environment and Global Change”, presentation at the 25<sup>th</sup> Anniversary of the White House Office of Science and Technology Policy Symposium. MIT, 1 May 2001
- “Significant Changes in Atmospheric OH over the past 22 Years”, presentation to Climate Conference at Universiteit Utrecht, Utrecht, Netherlands, 23 August 2001
- “Human Impact on air chemistry and quality”, presentation to Revelle Climate Policy Program Meeting at Scripps Institution of Oceanography, 10 September 2001
- “Predicting Future Climate Change: Science, Economics, Technology, and Social Science”, Presentation at the IPIECA Symposium on Long-Term Carbon and Energy Management: Issues and Approaches, Cambridge, MA, 15 October 2001
- “Is the oxidizing capability of the atmosphere decreasing?”, presentation to Yale University Department of Geology and Geophysics, New Haven, CT., 23 October 2001
- “Verification of Emissions by Inverse Modelling”, presentation at the Third International Symposium on Non-CO<sub>2</sub> Greenhouse Gases (NCGG), Maastricht, The Netherlands, 22 January 2002
- “Climate, Change: Uncertainty and Policy Implications”, presentation at Alliance for Global Sustainability Symposium, San Juan, Costa Rica, 21 March 2002
- “Atmospheric and Biospheric Traumas caused by Great Impacts”, MIT-MASS Seminar, 18 April 2002.  
“Climate Change: Integrating Science, Economics and Policy under Uncertainty”, presentation at Cambridge-MIT Distinguished Lecture Broadcast, Cambridge, MA, 24 April 2002.
- “Is the Cleansing Capacity of the Atmosphere Changing”, presentation at CEEPR-MIT Energy and Environmental Policy Workshop, 2 May 2002.
- “The AGAGE Program: Global and Regional Trends in Trace Gases and Inferred Emissions and OH Trends”, presentation to NIES, Tsukuba, Japan, 20 May 2002.
- “From Complex Science to Contentious Policy: Lessons from Global Warming”, opening session presentation at Technology Day (organized by the MIT Alumni Association), Cambridge, MA, 8 June 2002.
- “Climate Change: State of Science and Implications for Policy” presentation at the 17<sup>th</sup> World Petroleum Congress, Rio De Janeiro, Brazil, 2 September 2002.
- “Climate Change and Climate-ecosystem Interactions”, presentation at SUNY, Stonybrook, NY, 11 September 2002.
- “Detection of OH Trends”, presentation at IGAC-VII and CACGP-X Symposium, Crete, 20 September 2002.  
“Is the cleansing capacity of the atmosphere changing?” Graduate School of Oceanography seminar at University of Rhode Island, Narragansett, RI, 2 October 2002.
- “Climate Change and Climate-Ecosystem Interaction”, The 2002 Harris Lecture at Texas A&M University, 8 October 2002. “Climate Change: From uncertain Science to Contentious Policy”, Soil and Crop Sciences seminar at Texas A&M University, 9 October 2002.
- “AGAGE Trace Gas Measurements from 1978-2002 and Implications for Atmospheric Chemistry”, presentation at Harvard Atmospheric Chemistry Seminar, Cambridge, MA, 25 October 2002.
- “Global Warming: From Complex Science to Contentious Policy”, MIT on the Road presentation, Detroit, MI, 2 November 2002.
- “Climate Change: Uncertainty and Linkages to Urban Air Pollution”, CICERO - Univ. Oslo, Norway, 22 October 2002.
- “Climate Change: Complexities and Uncertainties”, Symposium on Climate Change, Cosmo CAIXA, Museo de la Ciencia, Madrid, Spain, 20 March 2003.



- “Climate Change: Complexities and Uncertainties”, Plenary Lecture, 5<sup>th</sup> International Conference on Environmental Future, ETH, Zurich, Switzerland, 23 March 2003.
- “Recent Developments and Issues in Climate Change Science”, EPRI Global Change Research Seminar, Arlington, VA, 28 May 2003.
- “Climate Change: Complexities and Uncertainties”, MIT Knight Science Journalism Lecture Series, 2 April 2003.
- “Climate Change: From Uncertain Science to Contentious Policy”, The Boston Group Seminar, 16 April 2003.  
“Atmospheric Chemical Change, Air Pollution, and Climate”, Union Lecture, 23<sup>rd</sup> General Assembly of IUGG, Sapporo, Japan, 3 July 2003.
- “Is the Cleansing Capacity of the Atmosphere (OH Concentration) Changing?” invited talk, Presidential Symposium on the Chemistry of Global Climate Change, 226<sup>th</sup> Annual American Chemical Society Meeting, New York, 8 September 2003.
- “Biocomplexity: Feedbacks Between Ecosystems and the Climate System” presentation to the National Science Foundation Biocomplexity in the Environment Awardees Meeting, Arlington, Virginia, 16 September 2003.
- “Estimation of trace gas fluxes by inverse modeling”, invited talk, AGU Fall Meeting, San Francisco, CA, 12 December 2003.
- “Ensemble Climate Predictions using a Global Model Coupling Economics, Chemistry, Climate Dynamics and Ecosystems”, Ecosystems Center, Marine Biology Laboratory, Woods Hole, MA, 16 December 2003.
- “Global Warming: Complex Science to Contentious Policy”, MIT Club, Portland, OR, 12 January 2004.  
“Global Warming”, MIT Knight Science Journalist Lecture Series, 3 March 2004.
- “Interaction of Climate Change with Regional Air Quality”, invited lecture, EPRI Ninth Annual Global Change Seminar, Washington, D.C., 3 June 2004.
- “Air pollution control: effects on climate”, XXII MIT Global Change Forum, Venice, Italy, 10 June 2004.  
“Climate Change: Past, present and future”, invited lecture, Cambiamenti Climatici Scenari e Politiche, Ateneo Veneto/FEEM, Venice, Italy, 8 June 2004.
- “Climate Change: Integrating Science, Economics and Policy”, The tenth C.H.B. Priestley Lecture, CSIRO, Aspendale, Australia, 6 December, 2004.
- “Determination of methane emissions by region and generating process using inverse methods”, invited lecture, AGU Fall Meeting, 17 December, 2004.
- “Integrated Assessment using a Global Model coupling Economics, Chemistry, Climate Dynamics and Ecosystems”, invited lecture, German National Colloquium on Global Change Research, Berlin, 23 November 2004.
- “Interactions between Air Pollution and Climate”, invited Multimedia lecture, EPRI Environmental Conference, Monterey, CA, 14 February 2005.
- “Climate Change: Integrating Science, Economics and Policy”, EPRI Global Change Committee, Monterey, CA, 15 February 2005.
- “Climate Change Science”, invited lecture, Meet The Scientists Program, Museum of Science, Boston, 11 February 2005.
- “Climate and Air Quality: Integration of Science and Policy”, Invited talk, EPRI Workshop on interactions of climate change and regional air quality”, Washington D.C., 27 April 2005.
- “Global Warming”, Invited keynote address, 50<sup>th</sup> Reunion of the MIT Class of 1955, MIT, 3 June 2005.  
“Climate and Air Quality: Integration of Science and Policy”, invited lecture, Gwangju Institute of Science and Technology, Gwangju, Korea, 14 June 2005.
- “Climate Change: Integration of Science, Economics, and Policy”, Keynote lecture, Tenth Anniversary GIST Symposium on Science, Technology and Policy for Sustainability, Gwangju, Korea, 15 June 2005.

- “Uncertainties in climate forecasts: Coupled modeling of the economics and natural components of the Earth System”, invited keynote lecture, First Workshop, International Postdoctoral Scientist Network for Earth System Science, Breckenridge, CO, 24 June 2005.
- “Integrated View of Emission Scenarios: Probabilities, observational tests and feedbacks with other issues”, invited talk, IPCC Workshop on New Emission Scenarios, IIASA, Laxenburg, Austria, 29 June 2005.
- “Uncertainties in climate forecasts: Coupled modelling of the economic and natural components of the Earth System”, invited talk, TEPCO Symposium, Tokyo, Japan, 1 September 2005.
- “Understanding atmosphere-biosphere interactions: Lessons from an Integrated Global System Model and Inverse Modeling”, invited talk, NAS/NRC, Irvine, CA, 30 September 2005.
- “Climate Change: Past, Present, and Future”, invited talk, 1<sup>st</sup> TOTAL University Symposium, MIT, 16 November 2005.
- “Effects of Air Pollution Control on Climate”, invited talk, 4<sup>th</sup> CONCAWE Symposium, Brussels, Belgium, 1 December 2005.
- “Climate Change: Past, Present and Future”, invited talk, ELIAS, MIT, Cambridge, MA, March 6, 2006.  
“Integration of the Science and Economics of Climate Change”, invited talk, Climate Change and Governance Conference, Wellington, New Zealand, March 28, 2006.
- “Integrating the Science and Economics of Climate Change and the Role of the Ocean”, invited lecture, CSIRO Marine and Atmospheric Research Center, Hobart, Tasmania, April 6, 2006.
- “Integrating the Issues of Energy and Environment”, MIT Energy Forum, Cambridge, MA, May 3, 2006.  
“Sustaining a Habitable Earth: Lessons from Climate Change”, invited lecture, University of Michigan, Ann Arbor, May 22, 2006.
- “Is the self-cleaning capability of the atmosphere (OH concentration) changing?”, invited lecture, University of Michigan, Ann Arbor, May 23, 2006.
- “Climate Change: Forecasts and Lowering Risks”, invited talk, TOTAL University Symposium, Paris, France, June 13, 2006.
- “Climate and Energy: Uncertainties in Forecasts and the Problems of Scale”, invited talk, MIT Energy Course, Cambridge, MA, June 15, 2006.
- “Climate Change: Integration of Science and Energy Policy”, invited talk, b-TEC/MIT Symposium, Barcelona, Spain, June 19, 2006.
- “Forecasting Climate Change and Evaluating Policy”, invited Plenary Lecture, International Building Performance Simulation Association, 2<sup>nd</sup> national conference, Simbuild 2006, Cambridge MA, August 3, 2006.
- “How good are climate forecasts?”, Environmental Business Council Seminar, invited talk, Boston MA, Sept. 12, 2006.
- “Developments in Climate Science”, invited talk, TOTAL-MIT-FRANCE Seminar, Cambridge MA, Nov. 13, 2006.
- “How the Global Environment impacts America: The Science of the Issue”, Invited Lecture and Discussion with the Newly Elected Members of Congress, Kennedy School, Harvard Univ., Cambridge MA, Nov. 30, 2006.
- “Climate change: A growing scientific impetus for policy”, Invited Oral Testimony to the Committee on Ways and Means, Hearing on Energy and Tax Policy, U.S. House of Representatives, Washington D.C., Feb. 28, 2007.
- “Global Climate: State of Science”, Invited Lecture, EPRI Environment Sector Council Meeting, San Francisco CA, March 8, 2007.
- “The Global Climate Machine: How Climate Works”, Knight Science Journalism “Great Global Crisis Boot Camp”, Cambridge MA, March 21, 2007.

- “Sustaining a Habitable Earth: Lessons from Climate Change”, Invited Plenary Lecture, Presidential Symposium, Sustainability: A World View, American Chemical Society, 233<sup>rd</sup> National Meeting, Chicago IL, Mar. 25, 2007.
- “Integrated Assessment of Global Climate Change”, Invited Seminar, Harvard University, Cambridge MA, April 27, 2007.
- “Some recent scientific results from the Advanced Global Atmospheric Gases Experiment (AGAGE) network”, NOAA Earth System Research Laboratory, Global Monitoring Division Annual Meeting, Boulder CO, May 2, 2007.
- “Recent global changes in greenhouse gases: how much and why?”, MIT Earth Systems Initiative, Invited Seminar, Cambridge MA, May 7, 2007.
- “Geo-engineering: Comments with a focus on effects of reducing solar radiative forcing”, presentation to 26th MIT Global Change Forum, Cambridge MA, June 21, 2007.
- “OH From Methyl Chloroform: Recent Results, Future Use & Alternatives”, Max Planck Institute for Chemistry, Global OH Workshop, Mainz, Germany, June 25, 2007.
- “The Climate Machine: Past, Present & Future”, Invited Lecture, Kapitan Khlebnikov Expedition, Siberian Arctic, 10 July 2007.
- “The Greenhouse Gamble: The Economics And Politics Of Climate”, Invited Lecture, Kapitan Khlebnikov Expedition, Siberian Arctic, July 14, 2007.
- “Arctic Climate: Now & 30 To 100 Years From Now”, Invited Lecture, Kapitan Khlebnikov Expedition, Siberian Arctic, 16 July 2007.
- “Climate: State Of Science With A Focus On The 2007 Intergovernmental Assessment”, Keynote Address, National Conference of State Legislatures, Boston MA, August 7, 2007.
- “Climate & Energy: Past, Present & Future”, Rocky Mountain Natural Gas Strategy Conference & Investment Forum, Keynote Address, Denver CO, 14 August 2007.
- “Global Climate Change: Science, Economics And Policy”, Keynote Address, Mount Washington Observatory Symposium for Air & Climate, Mt. Washington NH, 7 September 2007.
- “Global Climate Change: Science, Economics And Policy”, Invited Talk, MIT Class of 1950, Annapolis, MD, 25 September 2007.
- “Climate Change: Science, Economics And Policy”, Invited Talk, Imperial College of London Centenary Meeting, Cambridge, MA, 26 September 2007.
- “Anthropogenic Climate Change: Science, Economics And Policy”, Invited Talk, Earth System Revolutions Symposium, ESI/CGCS, MIT, Cambridge, MA, 9 October 2007.
- “Climate Change: Science, Economics And Policy”, Presentation To The Knight Science Journalism Fellows, MIT, Cambridge MA, 11 October 2007.
- “Climate Change: A Growing Scientific Impetus For Policy”, Presentation To Southern Company Joint Board Forum, Atlanta, GA, 15 October 2007.
- “Climate Change Science, Economics And Policy In The USA”, Keynote Address, Universite Total Seminar, Houston, TX, October 22, 2007.
- “Climate Change: A Growing Scientific Impetus For Policy”, Plenary Lecture, Committee On Economic Development Of Australia, Symposium On Climate Change, Sydney, Australia, 15 November 2007.
- “Climate Change: Science, Economics And Policy”, Invited University Lecture, Worcester Polytechnic Institute, Worcester MA, December 10, 2007.
- “Hydroxyl Radical Determination From Methyl Chloroform: Current Utility And Future Viability”, Invited Lecture, AGU Fall Meeting, San Francisco CA, December 14, 2007.
- “Climate Change: Science, Economics And Policy,” invited seminar, MIT Club of Washington, Kenwood Country Club, Baltimore MD, January 15, 2008.

- “Future Energy Options: Timetable for Action, Needed Scales and Implications, and Land Conversion For Bio-fuels,” invited presentation, CERAWEEK, Climate Change and Clean Energy Summit, Houston TX, February 11, 2008.
- “Climate Change: Science, Economics And Policy,” invited talk, MIT Focus On Climate Change Seminar Series, Cambridge MA, February 12, 2008.
- “Climate Change: Integrating Science, Economics and Policy,” invited talk, U.S. Geological Survey (USGS)-MIT First Global Climate Change Conference, MIT, March 5, 2008.
- “Environmental Implications of Wind and Solar Power at Very Large Scales”, invited talk, Twenty-seventh MIT Global Change Forum, Arlington, VA, March 28, 2008.
- “Geo-Engineering: At Best a Last Resort, At Worst a Diversion with Dangerous Unintended Consequences?”, invited talk, European Geophysical Union Great Geo-Engineering Debate, Vienna, Austria, April 15, 2008.
- “Climate Change: State of the Science, and Implications for Economics and Policy”, invited Plenary Presentation, KPMG 2008 Global Energy Conference, Houston, TX, May 21, 2008.
- “Climate Change: State of the Science, and the Needed Actions for Mitigation and Adaptation”, invited talk, Université Total: Ethical, Environmental and Social Responsibilities Conference, Calgary, Canada, May 29, 2008.
- “Climate Change: State of the Science, and Implications for Economics, Policy and Natural Gas”, invited Plenary presentation, COGA Natural Gas Strategy Conference and Investment Forum, Denver, CO, July 9, 2008.
- “Climate Change: State of the Science, and Implications for Economics and Policy”, invited talk, Symposium on Renewable Energy: Capturing the Sun, MIT, Cambridge, MA, August 4, 2008.
- “Climate Change: Causes, Forecasts and Impacts,” invited presentation to Inaugural Energy Fellows Symposium, MIT, Cambridge MA, September 22, 2008.
- “Climate Change: State of the Science, and Implications for Economics, Technology and Policy,” invited keynote address, Ontario Society of Professional Engineers, Symposium on Engineering in a Climate of Change, Ontario Science Center, Toronto, October 16, 2008.
- “Current Estimates of Climate Change Risk: Results from recent MIT ensemble forecasts with and without stabilization policies”, invited talk, 28th MIT Global Change Forum, Cambridge MA, October 30, 2008.
- “Climate Change: Causes, Forecasts, Impacts & New Energy at Scale,” presentation to Université Total Symposium, MIT, Cambridge, MA, November 11, 2008.
- “Recent Global Changes in Greenhouse Gases: How much and why?”, invited lecture, S.U.N.Y Stonybrook, NY, November 19, 2008.
- “The Future of Energy: Climate Change & New Energy Systems to Mitigate its Impacts,” invited presentation to Total Symposium, Marseilles, France, November 20, 2008.
- “Current and Future Emissions and Concentrations of Trace Gases Impacting the Stratosphere,” Invited lecture, AGU Fall Meeting, San Francisco, CA, December 15, 2008.
- “Climate change: Integrating Science, and Economics,” Invited Union Lecture, AGU Fall Meeting, San Francisco, CA, December 22, 2008.
- “The climate machine: Past, present and future”, Invited Lecture, Clipper Odyssey Expedition, New Zealand, January 18, 2009.
- “The greenhouse gamble: The economics & politics of climate”, Invited Lecture, Clipper Odyssey Expedition, New Zealand, January 22, 2009.
- “USA, New Zealand and other regional climates up to 100 years from now”, Invited Lecture, Clipper Odyssey Expedition, New Zealand, January 23, 2009.
- “Climate change: Integrating science, economics, technology and policy”, Invited Lecture, MIT Lincoln Laboratory, February 13, 2009.

- “The future of wind power as a source of energy in the world”, Invited Lecture, Rutgers Energy Institute Fourth Annual Energy Symposium, Rutgers University, NJ, May 6, 2009.
- “Optimal source/sink estimation using measurements, process models & 3D global circulation models”, Invited Lecture, Symposium on the Greenhouse Gas Information System, DOE Sandia National Laboratory, Albuquerque, NM, May 21, 2009.
- “21st Century Climate Change: Warmer Forecasts”, Invited Lecture, Boston Society of Civil Engineers, Boston, MA, May 14, 2009.
- “New MIT Forecasts of 21st Century Climate Change”, Invited Lecture, Cambridge City Hall Energy Forum, Cambridge, MA, April 30, 2009.
- “Probabilistic Forecasts for 21st Century Climate Based on Uncertainties in Emissions”, Invited Talk, European Geophysical Union Annual Meeting, Vienna, Austria, April 23, 2009.
- “Climate change: integrating science, economics, technology and policy”, Invited Talk, Carbon Markets USA Symposium, Washington DC, September 21, 2009.
- “Climate Change Science, Economics, Technology and Policy: Implications for future Energy & High Technology Industries”, Keynote Address, EPOCH-ILP Workshop, Taipei, Taiwan, October 12, 2009.
- “Climate Change Science, Economics, Technology and Policy: Implications for future Energy Producers & Users”, Invited Talk, ILP Special Meeting, Bangkok, Thailand, October 15, 2009.
- “Climate Change: Implications for Developing Countries & their Industries”, Invited Lecture, ILP Members Workshop, Manila, Philippines, October 13, 2009.
- “The Great Climate-Gate Debate”, Panelist, MIT, Thursday, December 10, 2009.
- “Climate Change: Integrating Science, Economics, Technology and Policy”, Invited Opening Lecture, KFAS-Kuwait Center Conference, Kuwait City, January 18, 2010.
- “Climate Change Science, Economics, Technology and Policy: Implications for future Energy, Agriculture and High Technology Industries, Invited Lecture, MIT in Japan Conference, Keidanren Kaikan, Tokyo, January 22, 2010.
- “Arctic Warming: Risks for Methane Emissions, Sea Ice Loss & Oceanic Overturn”, Invited Lecture, The Cambridge Forum, Cambridge, MA, January 28, 2010.
- “Climate Change; Integrating Science, Economics, Technology and Policy”, Invited Seminar, Boston University, February 26, 2010.
- “Advances in Natural Systems Representation in the MIT Integrated Global System Model (IGSM)”, Presentation to DOE Integrated Assessment Workshop, March 29, 2010.
- “Climate Change: Challenging Science, Economics, Technology and Policy”, MIT Alumni Day Keynote Lecture, June 4, 2010.
- “Climate Change: Challenging Science, Economics, Technology and Policy”, Bank of America Merrill Lynch Clean Tech at MIT Day, June 16, 2010.
- “Climate Change: Challenging Science, Technology and Policy”, Invited Lecture, Cornell Earth & Atmospheric Sciences Fall Seminar Series, September 15, 2010.
- “Climate Change: Impacts and Policy”, MIT Energy Futures Conference, Principality of Monaco, September 23, 2010.
- “Climate Change: State of the Science, Forecasts & New Energy at Scale”, Invited Lecture, MIT-IEEJ Energy & Global Change Workshop, Tokyo, September 30, 2010.
- “Optimal Source/Sink Estimation using Measurements, Process Models & 3D Global Circulation Models”, Invited seminar, Tokyo Institute of Technology, Yokohama, Japan, October 1, 2010.
- “Assessing Metrics and Simplified Aviation Climate Impact Models.” Presentation at DOT-FAA-ACCRI Pls Meeting, Constitution Center, Washington, D.C., November 18, 2010.
- “Toward a Comprehensive Earth System Model”, Invited Lecture, Sackler Colloquium: Fostering Advances in Inter-Disciplinary Climate Science, National Academy of Sciences, Washington, D.C., April 1, 2011.

- “Climate Forcing and Climate Change in the Amazon Region and the Globe.” Presentation at Conferencia Brazil-MIT, Cambridge, MA, April 15, 2011.
- “The Science of Climate Change”, Presentation at MIT-China Low Carbon Leadership Program, Cambridge, MA, April 19, 2011.
- “Rethinking Climate Change: The Next 100 Years”, Presentation at MIT Panel “Rethinking Climate Change”, Colloquium for Earth Week, April 21, 2011.
- “Why Do We Need Earth System Models?” Presentation at Forum France-MIT, Paris, France, June 29, 2011. “Hot Issues in Climate Science,” Sponsors’ Webinar Series #1, MIT Joint Program on the Science and Policy of Global Change, September 15, 2011.
- “Potential Climatic Impacts and Reliability of Large-Scale Onshore and Offshore Wind Farms”, Presentation to DOE’s Climate and Earth System Modeling Principal Investigators’ Meeting, Washington, D.C., September 21, 2011.
- “Climate Policy: Why Are We Waiting?” Presentation at Knight Science Journalism Event, “Climate Change: When Policymakers Fail”, MIT, October 4, 2011.
- “Climate Change: Current Trends, Forecasts and Implications for Economics and Policy.” Invited Seminar, National Institute for Environmental Studies, Tsukuba, Ibaraki, Japan, October 25, 2011.
- “Climate Change: Current Trends, Forecast and Policy,” Invited Seminar at Tokyo Institute of Technology, Yokohama, Japan, October 26, 2011.
- “Advanced Global Atmospheric Gases Experiment (AGAGE): An NDACC Cooperating Network”, Presentation at 20<sup>th</sup> Anniversary Symposium of Network for the Detection of Atmospheric Composition Change, Reunion Island, November 10, 2011.
- “The Science of Global Climate Change”, Presentation at MIT-China Low Carbon Leadership Program, Cambridge, MA, December 5, 2011.
- “Climate Change”, Presentation at MIT Environmental Research Forum, Cambridge, MA, December 15, 2011. “Climate Change: Challenging Science, Technology, Economics and Policy”, Collins Lecture, Massachusetts General Hospital, Boston, MA, December 20, 2011.
- “Climate: Observations, Forecasts, Economics, Technology & Policy”, invited lecture, CENSAM Fifth Annual Workshop, National University of Singapore, January 12, 2012.
- “Climate Change: What Has Happened and Why?”, invited lecture, Classic Seychelles Odyssey Cruise, January 28-February 10, 2012.
- “Climate Change: Predicting the Future, and the Greenhouse Gamble”, invited lecture, Classic Seychelles Odyssey Cruise, January 28-February 10, 2012.
- “Climate Change: Economics and Policy”, invited lecture, Classic Seychelles Odyssey Cruise, January 28-February 10, 2012.
- “Development and Application of Earth System Models,” invited address, at CSIRO, Center for Marine & Atmospheric Research, Aspendale, Victoria, Australia, February 20, 2012.
- “Development of Earth System Models and Application to Climate Policy”, invited lecture at Victoria University & NIWA, Wellington, New Zealand, February 23, 2012.
- “Uncertainties in Global Change Modeling” and “The MIT Integrated Global Systems Modeling Experience”, invited address, Vale Technological Institute for Sustainable Development, International Workshop on Global Change and Sustainability, Belém, Pará, Brasil, March 7, 2012.
- “The MIT IGSM (Integrated Global System Model) Modeling Experience”, invited address, Vale Technological Institute for Sustainable Development, International Workshop on Global Change and Sustainability, Belém, Pará, Brasil, March 8, 2012.
- “National Emissions Verification by Merging Earth System Measurements, Global Social Data and Earth System Models,” keynote address at 40<sup>th</sup> NOAA ESRL Global Monitoring Annual Conference, Boulder, CO, May 16, 2012

- “Development and Application of Complex Integrated Assessment Models,” invited presentation, NAS (USA)-Royal Society (UK) Sackler Forum on Integrated Assessment Models & Future Needs of Climate Change Research, Kavli Royal Society International Centre, UK, September 19, 2012.
- “The Science of Climate & Implications for Economics, Technology & Policy”, invited lecture, MIT-China Low Carbon Energy Leadership Program, MIT, August 31, 2012
- “The Science of Global Climate Change & Implications for Economics, Technology & Policy”, invited lecture, MIT-China Low Carbon Energy Leadership Program, MIT, September 14, 2012.
- “Improvements in Climate Science, Technology and Policy & Solutions to Climate Change Challenges”, presentation to National Climate Change Secretariat, Office of the Prime Minister, Singapore, October 8, 2012
- “Climate Change: A Challenge to Science, Economics, Technology & Policy”, invited presentation to National University of Singapore (NUS) & SMART, Singapore, October 9, 2012.
- “Global Climate Change: Science & Implications for Economics, Technology & Policy”, invited lecture, MIT-China Low Carbon Energy Leadership Program, MIT, October 30, 2012.
- “Climate Change: Current Trends, Forecasts & Implications for Energy Technology & Policy”, invited lecture, Total-MIT Seminar: Energy Agenda in a World of Crises, MIT, November 7, 2012.
- “Roles of Aviation Emissions on CH<sub>4</sub>, O<sub>3</sub> and NO<sub>x</sub> Distributions: Multi-Model Results”, presentation at DOT-ACCRI Third Annual Symposium, Virginia Beach, VA, November 27, 2012.
- “Integrated Earth System Models: Critical Tools for Environmentally and Economically Beneficial Development of Future Energy, Food and Water Resources”, Invited Keynote Lecture, 100<sup>th</sup> Indian Science Congress, D. N. Wadia Session on Earth System Sciences, Kolkata, India, January 4, 2013.
- “Predicting the Future with Earth System Models: Critical Tools for Environmentally and Economically Beneficial Development of Future Energy, Food and Water Resources”, Invited Keynote Address to Awardees, Jagadis Bose National Science Talent Search (JBNSTS), Annual award Ceremony, Jagadis Bose Centre, Kolkata, India, January 5, 2013.
- “The MIT Integrated Global System Model: A Guide for Environmentally and Economically Beneficial Development of Energy, Food and Water Resources,” Visiting Scholar, invited address to Faculty Fellows, Martin Institute for Law and Society, Stonehill College, Easton, MA, March 13, 2013.
- “Climate Change Science: What we know and what we do not know,” invited address at Workshop eni-MIT “Global Change”, Eni Corporate University, San Donato Milanese, Italy, March 25, 2013.
- “Climate Change and Implications for Future Water and Energy Resources”, invited address at Eni Workshop: Energy and Water Nexus, San Donato Milanese, March 26, 2013
- “Climate Change: Its Potential Impact on Major Cities,” invited presentation to Partners’ annual meeting at MIT Center for Real Estate, April 5, 2013.
- “Global Measurements and Cycles of Atmospheric Gases: Past, Present, and Future”, Keynote Speaker at Symposium in Honor of Distinguished Professor Ray F. Weiss, Scripps Institute of Oceanography, University of California at San Diego, La Jolla, CA, May 29, 2013.
- “The MIT Integrated Global System Model” invited speaker, Global Energy Outlook and the Big Transitions, Aspen Seminars for Leaders, Aspen Institute Italia, Venice, Italy, July 13, 2013.
- “The MIT Integrated Global System Model: A Guide for Environmentally and Economically Beneficial Development of Energy, Food and Water Resources,” invited talk, CNPEM-MIT Workshop, Campinas, Brazil, July 18, 2013.
- “The Science of Global Climate Change & Implications for Economics, Technology & Policy,” invited talk, MIT-China Low Carbon Energy Leaders Program, MIT, Cambridge, MA, September 9, 2013.
- “Climate Change: State of Science & Implications for Technology & Policy,” invited talk, MITEI Fall Research Conference, MIT, Cambridge, MA, October 3, 2013.
- “Methane Concentrations, Sources and Sinks: Past, Present and Future”, invited talk at IPIECA Workshop: Short-Lived Climate Forcers, Eni, Rome, Italy, October 8, 2013.

- “Climate Change and Mitigation”, invited presentation with Henry Jacoby to MITEI External Advisory Board, MIT, Cambridge, MA, October 25, 2013.
- “Smart Cities Grow But Also Sustain the Environment”, invited panelist, “Smart Cities: the Future of Urbanisation”, Transform Africa Summit, Kigali, Rwanda, October 30, 2013.
- “Climate Change Science: Implications for Economics, Technology, and Policy”, TOTAL Seminar, MIT-France Program, MIT, Cambridge, MA, November 6, 2013.
- “Integrated Global System Models: New Tools for Environmentally and Economically Beneficial Development of energy, Food and Water Resources”, invited lecture, Center for Integrated Earth System Science, University of Texas at Austin, November 18, 2013.
- “The MIT Integrated Global System Model: A Facility for Assessing and Communicating Climate Change Uncertainty,” invited presentation, American Geophysical Union Fall Meeting, San Francisco, CA, December 11, 2013.
- “Air Pollution & Climate Change: Trends, Causes, & Future Impacts”, Invited Lecture for Lab4Energy Educational Project of Fondazione Eni Enrico Mattei of Milan, Italy, videotaped in Cambridge, MA, February 14, 2014.
- “Ozone Depletion and Climate Change: Analysis of Science and Policy using Global Measurements and a Global System Model”, Invited presentation at Symposium in Honor of Professor Mario Molina, Robert Paine Scripps Forum, University of California at San Diego, La Jolla, CA, May 12, 2014.
- “Climate Change: (1) Evidence, Causes & Projections: MIT & IPCC, (2) Impacts, Mitigation & Adaptation,(3) Effects on Economy & Business”, Invited presentation to MIT ILP Japan Members, Tokyo, Japan, August 19, 2014.
- “Climate Change: (1) Evidence, Causes & Projections, (2) Effects on Business & Economies, (3) Impacts on the Oceans”, Invited presentation to Epoch-MIT ILP, Delta Electronics Foundation, Taipei, Taiwan, August 21, 2014.
- “Climate Change & Air Pollution: Science, Impacts and Adaptation with an African focus”, Invited Lecture, University of Rwanda, Kigali, Rwanda, October 22, 2014.
- “Climate Change Science: Implications for Economics, Technology and Policy”, Invited presentation at Université Total Seminar, MIT-France Program, MIT, Cambridge, MA, November 10, 2014.
- “Climate Change: Past, Present and Possible Futures”, Invited presentation, MIT Alumni Travel, M.S. Caledonian Sky, January 3, 2015.
- “The Climate Gamble: Economics, Technology and Policy”, Invited presentation, MIT Alumni Travel, M.S. Caledonian Sky, January 6, 2015
- “Lowering risks of climate change by mitigation and adaptation”, Invited panelist, “Looking Forward to Energy in 2025,” Plenary Panel at 10th annual MIT Energy Conference, MIT, Cambridge, MA, February 28, 2015
- “Climate Change & Air Pollution: Science, Impacts & Adaptation with an African Focus”, Invited Lecture, University of Rwanda/CST/CBE, Kigali, Rwanda, March 26, 2015
- “Climate Science & the Importance of Land & Water”, Presentation at Symposium on Land & Water Resources: looking into the future, MIT, April 29, 2015
- “The Climate Challenge: Toward a Low-Carbon Energy Economy”, Invited presentation, Low-Carbon Energy Economy Workshop, MIT, Cambridge, MA, May 26, 2015
- “Status of the Advanced Global Atmospheric Gases Experiment (AGAGE): An NDACC Cooperating Network”, Invited presentation, NDACC Steering Committee Meeting, La Jolla, CA, October 13, 2015
- “Introduction to Atmospheric & Climate Science,” Invited Lecture, Inauguration of the Masters degree in Atmospheric & Climate Science, College of Science & Technology, University of Rwanda, Kigali, Rwanda, November 4, 2015
- “Climate Change: Science and Policy,” Invited presentation, Newton Inspires Forum, Newton Schools Foundation, Newton, MA November 9, 2015



- “Climate Change: Science, Economics, Technology and Policy,” Invited presentation, Université Total, MIT-France Program, MIT, Cambridge, MA, November 10, 2015
- “Meeting the Climate Challenge of 2°C: A Study using an Integrated Economics & Earth System Model”, Invited Keynote Lecture, Mario Molina Symposium, American Meteorological Society, New Orleans, LA, January 12, 2016.
- “Climate Change: the Greenhouse Gamble and the Challenge of 2°C”, Invited Talk, MIT on CLIMATE = Science + Action Symposium, MIT, January 27, 2016.
- “Climate Change: Science, Impacts, Solutions and Adaptation with an African Focus,” Invited Lecture, Carnegie Mellon University, Kigali campus, Rwanda, April 21, 2016.
- “Lowering Risks of Climate Change: the Greenhouse Gamble and the Challenge of 2°C”, Invited Panelist, MIT Sustainability Connect 2016, MIT, May 9, 2016.
- “Benefits of a World-class Climate and Greenhouse Gas Observatory in the Azores,” Invited Presentation, Atlantic Interactions: Knowledge, Climate Change, Space and Oceans, 2<sup>nd</sup> Workshop, FCT – Fundação para a Ciência e a Tecnologia, University of the Azores, Ponta Delgada campus, Portugal, June 27, 2016.
- “Benefits of a World-class Climate and Greenhouse Gas Observatory in the Azores,” Invited Presentation, Azores International Research (AIR) Center Meeting, European Commission, Brussels, Belgium, September 18, 2016.
- “Wild Weather and Climate Change,” Invited Webinar designed specifically for the sponsor membership of the M.I.T. Joint Program on the Science and Policy of Global Change, September 29, 2016.
- “Advanced Global Atmospheric Gases Experiment (AGAGE): An Overview,” Invited Presentation, Network for Detection of Atmospheric Composition Change (NDACC), International Steering Committee Annual Meeting, Bremen, Germany, October 18, 2016.
- “Theme Group for Combining Trace Gas Data from NDACC and Cooperating Networks,” Invited Presentation, Network for Detection of Atmospheric Composition Change (NDACC), International Steering Committee Annual Meeting, Bremen, Germany, October 19, 2016.
- “Advanced Global Atmospheric Gases Experiment (AGAGE): An Overview,” Invited Presentation, Joint Meeting of WMO-GAW Reactive Gases Advisory Group and Advanced Global Atmospheric Gases Experiment (AGAGE) Scientists, Stanley, Tasmania, November 12, 2016.
- “Climate Change: Physics, Chemistry, Biology, Economics, Technology & Policy,” Invited Presentation, American Chemical Society Northeastern University Student Chapter, Hurtig Hall, Boston, MA, November 17, 2016.
- “Understanding Climate Risks: Past, Present and Possible Futures,” Invited Lecture, MIT Alumni Circumnavigation of Iceland, M.S. Ocean Diamond, June 6, 2017.
- “Winning the Climate Gamble: Economics, Technology and Policy,” Invited Lecture, MIT Alumni Circumnavigation of Iceland, M.S. Ocean Diamond, June 9, 2017.
- “Climate Change Risks and the Challenge of Avoiding 2°C Warming,” The Bose Institute Centenary Invited Lecture, The Bose Institute, Kolkata, India, August 30, 2017.
- “The Dangers of Climate Change and the Task of Avoiding 2°C Warming,” Invited Lecture, The Indian Institute of Science Education and Research, Kolkata, India, August 31, 2017.
- “Global Warming: The Science, Risks & Realities of Climate Change. Can We Still Avoid the Tipping Point?” presentation at EAPS Development Department event, The Garden Court Hotel, Palo Alto, California, November 16, 2017.
- “Advanced Global Atmospheric Gases Experiment (AGAGE): An Overview,” Invited Presentation, Network for Detection of Atmospheric Composition Change (NDACC), International Steering Committee Annual Meeting, Boulder, CO, November 7, 2017.
- “Theme Group for Combining Trace Gas Data from NDACC and Cooperating Networks,” Invited Presentation, Network for Detection of Atmospheric Composition Change (NDACC), International Steering Committee Annual Meeting, Boulder, CO, November 7, 2017

- “Forty years of global measurements of the trends of ozone depleting and greenhouse gases, and estimation of the sources and sinks that drive them”, MIT EAPS Department Lecture Series, March 23, 2018.
- “Climate Change: Science, Forecasts, Risks & Responses”, Invited Presentation, University of Texas Energy Institute Board, Austin, TX, April 4, 2018.
- “Climate Change: Causes, Impacts, Solutions and Adaptations with an African Focus”, Invited Keynote Presentation, College of Science & Technology, University of Rwanda, Kigali, Rwanda, January 11, 2019.
- “Climate Change: Trends, Extremes & the 2°C Challenge,” Invited Presentation, New Dow Leadership Summit, Hollywood, FL, February 20, 2019.
- “Understanding Climate Risks: Past, Present and Possible Futures,” Invited Presentation, Arctic Svalbard Expedition, M.V. L’Austral, June 24, 2019.
- “Winning the Climate Gamble: Economics, Technology and Policy,” Invited Presentation, Arctic Svalbard Expedition, M.V. L’Austral, June 28, 2019.
- “Atmospheric Chemistry: A Century of Expanding Scientific Discovery and Societal Relevance,” Invited Keynote Speaker, American Meteorological Society, January 14, 2020.