

# Douglas G. MacMartin\*

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## Research Interests

Primary focus is on developing the knowledge needed to support informed decisions about solar geoengineering. Interests also include dynamics and feedback analysis in climate systems more generally, with application to climate dynamics and modes of variability. Previous research areas include control design for the Thirty Meter Telescope, and vibration, noise, and flow control.

## Education

- Ph.D. (1992) Massachusetts Institute of Technology, Dept. of Aeronautics and Astronautics. Major in controls; minor structural dynamics. Thesis topic: “A Stochastic Approach to Broadband Control of Parametrically Uncertain Structures”.
- S.M. (1990) Massachusetts Institute of Technology, Dept. of Aeronautics and Astronautics.
- B.A.Sc. (1987) University of Toronto, Engineering Science, Aerospace option.

## Professional Experience

- 2015-present Senior Research Associate and Senior Lecturer, Sibley School of Mechanical & Aerospace Engineering, Cornell University.
- 2015-present Visiting Associate, Computing and Mathematical Sciences, California Institute of Technology.
- 2008-2015 Research Professor of Computing and Mathematical Sciences, California Institute of Technology.
- 2008-2014 Visiting investigator, Carnegie Institution for Science (Dept. Global Ecology).
- 2010 Guest researcher, Lund University, Sweden, Department of Astronomy.
- 2006 Visiting Scientist, University of New South Wales and University of Adelaide.
- 2002-2008 Senior Research Fellow, Department of Control & Dynamical Systems, Caltech.
- 2000-2002 Visiting Associate, Department of Control & Dynamical Systems, Caltech.
- 1994-2000 Flow Control Program Manager (99-00), Active Control Theme Leader (96-99), and Senior Research Engineer (94-96), United Technologies Research Center.
- 1993-1994 Assistant Research Officer, Institute for Aerospace Research, National Research Council of Canada.
- 1992-1993 Postdoctoral Fellow, Department of Aeronautics and Astronautics, MIT.
- 1987-1992 Research Assistant, Department of Aeronautics and Astronautics, MIT.

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\* Formerly *Douglas MacMynowski*

## Honours and Awards

- Faculty Fellow, Cornell Atkinson Center for a Sustainable Future
- Associate Fellow, AIAA
- AACC O. Hugo Schuck Best Paper, Applications, 2011 American Control Conference.
- Guest researcher, Lund University, Department of Astronomy, 2010.
- UTRC Leadership Council, 1996-2000.
- UTRC Outstanding Achievement Awards for technical contributions in helicopter cabin active noise control for laboratory demonstration and successful flight test, 1994 and 1996.
- NASA Certificate of Appreciation for support of the development and flight of the Middeck Active Control Experiment, 1995
- Barbara Zdasiuk Medal for highest graduating average in Eng. Science, U. Toronto, 1987.
- Canadian Aeronautics and Space Institute (CASI) student award, Toronto branch, 1987.

## Professional Service

- Committee member, National Academies of Sciences Engineering and Medicine, 2019-2020; “Developing a Research Agenda and Research Governance Approaches for Climate Intervention Strategies that Reflect Sunlight to Cool Earth”
- Associate Fellow, AIAA, and Member, American Geophysical Union (AGU).
- Co-chair, 2017 (inaugural) Gordon Research Conference on Climate Engineering; future chair of 2020 conference.
- Advisor for DECIMALS projects supporting developing-world impacts analysis of geoengineering.
- Previous advisory roles include board of Advisors for the Forum for Climate Engineering Assessment at American University; international advisor for climate engineering program at Beijing Normal University; member of Advisory Group for second international Climate Engineering Conference (CEC17).
- AIAA Fluid Dynamics Technical Committee 2002-2006, member of Flow Control Architecture and Algorithms sub-committee, and lead editor of document clarifying flow control nomenclature to improve communications between fluids and control researchers.
- Treasurer, AIAA Guidance, Navigation and Control Technical Committee, 1998-2004.
- Area chair for “*Control and Dynamics of Flexible Structures*”, AIAA Guidance, Navigation and Control Conf., 2001-2002 and co-chair/chair for “*Multidisciplinary Control*”, 2003-2004.
- Co-organizer of “*Climate Feedbacks and Climate Dynamics*”, 2004 AGU fall meeting.
- External review panel member for JPL SMAP dynamics (Soil Moisture Active & Passive mission), and for ESO E-ELT (European Extremely Large Telescope) construction proposal. Atkinson Center AVF reviewer. Review committee chair for Giant Magellan Telescope Integrated Modeling Review, June 2017.
- Have been a reviewer for over 29 different journals spanning aerospace, controls, fluids, telescope design and climate dynamics and change; also served on ACC O. Hugo Schuck best paper committee and several AIAA best paper committees.

## Recent Research Support

- *Cornell Research in Climate Engineering* (private donor, through Atkinson Center), 2019-2021 (\$250k)
- *EAGER: Introducing a design element into stratospheric aerosol geoengineering* (NSF, Environmental Sustainability), 2018-2020 (\$300k).
- *Developing a research strategy for solar geoengineering* (private donor, through Atkinson Center); 2017-2018. (\$162K)
- *How do you construct a strategic approach to climate change by coupling geoengineering to mitigation and adaptation* (Atkinson Center for a Sustainable Future); 2016-17. (\$71K at Cornell, unburdened.) Joint with EDF.
- *Geoengineering on a Regional Scale* (Atkinson Academic Venture Fund, Cornell), 2016-17. (\$116K unburdened)
- *A Rigorous Evaluation of the Potentials and the Limitations of Climate Perturbations Using Systems Engineering Approaches*, 2015 (\$97K at Caltech), renewed 2016 (\$79K at Cornell) and 2017 (\$25K) (with Kravitz, PNNL)
- *Variability, stochastic dynamics, and compensating model errors of the Atlantic Meridional Ocean Circulation in coupled IPCC models*, (NOAA), 2013-2017. \$243K at Caltech. With Penland (NOAA) and Tziperman (Harvard).
- *Monitoring of geo-engineering effects and their natural and anthropogenic analogues*, (Keck Institute of Space Studies), 2011-2012
- *Improving Inter-annual Prediction Skill in a Changing Climate via the Identification of Compensating Coupled Model Error* (DOE), 2010-2013. \$262K at Caltech. With Eli Tziperman, Harvard.
- *Geoengineering Controllability* (Fund for Innovative Climate & Energy Research), \$200K (unburdened), 2008-2011.
- *Closed Loop Control of Vortex Formation* (AFOSR MURI), 2005-2010. PI: Tim Colonius, joint between Caltech, Princeton, Northeastern, IIT.
- *Climate: Complex system, simple behavior* (McDonnell foundation), 2003-2007. \$100K (unburdened) at Caltech. (With Eli Tziperman, Harvard)
- *Design Development* (2004-2009) and *Early Construction* (2009-20xx) of the *Thirty Meter Telescope* (Moore foundation).
- *Conceptual design of the California Extremely Large Telescope* (Caltech Board), 2000-2003.
- *Integrated Control of Inlet/Compression Systems, & Actively Stabilized Isentropic Supersonic Inlet* (DARPA Micro-Adaptive Flow Control and Quiet Supersonic Platform projects), 2000-2002. Joint project between MIT, Caltech, NASA Glenn, and Northrop Grumman.
- UTRC funding: DARPA (separation control), National Rotorcraft Tech. Center and Sikorsky (noise control), Pratt & Whitney (externals & controls management, eddy current inspection), and internal UTRC (active control leadership, flow control, noise control).

## Teaching

- Cornell:
  - MAE 4780/5780 (2015-18) *Feedback Control Systems*; undergraduate/graduate introductory controls and feedback analysis.
  - Guest lectures (on geoengineering) in STS 2011 *What is Science?*, (2015-17); NTRES 3311 *Environmental Governance*, (2016); EAS 1101 *Climate and Energy*, (2016-17); STS 3181 *Living in an Uncertain World: Science, Technology, & Risk* (2017, 2018);

STS 2061 *Environmental Ethics* (2019); and EAS 4940/6920 *Seminar on Geoengineering the Climate* (2019)

- Caltech:
  - CDS 110a/101 (2009–14; and co-instructor, 2003, 2008), *Analysis and Design of Feedback Systems*; undergraduate/graduate introductory controls and feedback analysis. (Typical combined enrollment 65-70, including engineers, biologists, etc.)
  - CDS 110b (2004–05, 2009–11) *Introduction to Control Theory*; undergraduate/graduate 2<sup>nd</sup> controls class covering estimation, optimal control, and robustness.
  - CDS 111 (2001–2004) *Applications of Control*; undergraduate/graduate class focused on laboratory implementation of control designs.
  - CDS 140 (formerly CDS140a/ACM101/AM125b) (2016, co-taught 2013) *Differential equations, dynamical systems*
  - CDS 140b (2012, co-taught 2014) *Introduction to Dynamics*; nonlinear dynamics and control
  - Ae240 (co-instructor, 2009, guest lectures 2012, 2013) *Closed-loop Flow Control*.

### Other Cornell Service

- Faculty advisor for Cornell Rocketry Team, 2018-...

### Advisees

- PhD:
  - Walker Lee
  - John Carson III (Caltech; 2009, co-advised with R. Murray)
- Postdoctoral:
  - Daniele Visioni (2018-...)
  - Wei Cheng (2017-...)
  - Wenli Wang (2017-2018)
  - Kate Ricke (2016)
  - Tait Pottebaum (Caltech, 2003-04)
- PhD Thesis Committees served on (incomplete list)
  - Sawyer Elliott (Cornell, 2019)
  - Holly Buck (Cornell, 2017)
  - Won-Tae Joe (Caltech, 2010)
  - Michael Epstein (Caltech, 2008)
  - Sean Humbert (Caltech, 2005)
  - Mark Campbell (MIT, 1996)
- MS committees served on
  - Yuzhe Sheng (2019)
  - Quanxing Lu (2018)
- MEng
  - Douglas Berman (2017)

- Undergraduate research and senior-design supervision
  - Albert Chu (2017)
  - Paul Salazar (2017-2018)
  - Isaac Sarnoff (2017)
  - Matthew Boudreau (2018)
  - Justin Cho (2018; CRT)
  - Christopher Vann (2019; CRT)
  - Dan Wolfe (2019; CRT)
- Visitors
  - Jiu Jiang (2018-2019, Zhejiang University)

## Publications

### Statistics:

72 peer-reviewed journal publications (39 first author), plus 2 book chapters, 5 patents, 73 conference papers (36 first author)

Citations (Google-scholar): 2812, h-index: 27, i-10 index: 83 (as of 6/17/19)

Useless trivia: 36 different journals, 92 different co-authors

### Links to public profiles:

- <http://scholar.google.com/citations?user=SkjV1ZQAAAAJ&hl=en>,
- <http://www.researcherid.com/rid/A-6333-2016>,
- <http://orcid.org/0000-0003-1987-9417>,

### Submitted Journal Articles:

- Irvine, P., E. Burns, K. Caldeira, F. Keutsch, D. MacMartin, D. Tingley, and D. Keith, “Identifying solar geoengineering research priorities and challenges from an expert survey and discussion”.
- Simpson, I., S. Tilmes, J. Richter, B. Kravitz, D. MacMartin, M. Mills, J. Fasullo, and A. Pendergrass, “The regional hydroclimate response to stratospheric sulfate geoengineering and the role of stratospheric heating”, *submitted*.
- MacMartin, D.G., P. Irvine, B. Kravitz, and J. Horton, “Technical characteristics of solar geoengineering deployment and implications for governance”, *submitted*.
- Aksimet, N., B. Kravitz, D.G. MacMartin, G. Haller, “Harnessing Stratospheric Diffusion Barriers to Enhance Climate Geoengineering”, *submitted*
- Visioni, D., S. Tilmes, M.J. Mills, C. Bardeen, J.H. Richter, B. Kravitz, D.G. MacMartin, I. Simpson “Changes in sulfate geoengineering efficacy due to uncertainties in model representations of high clouds”, *submitted*.
- Cheng, W., D.G. MacMartin, K. Dagon, B. Kravitz, S. Tilmes, J.H. Richter, M.J. Mills, I.R. Simpson “Soil moisture and other hydrological changes in a stratospheric aerosol geoengineering large ensemble”, *submitted*.
- Harding, A.R., J. Moreno-Cruz, D.G. MacMartin, D. Heyen, and K.L. Ricke, “Solar geoengineering reduces global income inequality”, *submitted*.

### Journal Articles:

- J72. Visioni, D., D.G. MacMartin, B. Kravitz, S. Tilmes, M.J. Mills, J.H. Richter, and M.P. Boudreau, “Seasonal injection strategies for stratospheric aerosol geoengineering”, *Geophysical Research Letters*, 2019.
- J71. Kravitz, B., D.G. MacMartin, S. Tilmes, J.H. Richter, M.J. Mills, W. Cheng, K. Dagon, A.S. Glanville, J.-F. Lamarque, I.R. Simpson, J.J. Tribbia, and F. Vitt, “Comparing surface and stratospheric impacts of geoengineering with different SO<sub>2</sub> injection strategies”, *to appear, J. Geophysical Research A*, 2019. [doi:10.1029/2019JD030329](https://doi.org/10.1029/2019JD030329)
- J70. MacMartin, D.G., W. Wang, B. Kravitz, S. Tilmes, J.H. Richter, and M.J. Mills, “Timescale for detecting the climate response to stratospheric aerosol geoengineering”, *J. Geophysical Research A*, **124**(3), 2019. [DOI:10.1029/2018JD028906](https://doi.org/10.1029/2018JD028906)
- J69. MacMartin, D.G., and B. Kravitz, “The engineering of climate engineering”, *Annual Reviews of Control, Robotics, and Autonomous Systems*, **2**:445-67, 2019. [doi:annurev-control-053018-023725](https://doi.org/10.1111/annurev-control-053018-023725)

- J68. MacMartin, D.G. and B. Kravitz, “Mission-driven research for stratospheric aerosol geoengineering”, *Proc. National Academy of Sciences*, **116**(4):1089-1094, 2019. <https://doi.org/10.1073/pnas.1811022116>
- J67. Madronich, S., S. Tilmes, B. Kravitz, D.G. MacMartin, J.H. Richter, “Response of Surface Ultraviolet and Visible Radiation to Stratospheric SO<sub>2</sub> Injections”, *Atmosphere*, **9**(11), 432, 2018. [doi:10.3390/atmos9110432](https://doi.org/10.3390/atmos9110432)
- J66. Kravitz, B., MacMartin, D.G., Tilmes, S., Richter, J.H., Mills, M.J., Lamarque, J.-F., Tribbia, J., and Large, W., “Holistic Assessment of SO<sub>2</sub> Injections using CESM1(WACCM): Introduction to the Special Issue”, *J. Geophys. Res. A.*, **123**, 2018. [doi.org/10.1029/2018JD029293](https://doi.org/10.1029/2018JD029293)
- J65. Fasullo, J.T., S. Tilmes, J. H. Richter, B. Kravitz, D.G. MacMartin, M.J. Mills, and I.R. Simpson, “Persistent polar ocean warming in a strategically geoengineered climate”, *Nature Geoscience*, 2018. [doi:10.1038/s41561-018-0249-7](https://doi.org/10.1038/s41561-018-0249-7)
- J64. Tilmes, S., J. H. Richter, B. Kravitz, D. G. MacMartin, M. J. Mills, I. Simpson, A. S. Glanville, J. T. Fasullo, A. S. Phillips, J.-F. Lamarque, J. Tribbia, J. Edwards, S. Mickelson, and S. Gosh, “CESM1(WACCM) Stratospheric Aerosol Geoengineering Large Ensemble (GLENS) Project”, *Bulletin Am. Met. Soc.*, **99**(11), 2018. <https://doi.org/10.1175/BAMS-D-17-0267.1>
- J63. Richter, J. H., S. Tilmes, A. Glanville, B. Kravitz, D. G. MacMartin, M. J. Mills, I. R. Simpson, F. Vitt, J. J. Tribbia, and J.-F. Lamarque, “Stratospheric response in the first geoengineering simulation meeting multiple surface climate objectives”, *J. Geophys. Res. A.*, **123**(11):5762-5782, 2018. <https://doi.org/10.1029/2018JD028285>
- J62. Tilmes, S., J. H. Richter, M. M. Mills, B. Kravitz, D. G. MacMartin, R. R. Garcia, D. E. Kinnison, J.-F. Lamarque, J. Tribbia, and F. Vitt, “Effects of different stratospheric SO<sub>2</sub> injection altitude on stratospheric chemistry and dynamics”, *J. Geophys. Res. A.* **123**(9): 4654-4673, 2018. <https://doi.org/10.1002/2017JD028146>
- J61. MacMartin, D. G., K. L. Ricke, and D. W. Keith, “Solar Geoengineering as part of an overall strategy for meeting the 1.5°C Paris target”, *Phil. Trans. Royal Soc. A.*, **376**: 20160454, 2018. [doi:10.1098/rsta.2016.0454](https://doi.org/10.1098/rsta.2016.0454)
- J60. Kravitz, B., D.G. MacMartin, M. J. Mills, J. H. Richter, S. Tilmes, J.-F. Lamarque, J. J. Tribbia and F. Vitt, “First simulations of designing stratospheric sulfate aerosol geoengineering to meet multiple simultaneous climate objectives”, *J. Geophys. Res. A.*, **122**, 12,616–12,634, 2017. [doi:10.1002/2017JD026874](https://doi.org/10.1002/2017JD026874)
- J59. MacMartin, D.G., B. Kravitz, S. Tilmes, J.H. Richter, M.J. Mills, J.-F. Lamarque, J.J. Tribbia, and F. Vitt, “The climate response to stratospheric aerosol geoengineering can be tailored using multiple injection locations” *J. Geophys. Res. A.*, **122**, 12,574–12,590, 2017. [doi: 10.1002/2017JD026868](https://doi.org/10.1002/2017JD026868)
- J58. Richter, J.H., S. Tilmes, M. M. Mills, J. Tribbia, B. Kravitz, D. G. MacMartin, F. Vitt and J.-F. Lamarque, “Stratospheric dynamical response and ozone feedbacks in the presence of SO<sub>2</sub> injections”, *J. Geophys. Res. A.*, **122**, 12,557–12,573, 2017. [doi:10.1002/2017JD026912](https://doi.org/10.1002/2017JD026912)
- J57. Tilmes, S., J. H. Richter, M. M. Mills, B. Kravitz, D. G. MacMartin, F. Vitt, J. Tribbia, and J.-F. Lamarque, “Sensitivity of aerosol distribution and climate response to stratospheric SO<sub>2</sub> injection locations”, *J. Geophys. Res. A.*, **122**, 12,591–12,615, 2017. [doi:10.1002/2017JD026888](https://doi.org/10.1002/2017JD026888)
- J56. Mills, M.J., J.H. Richter, S. Tilmes, B. Kravitz, D.G. MacMartin, A.A. Glanville, J.J. Tribbia, J.-F. Lamarque, F. Vitt, A. Schmidt, A. Gettelman, C. Hannay, J.T. Bacmeister, D.E. Kinnison, “Radiative and chemical response to interactive stratospheric aerosols in fully coupled CESM1(WACCM)”, *J. Geophys. Res. A.*, **122**, 13,061–13,078, 2017. [doi:10.1002/2017JD027006](https://doi.org/10.1002/2017JD027006)
- J55. Ricke, K.L., R.J. Millar and D.G. MacMartin, “Constraints on global temperature target overshoot”, *Nature Scientific Reports*, **7**, 2017. [doi:10.1038/s41598-017-14503-9](https://doi.org/10.1038/s41598-017-14503-9)

- J54. Kravitz, B., D.G. MacMartin, P.J. Rasch and H. Wang, “Technical note: Simultaneous fully dynamic characterization of multiple input-output relationships in climate models”, *Atm. Chem. Physics*, 17, 2525-2541, 2017. doi: [10.5194/acp-17-2525-2017](https://doi.org/10.5194/acp-17-2525-2017).
- J53. MacMartin, D.G. and B. Kravitz, “Dynamic climate emulator for solar geoengineering” *Atm. Chem. Physics*, 16, 15789-15799, 2016. doi: [10.5194/acp-16-15789-2016](https://doi.org/10.5194/acp-16-15789-2016).
- J52. MacMartin, D. G., B. Kravitz, J.C.S. Long, and P.J. Rasch, “Geoengineering with stratospheric aerosols: what do we not know after a decade of research?” *Earth's Future*, 4, 543-548, 2016. doi: [10.1002/2016EF000418](https://doi.org/10.1002/2016EF000418)
- J51. Kravitz, B., D. G. MacMartin, H. Wang, and P. J. Rasch, “Geoengineering as a design problem”, *Earth System Dynamics*, 7, 469-497, 2016. doi:[10.5194/esd-7-469-2016](https://doi.org/10.5194/esd-7-469-2016)
- J50. MacMartin, D.G., L. Zanna, and E. Tziperman, “Suppression of AMOC variability at increased CO<sub>2</sub>” *J. Climate*, 29(11), 4155-4164, 2016. doi: [10.1175/JCLI-D-15-0533.1](https://doi.org/10.1175/JCLI-D-15-0533.1)
- J49. Kravitz, B., D. G. MacMartin, P. J. Rasch, and A. J. Jarvis, “A new method of comparing climate forcing agents”, *J. Climate*, Vol. 28, No. 20, pp 8203-8218, 2015. doi: [10.1175/JCLI-D-14-00663.1](https://doi.org/10.1175/JCLI-D-14-00663.1)
- J48. MacMartin, D. G., and H. Thompson, “A vibration budget for observatory equipment”, *SPIE Journal of Astronomical Telescopes, Instruments, and Systems*, 1 (3), 034005, 16, 2015. doi: [10.1117/1.JATIS.1.3.034005](https://doi.org/10.1117/1.JATIS.1.3.034005)
- J47. MacMartin, D. G., B. Kravitz, and P. J. Rasch, “On solar geoengineering and climate uncertainty”, *Geophysical Research Letters*, 42, 7156-7161, 2015. doi:[10.1002/2015GL065391](https://doi.org/10.1002/2015GL065391).
- J46. Cvijanovic, I., K. Caldeira, and D. G. MacMartin, “Impacts of ocean albedo alteration on Arctic sea ice restoration and Northern Hemisphere climate”, *Environmental Research Letters*, 10(4), 2015. doi: [10.1088/1748-9326/10/4/044020](https://doi.org/10.1088/1748-9326/10/4/044020)
- J45. Keith, D. W., and D. G. MacMartin, “A temporary, moderate, and responsive scenario for solar geoengineering”, *Nature Climate Change*, 5, 201-206, 2015. doi:[10.1038/nclimate2493](https://doi.org/10.1038/nclimate2493)
- J44. Keith, D. W., R. Duren and D. G. MacMartin, “Field experiments on Solar Geoengineering: An exploration of a representative research portfolio”, *Phil. Trans. Royal Soc. A.*, 372(2031), 2014. doi: [10.1098/rsta.2014.0175](https://doi.org/10.1098/rsta.2014.0175)
- J43. MacMartin, D. G., K. Caldeira, and D. W. Keith, “Solar geoengineering to limit rates of change”, *Phil. Trans. Royal Soc. A*, 372(2031), 2014. doi:[10.1098/rsta.2014.0134](https://doi.org/10.1098/rsta.2014.0134)
- J42. Kravitz, B., D. G. MacMartin, A. Robock, P.J. Rasch, K.L. Ricke, J.N.S. Cole, C.L. Curry, P.J. Irvine, D. Ji, D. W. Keith, J.E. Kristjánsson, J.C. Moore, H. Muri, B. Singh, S. Tilmes, S. Watanabe, S. Yang, and J.-H. Yoon, “A multi-model assessment of regional climate disparities caused by solar geoengineering”, *Environmental Research Letters*, 9(7), 2014. doi:[10.1088/1748-9326/9/7/074013](https://doi.org/10.1088/1748-9326/9/7/074013)
- J41. Linz, M., Tziperman, E., and MacMartin, D. G., “Process-based analysis of climate model ENSO simulations: Intermodel consistency and compensating errors”, *J. Geophysical Research: Atmospheres*, 119(12):7396-7409, 2014. doi: [10.1002/2013JD021415](https://doi.org/10.1002/2013JD021415)
- J40. MacMartin, D. G. and Tziperman, E., “Using transfer functions to quantify ENSO dynamics in data and models”, *Proc. Royal Soc. A*, 470 (2169):20140272, 2014. doi:[10.1098/rspa.2014.0272](https://doi.org/10.1098/rspa.2014.0272)
- J39. Kravitz, B., MacMartin, D. G., Leedal, D. T., Rasch, P. J., and Jarvis, A. J., “Explicit feedback and the management of uncertainty in meeting climate objectives with solar geoengineering”, *Environmental Research Letters*, 9(4), 2014. doi:[10.1088/1748-9326/9/4/044006](https://doi.org/10.1088/1748-9326/9/4/044006)
- J38. MacMartin, D. G., Kravitz, B., Keith, D. W., and Jarvis, A., “Dynamics of the coupled human-climate system resulting from closed-loop control of solar geoengineering”, *Climate Dynamics*, 43(1-2): 243-258, 2014. (doi: [10.1007/s00382-013-1822-9](https://doi.org/10.1007/s00382-013-1822-9))
- J37. MacMartin, D. G., Thompson, P., Colavita, M. M., Sirota, M. J., “Dynamic analysis of the active-controlled segmented mirror of the Thirty Meter Telescope”, *IEEE Transactions on Control Systems Technology*, 22(1): 58-68, 2014. (doi:[10.1109/TCST.2013.2240456](https://doi.org/10.1109/TCST.2013.2240456))



- J36. MacMartin, D. G., Tziperman, E., and Zanna, L., "Frequency domain multi-model analysis of the response of Atlantic meridional overturning circulation to surface forcing", *J. Climate*, **26**(21): 8323-8340, 2013. ([doi: 10.1175/JCLI-D-12-00717.1](https://doi.org/10.1175/JCLI-D-12-00717.1))
- J35. Robock, A., MacMartin, D.G., Duren, R., and Christensen, M.W., "Studying geoengineering with natural and anthropogenic analogs," *Climatic Change*, **121**(3): 445-458, 2013. ([doi: 10.0007/s10584-013-0777-5](https://doi.org/10.0007/s10584-013-0777-5))
- J34. Carson III, J. M., Açikmeşe, B., Murray, R. M., and MacMartin, D. G., "A Robust Nonlinear Model Predictive Control Algorithm Augmented with a Safety Mode", *Automatica*, **49**(5):1251-1260, 2013. ([doi:10.1016/j.automatica.2013.02.025](https://doi.org/10.1016/j.automatica.2013.02.025))
- J33. MacMartin, D.G., Keith, D. W., Kravitz, B., and Caldeira, K., "Management of tradeoffs in geoengineering through optimal choice of non-uniform radiative forcing", *Nature Climate Change*, **3**:365-368, 2013. ([doi: 10.1038/nclimate1722](https://doi.org/10.1038/nclimate1722))
- J32. Kravitz, B., MacMartin, D. G., and Caldeira, K., "Geoengineering: Whiter skies?" *Geophysical Research Letters*, **39**, L11801, 2012. ([doi:10.1029/2012GL051652](https://doi.org/10.1029/2012GL051652))
- J31. MacMynowski, D. G., "Control of a hypersegmented space telescope", *AIAA J. Guidance, Control and Dynamics*, **35**(3), 2012. ([doi: 10.2514/1.55428](https://doi.org/10.2514/1.55428))
- J30. MacMynowski, D. G., Roberts Jr., L. C., Shelton, J. C., Chanan, G. and Bonnet, H. "In-plane effects on segmented mirror control", *Applied Optics*, **51**(12):1929-1938, 2012. ([doi:10.1364/AO.51.001929](https://doi.org/10.1364/AO.51.001929))
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## Recent Invited lectures and Media interviews

- American Museum of Natural History, 5/7/19, “Science, Society, and our Environment – Geoengineering”  
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- American Geophysical Union Fall Meeting, invited presentation Dec 12, 2018
- Caribbean Academy of Sciences 21<sup>st</sup> General Meeting and Conference, Plenary Speaker, Nov 29, 2018  
“Geoengineering and Climate Change”
- University of the West Indies, Mona, Nov 28 2018, “Achieving 1.5°C: Is there a role for geoengineering?”
- Ohio State University Center for Ethics and Human Values, Nov 16 2018, “Geoengineering”
- Briefing to United Nations Environment Committee of Permanent Representatives on Governing Solar  
Geoengineering and Carbon Removal, Nairobi Kenya, 5/22/18 and workshop 5/23/18, “Solar  
Geoengineering: Technologies and techniques; State of development; Future prospects”
- Briefing to the Government of Brazil on Governing Solar Geoengineering and Carbon Removal (webinar),  
4/20/18, “Solar Geoengineering: Technologies and techniques; State of development; Future  
prospects”
- Cornell University Climate Change Seminar (Atkinson Center), 3/26/18, “[Could Geoengineering Be Part of  
an Overall Climate Strategy?](#)”
- Pacifica radio, “In Other News”, 3/15/18
- Invited speaker, Pacific Climate Change Conference, Wellington NZ, workshop on Engaging Pacific  
Islands on SRM geoengineering research, 2/20/18
- NPR, “Main Street”, 1/3/18
- Panel moderator, 12/9/17, Caltech, Symposium – Plan B: Engineering a Cooler Earth
- NPR Science Friday, November 17, 2017 “Could tweaking the atmosphere help us fight climate change?”  
<https://www.sciencefriday.com/episodes/november-17-2017/>
- US Congress, subcommittee on Environment and Subcommittee on Energy, Hearing on Geoengineering:  
Innovation, Research, and Technology, 11/8/2017,  
[https://science.house.gov/legislation/hearings/subcommittee-environment-and-subcommittee-energy-  
hearing-geoengineering](https://science.house.gov/legislation/hearings/subcommittee-environment-and-subcommittee-energy-hearing-geoengineering)
- Panelist, 11/2/17; Webinar: Geoengineering and Biological Diversity (convened by Carnegie  
Geoengineering Governance Initiative and UN Secretariat of the Convention on Biological Diversity)  
<https://www.c2g2.net/webinar-geoengineering-biological-diversity/>
- Panelist, ISGP’s “Climate Geoengineering: GeoElive” at American University, 9/12/17
- Summer school on geoengineering for the developing world, Beijing Normal University, 7/17-7/21/17,  
*Linearity, Dynamics, Climate Emulators and 1.5°C*
- Panelist; briefing for IPCC on geoengineering, 5/16/2017  
([https://www.carnegiecouncil.org/news/announcements/2017-05-11-a-briefing-and-discussion-on-  
solar-geoengineering-science-ethics-and-governance](https://www.carnegiecouncil.org/news/announcements/2017-05-11-a-briefing-and-discussion-on-solar-geoengineering-science-ethics-and-governance)); see also: [C2G2 website](#)
- Forum on U.S. Solar Geoengineering Research, 3/24/17, panel moderator for *Natural Science: What we  
know and what we ought to know.* ([https://geoengineering.environment.harvard.edu/Forum-US-Solar-  
Geoengineering-Research-DC-March-2017](https://geoengineering.environment.harvard.edu/Forum-US-Solar-Geoengineering-Research-DC-March-2017))
- Harvard University (Center for the Environment), 2/22/17, *Simulating stratospheric aerosol  
geoengineering*
- Carnegie Council for Ethics in International Affairs, panelist 2/16/17 for formal launch of Carnegie Climate  
Geoengineering Governance (C2G2) initiative.
- AIAA SciTech Conference, invited panelist 1/10/17, *Geoengineering to Mitigate Climate Change – is there  
a Role for Aerospace?* (<https://livestream.com/AIAAvideo/SciTech2017/videos/146430830>)
- 22<sup>nd</sup> Conference of the Parties to the UN Framework Convention on Climate Change (COP-22) press room  
panelist, 11/18/16, *Climate Engineering Governance* (<https://youtu.be/1odmMH0SiQ>)



NOAA AMOC Mechanisms and Decadal Predictability webinar, 11/9/2016, *Suppression of AMOC variability at increased CO<sub>2</sub>*

NYU Courant Institute, Center for Atmosphere Ocean Science, 10/28/15, *Solar Geoengineering: What do (and don't) we know?*

MIT Program on Atmosphere, Ocean & Climate, annual retreat, 10/3/15, *Solar Geoengineering: What do we know?*

Beijing Normal University (Global Change & Earth System Science), 8/27/15, *Designing Geoengineering*

Hammer Museum, People's UN, 5/2/15, *Climate Change & Climate Engineering*

Caltech (Resnick Institute), 4/28/15, *Solar Geoengineering & Climate Risks*

Yale (Climate & Energy Institute), 4/23/15, *Solar Geoengineering: Design and Challenges*

Cornell (MAE), 1/27/15, *Geoengineering: the World's largest control challenge*

MIT (EAPS, MASS seminar), 10/14/14, *Frequency domain analysis of ENSO & AMOC variability*

Caltech (IST Seminar), 10/29/13, *"Geoengineering Earth's climate: the world's largest control problem"*

UC Irvine (Earth System Science), 1/30/13, *"Putting engineering into geoengineering: Dynamics, optimization and control"*

U. Minnesota (Aerospace Eng.), 10/21/11, *"Control of the Thirty Meter Telescope"*

Caltech (Yuk Yung GPS seminar), 4/14/11, *"Can we test geoengineering?"*

Princeton (Mech. & Aerospace Eng.), 10/15/10, *"From El Nino to geoengineering: applications of feedback analysis tools to climate problems"*

U. Maryland (Aerospace Eng.), 10/14/10, *"From El Nino to geoengineering: applications of feedback analysis tools to climate problems"*

Penn State (Geosciences), 10/13/10, *"Can we test geoengineering?"*

KTH (Automatic Control Lab), 9/13/10,  
*"Control of future large telescopes: Control of systems with thousands of actuators"*

JPL (Controls group), 4/2/09, *"Control for the Thirty Meter Telescope"*

Northrop Grumman (Space Technology), 2/13/09 *"Control for the Thirty Meter Telescope"*

University of Chicago (Kavli Institute for Cosmological Physics), 12/02/2008  
*"Thirty Meter Telescope: Design, Performance, and Control"*

University of Illinois, Urbana-Champaign (Aerospace Eng.), 12/01/2008  
*"Feedback analysis and control in climate dynamics"*

European Southern Observatory, 11/21/2008, *"Control of TMT Wind Response"*

Danish Meteorological Institute, 11/14/2008  
*"Applying feedback analysis tools from engineering control theory to climate dynamics"*

Lund University, Sweden (Astronomy), 11/13/2008,  
*"Thirty Meter Telescope Performance Modeling and Control"*

Lund University, Sweden (Dept. of Automatic Control), 11/12/2008  
*"Control for the Thirty Meter Telescope"*

Hertzberg Institute for Astrophysics, National Research Council of Canada, 05/05/2008  
*"Control of TMT Wind Response"*

UC Santa Cruz (Computer eng.), 02/25/2008, *"From Telescope Control to Climate Dynamics"*

JPL, 02/08/2008, *"Applying feedback analysis tools from engineering control theory to climate dynamics"*

U. Colorado, Boulder (EE) , 10/30/2007  
*"Applying feedback analysis tools from engineering control theory to climate dynamics"*

UC Santa Cruz (Computer engineering), 5/2/2007, *"Control for Extremely Large Telescopes"*

Stanford University, (Aero/Astro), 2/21/2007  
*"Applying feedback analysis tools from engineering control theory to climate dynamics"*

U. New South Wales, Australia, (Math), 9/21/2006  
*"Applying feedback analysis tools from engineering control theory to climate dynamics"*

U. New South Wales, Australia, (Inst. Environmental Studies), 9/19/2006, *"What it takes to be undisciplined: An Interdisciplinary Adventure through Government, Industry and Academia"*

U. Adelaide, (ME), 6/7/2006, *"Control for the Thirty-Meter Telescope"*

UCLA, (Atm. & Ocean Sciences), 3/18/2005  
*"Analysis of feedback coupling between THC and WDC using tools from control theory"*

Stanford University, (Aero/Astro), 11/17/2004, *"Control for the Thirty-Meter Telescope"*

NASA Langley, 7/15/2004, *"Feedback Flow Control"*

AIAA Aerospace Sciences Conf., 1/6/2004 *"Design Tools for Synthetic Jet Separation Control"*

UCSD, (Mech. & Aero Engineering), 4/15/2003  
*"Dynamics and Control of Shock Motion in a Near-Isentropic Inlet"*

U. Maryland (Aerospace Eng.), 9/28/2001 *"Flow Control with Applications to Aircraft Inlets"*

AFRL WPAFB, 4/27/2001, *"Integrated Control of Inlet/Compression Systems"*

NASA Glenn, 4/26/2001, *"Integrated Control of Inlet/Compression Systems"*

**Consulting**

- LSST (2013-15), telescope active optics analysis
- CSA Eng. (2008-09) aeroservoelasticity, (2003–04), wind-turbine vibration/noise control
- UTRC (2001–02), helicopter active noise control