Douglas G. MacMartin*

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Research Interests

Primary focus is on developing the knowledge needed to support informed decisions about solar geoengineering; mainly with stratospheric aerosol injection (SAI). Interests also include dynamics and feedback analysis of the climate more generally. Member of the systems engineering team for the Thirty Meter Telescope, involved in control design and dynamic performance analysis. Previous research areas include 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.

* Formerly *Douglas MacMynowski,* 2005-2011

Honours and Awards

- 2019 Editor's Citation for Excellence in Refereeing for *Earth's Future*
- 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

- Steering committee, Geoengineering Modeling Research Consortium (GMRC), 2020-
- National Academies of Sciences Engineering and Medicine Committee member, 2019-2021; "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).
- Chair of 2022 Gordon Research Conference on Climate Engineering (formerly 2020 meeting, postponed to 2022 due to Coronavirus).
- Vice-chair, 2017 (inaugural) Gordon Research Conference on Climate Engineering.
- 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 and third international Climate Engineering Conference (CEC17 and CEC21).
- 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.
- Consultant, Large Synoptic Survey Telescope, CSA Engineering, UTRC
- 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.
- Served on ACC O. Hugo Schuck best paper committee, several AIAA best paper committees.
- Have been a reviewer for over 30 different journals spanning aerospace, controls, fluids, telescope design, climate dynamics, climate change, and climate policy.

Recent Research Support

- *2022 Gordon Research Conference* ($50k, NSF)
- *Fundamental limits and trade-offs of stratospheric aerosol geoengineering*, NSF Environmental Sustainability, 2021-2023; $398,143
- *Cornell Research in Climate Engineering* ($1.88M, private donors through Atkinson Center), 2019-2023. Multiple donors: $250k + $30k + $500k (Silver Lining) + $1M + $25k + $25K + $50K
- *EAGER: Marine Sky Brightening: Prospects and Consequences* (NSF, Environmental Sustainability; B. Kravitz at Indiana U. is the PI). 2019-2022 ($104k at Cornell)
- *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 at Cornell) (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 (fall, 2015-21) *Feedback Control Systems*; undergraduate/graduate introductory controls and feedback analysis. Distance-learning option 2018-2021
  - EAS 4940/6920 (spring 2020, 2021) *Seminar on Geoengineering the Climate: Controversies and Possibilities* (co-taught with N. Mahowald)
  - Guest lectures (on geoengineering) in STS 2011 *What is Science?*, (2015-17); NTRES 3311 *Environmental Governance*, (2016); EAS 1101 *Climate and Energy*, (2016-17, 2019-20); STS 3181 *Living in an Uncertain World: Science, Technology, & Risk* (2017-18, 2020-21); 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 2nd 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) (2015, 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-…
- MAE Graduate Program Committee, Fall 2021-

Advisees

- PhD:
  - Jared Farley
  - Walker Lee (~2023)
  - Yan Zhang (~2023)
  - John Carson III (Caltech; 2009, co-advised with R. Murray)
- Postdoctoral:
  - Ewa Bednarz (2021-…)
  - Sally Woodhouse (2021)
  - Daniele Visioni (2018-…)
  - Wei Cheng (2017-2020)
  - Wenli Wang (2017-2018)
  - Kate Ricke (2016)
  - Tait Pottebaum (Caltech, 03-04)
- MS:
  - Ziheng Wang (2021-2022)
- PhD Thesis Committees served on (incomplete list prior to 2015)
  - Hyung Min (Atm. Sci.)
  - Kaitlyn Sumney (~2024)

    - Junyi Dong (~2023)
    - Duan Li (~2023)
    - Yucheng Chen (~2023)
    - Shi Chang (~2022)
    - Jaejeong Shin (2021)
    - Vighnesh Vatsal (2020)
    - Sawyer Elliott (2019)
    - Holly Buck (Dev. Soc., 2017)
    - Won-Tae Joe (Caltech, 2010)
    - Michael Epstein (Caltech, 2008)
    - Sean Humbert (Caltech, 2005)
    - Mark Campbell (MIT, 1996)
- MS committees served on
    - Yuzhe Sheng (2018-2020)
    - Quanxing Lu (2018)
- MEng
    - Jacob Mensah (2020; MAE)
    - Jordan Gurian (2019-20; MAE)
    - Zineb Louriqate (19-20; SysE)
    - Douglas Berman (2017; MAE)
- Undergraduate research and senior-design supervision ('*' = Cornell Rocketry Team)
    - Stephen McDonnell (2021*)
    - Maria Montaner (2021*)
    - Matt Schneider (2021*)
    - Sirena DePue (2020*)
    - Jacob Mensah (2019*)
    - Nathan Messuri (2019*)
    - Bob Qian (2019*)
    - Christopher Vann (2019*)
    - Dan Wolfe (2019*)
    - Justin Cho (2018*)
    - Matthew Boudreau (2018)
    - Isaac Sarnoff (2017)
    - Albert Chu (2017)
    - Paul Salazar (2017-2018)
- Visitors
    - Jiu Jiang (2018-2019, Zhejiang University)
    - Ilaria Quaglia (2021, U. of L'Aquila)

Publications

Statistics:

94 peer-reviewed journal publications (40 first author), 73 conference papers (36 first author), 5 patents, several book chapters and contributions to edited volumes.

Citations (Google-scholar): 4191, h-index: 35, i-10 index: 110 (as of 12/31/21)

Useless trivia: 40 different journals, 137 different co-authors, Erdös number of 4.

Links to public profiles:

- http://scholar.google.com/citations?user=SkjV1ZQAAAAJ&hl=en,
- http://www.researcherid.com/rid/A-6333-2016, (looks like they fixed bugs and this is up to date
- http://www.researcherid.com/rid/AAB-5314-2020, (duplicate and not up to date, only up to 2019)
- http://orcid.org/0000-0003-1987-9417,

Submitted Journal Articles:

- Cheng, W. et al, "Changes in Hadley circulation and intertropical convergence zone under strategic stratospheric aerosol geoengineering"
- Adams, D., Fordham, B., Jakob, G., MacMartin, D., Sedghi, B., Schwartz, D., Travouillon, T., Smith, B., Kerrian, P, and Thompson, H., "Management of equipment vibration for extremely large telescopes", *submitted to SPIE JATIS*
- Jadwiga H. Richter, Daniele Visioni, Douglas G. MacMartin, David A. Bailey, Nan Rosenbloom, Walker R. Lee, Mari Tye, Jean-Francois Lamarque "Assessing Responses and Impacts of Solar climate intervention on the Earth system with stratospheric aerosols"
- Buck, H.J., I. Mettiäinen, K. Ricke and D.G. MacMartin, " "Bog there, marshland here:" Co-producing scientific knowledge on climate geoengineering in the Arctic".

Journal Articles:

J94. Visioni, D., S. Tilmes, C. Bardeen, M. Mills, D.G. MacMartin, B. Kravitz, and J. Richter, "Limitations of assuming internal mixing between different aerosol species: a case study with sulfate geoengineering simulations", to appear, *Atmos. Chem. & Phys.*, 2022

J93. Zhang, Y., D. G. MacMartin, D. Visioni, and B. Kravitz, "How large is the design space for stratospheric aerosol geoengineering?" *Earth System Dynamics,* **13**, 201–217, 2022. https://doi.org/10.5194/esd-13-201-2022

J92. Abiodun, Babatunde J.; R. C. Odoulami; W. Sawadogo; O.A. Oloniyo; A. A. Abatan; M. New; C. Lennard; I. Pinto; T. S. Egbebiyi; D. G. MacMartin, "Potential Impacts of Stratospheric Aerosol Injection on Drought Risk Managements over major River Basins in Africa", *Climatic Change,* **169,** 31 (2021). https://doi.org/10.1007/s10584-021-03268-w

J91. Tilmes, S., J.H. Richter, B. Kravitz, D.G. MacMartin, A.S. Glanville, D. Visioni, D.E. Kinnison, R. Müller (2021), "Sensitivity of total column ozone to stratospheric sulfur injection strategies", *Geophysical Research Letters,* **48,** e2021GL094058, https://doi.org/10.1029/2021GL094058

J90. Visioni, D., D.G. MacMartin, B. Kravitz, O. Boucher, A. Jones, T. Lurton, M. Martine, M.J. Mills, P. Nabat, U. Niemeier, R. Sèfèrian, and S. Tilmes, "Identifying the sources of uncertainty in climate model simulations of solar radiation modification with the G6sulfur and G6solar Geoengineering Model Intercomparison Project (GeoMIP) simulations", *Atmos. Chem. Phys.,* **21,** 10029-10063, 2021. https://doi.org/10.5194/acp-21-10039-2021

J89. Aksamit, N.O., B. Kravitz, D.G. MacMartin, G. Haller, "Harnessing Stratospheric Diffusion Barriers for Enhanced Climate Geoengineering", *Atmos. Chem. Phys.,* **21,** 8845-8861, 2021. Doi:10.5194/acp-21-8845-2021.

J88. Lee, W., D.G. MacMartin, D. Visioni, and B. Kravitz, "High-latitude stratospheric aerosol geoengineering can be more effective if injection is limited to spring", *Geophysical Research Letters,* **48**, e2021GL092696, 2021. Doi: 10.1029/2021GL092696.

J87. Kravitz, B., D.G. MacMartin, D. Visioni, O. Boucher, J.N.S. Cole, J. Haywood, A. Jones, T. Lurton, P. Nabat, U. Niemeier, A. Robock, R. Séférian, and S. Tilmes, "Comparing different generations of idealized solar geoengineering simulations in the Geoengineering Model Intercomparison Project (GeoMIP)", *Atmos. Chem. Phys.,* **21**, 4231-4247, 2021. https://doi.org/10.5194/acp-21-4231-2021

J86. Visioni, D., D.G., MacMartin, and B. Kravitz, "Is turning down the sun a good proxy for stratospheric aerosol geoengineering?" *J. Geophysical Research, Atm*, **126**(5):e2020JDo33952 2021. doi: 10.1029/2020JD033952

J85. Lee, W., D.G. MacMartin, D. Visioni, B. Kravitz, "Expanding the Design Space of Stratospheric Aerosol Geoengineering to Include Precipitation-Based Objectives and Explore Trade-offs", *Earth System Dynamics*, **11**, 1051-1072, 2020. Doi: 10.5194/esd-11-1051-2020

J84. Visioni, D., D.G. MacMartin, B. Kravitz, W. Lee, I.R. Simpson and J.H. Richter, "Reduced poleward transport due to stratospheric heating under geoengineering", *Geophys. Res. Letters,* **47,** e2020GL089470, 2020. *Doi:* 10.1029/2020GL089470

J83. Lockley, A., D.G. MacMartin, H. Hunt, "An update on engineering issues concerning stratospheric aerosol injection for geoengineering", *Environmental Research Communications,* **2**(8):082001, 2020. Doi: 10.1088/2515-7620/aba944

J82. Yang, C.-E., F. M. Hoffman, D. M. Ricciuto, S. Tilmes, L. Xia, D. G. MacMartin, B. Kravitz, J. H. Richter, M. Mills, and J. S. Fu, "Assessing terrestrial biogeochemical feedbacks in a strategically geoengineered climate", *Environmental Research Letters,* **15**, 104043, 2020. Doi: 10.1088/1748-9326/abacf7

J81. Tilmes, S., D.G. MacMartin, J.T.M. Lenaerts, L. van Kampenhout, L. Muntjewerf, L. Xia, C.S. Harrison, K.M. Krumhardt, M. J. Mills, B. Kravitz and A. Robock, "Reaching 1.5°C and 2.0°C global surface temperature targets using stratospheric aerosol geoengineering in CMIP6", *Earth System Dynamics*, **11**(3), 579-601, 2020. Doi: 10.5194/esd-11-1-2020.

J80. Visioni, D., E. Slessarev, D.G. MacMartin, N.M. Mahowald, C.L. Goodale, and L. Xia, "What goes up must come down: impacts of deposition in a sulfate geoengineering scenario", *Environmental Research Letters*, **15,** 094063, 2020. Doi: 10.1088/1748-9326/ab94eb

J79. Visioni, D., D.G. MacMartin, B. Kravitz, J.H. Richter, S. Tilmes, and M.J. Mills, "Seasonally modulated stratospheric aerosol geoengineering alters the climate outcomes", *Geophysical Research Letters*, **47**(12), e2020GL088337, 2020. Doi:/10.1029/2020GL088337

J78. Harding, A.R., K. Ricke, D. Heyen, D.G. MacMartin, and J. Moreno-Cruz, "Climate econometric models indicate solar geoengineering would reduce inter-country income inequality", *Nature Communications*, **11,** 227, (2020). doi:10.1038/s41467-019-13957-x

J77. Kravitz, B., and D. G. MacMartin, "Uncertainty and the basis for confidence in solar geoengineering research", *Nature Reviews Earth & Environment,* **1,** 64-75 (2020). Doi: 10.1038/s43017-019-0004-7

J76. 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", *J. Geophysical Research A.* **124,** 12587-12616, 2019. doi:10.1029/2019JD031093

J75. Jiang, J., L. Cao, D.G. MacMartin, I.R. Simpson, B. Kravitz, W. Cheng, D. Visioni, S. Tilmes, J.H. Richter, and M.J. Mills, "Stratospheric sulfate aerosol geoengineering could alter the high latitude seasonal cycle", *Geophysical Research Letters,* **46**, 2019. doi: 10.1029/2019GL085758

J74. MacMartin, D.G., P. Irvine, B. Kravitz, and J. Horton, "Technical characteristics of solar geoengineering deployment and implications for governance", *Climate Policy,* **19**(10), 2019. Doi: 10.1080/14693062.2019.1668347

J73. 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", *J. Geophysical Research A.* **124,** 12773-12793, 2019. doi: 10.1029/2018JD030237

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*, **46**, 2019. doi:10.1029/2019GL083680

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_2 injection strategies", *J. Geophysical Research A*, **124,** 2019. doi: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):1233-1247, 2019. DOI: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:10.1146/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_2 Injections", *Atmosphere,* **9**(11), 432, 2018. doi: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_2 Injections using CESM1(WACCM): Introduction to the Special Issue", *J. Geophys. Res. A.*, **123**, 2018. 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

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_2 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

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

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

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_2 injections", *J. Geophys. Res. A.*, **122**, 12,557–12,573, 2017. doi: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_2 injection locations", *J. Geophys. Res. A*, **122**, 12,591–12,615, 2017. doi: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

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

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.

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.

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

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C18. Lord, W., MacMartin, D.G., and Tillman, T.G., "Flow Control Opportunities in Gas Turbine Engines", *Fluids 2000,* Denver, CO, June 2000. AIAA Paper 2000-2234.

C17. Lorber, P., McCormick, D., Anderson, T., Wake, B., MacMartin, D., Pollack, M., Corke, T., Breuer, K., "Rotorcraft Retreating Blade Stall Control," *Fluids 2000*, June 2000. AIAA Paper 2000-2475.

C16. Millott, T. A., Welsh, W. A., Yoerkie, C. A. Jr., MacMartin, D. G., and Davis, M. W., "Flight Test of Active Gear-Mesh Noise Control on an S-76," *American Helicopter Society 54th Annual Forum*, Washington, DC, May 1998.

C15. MacMartin, D. G., Davis, M. W., Yoerkie, C. A. Jr., and Welsh, W. A., "Helicopter Gear-Mesh ANC Concept Demonstration," *Active '97*, Budapest, Hungary, Aug. 1997.

C14. MacMartin, D. G., "Collocated Structural Control: Motivation and Methodology," *IEEE Conference on Control Applications*, Albany, NY, Sept. 1995.

C13. MacMartin, D. G. and How, J. P., "Implementation and Prevention of Unstable Optimal Compensators," *American Control Conference*, Baltimore, MD, June 1994, pp. 2190-2195.

C12. MacMartin, D. G., "A Feedback Perspective on the LMS Disturbance Feedforward Algorithm," *American Control Conference*, Baltimore, MD, June 1994, pp. 1632-1636.

C11. MacMartin, D. G., "Piezoelectric Control of Aircraft Cabin Noise," *Third International Congress on Air- and Structure-Borne Noise*, Montreal, Canada, June 1994, pp. 1269-1274.

C10. MacMartin, D. G., Basso, G., and Leigh, B., "Reduction of Internal Noise in Turboprop Aircraft," in *78th Structures and Materials Panel Meeting, Specialist's Meeting on Impact of Acoustic Loads on Aircraft Structures*, Lillehammer, Norway, AGARD, May 1994, pp. 21- 1-9. AGARD-CP-549.

C9. MacMartin, D. G. and Hall, S. R., "Broadband Structural Control using Statistical Energy Analysis Concepts," *American Control Conference*, San Francisco, CA, June 1993, pp. 997-1002.

C8. MacMartin, D. G. and Miller, D. W., "MIT Middeck Active Control Experiment (MACE): Non-collocated payload pointing control," *1993 SPIE North American Conference on Smart Structures and Materials*, Albuquerque, NM, Feb. 1993. (Paper # SPIE 1917-47).

C7. Hall, S. R., MacMartin, D. G., and Bernstein, D. S., "Covariance Averaging in the Analysis of Uncertain Systems," *IEEE Conference on Decision and Control*, Dec. 1992, pp. 1842-1849.

C6. Grocott, S. C. O., MacMartin, D. G., and Miller, D. W., "Experimental Implementation of a Multiple Model Technique for Robust Control of the MACE Test Article," *Third International Conference on Adaptive Structures*, San Diego, CA, Nov. 1992.

C5. MacMartin, D. G., Hall, S. R., and Bernstein, D. S., "Fixed Order Multi-Model Estimation and Control," *American Control Conference*, Boston, MA, June 1991, pp. 2113-2118.

C4. MacMartin, D. G., Miller, D. W., and Hall, S. R., "Structural Control using Active Broadband Impedance Matching," *Recent Advances in Active Control of Sound and Vibration*, Apr. 1991, pp. 604-617.

C3. MacMartin, D. G., Hall, S. R., and Mustafa, D., "On a Cost Functional for H_2/H_∞ Minimization," *IEEE Conference on Decision and Control*, Dec. 1990, pp. 1010-1012.

C2. MacMartin, D. G. and Hall, S. R., "Structural Control Experiments using an H_∞ Power Flow Approach," *AIAA Guidance, Navigation, and Control Conference*, Aug. 1990, pp. 1634-1644.

C1. MacMartin, D. G. and Hall, S. R., "An H_∞ Power Flow Approach to Control of Uncertain Structures," *American Control Conference*, San Diego, CA, June 1990, pp. 3073-3080.

Other Publications:

O6. Tilmes, S., Smith, A., Lawrence, P, Barnes, T., Gadikota, G., Grabowski, W., MacMartin, D.G., Medeiros, B., Morrison, M., Prein, A., Rasmussen, R., Rosenlof, K., Rothman, D.S., Seimon, A., Shreshtha, G., and Stephens, B.B., "Developing a framework for an interdisciplinary and international climate intervention strategies research program", *Bull. Am. Met. Soc.,* 2021. https://doi.org/10.1175/BAMS-D-21-0053.1

O5. Kravitz, B., Visioni, D., Lisa H. Sideris, D. G. MacMartin, "Climate engineering research is essential to a just transition and sustainable future", *The Hill*, 06/21/21. https://thehill.com/opinion/energy-environment/559859-climate-engineering-research-is-essential-to-a-just-transition-and

O4. National Academies of Science, Engineering, and Medicine (Fields, C., W. Cheung, L. Dilling, P. Frumhoff, H. Greely, M. E. Hourdequin, J. W. Hurrell, A. W. Light, A. Lin, D. MacMartin, R. McHenry, J. Moreno-Cruz, K. Ricke, L. Russell, A. Sagar, and P. Wennberg), *Reflecting Sunlight: A Research Agenda and Research Governance Strategies for Solar Geoengineering*, National Academies Press, 2021

O3. Kravitz, B., Robock A., and D.G. MacMartin, "The road toward process-level understanding of solar geoengineering through a multi-model intercomparison", *Bull. Am. Met. Soc.,* 2020

O2. MacMartin, D. G., Written testimony for Subcommittee on Environment and Subcommittee on Energy Hearing – Geoengineering: Innovation, Research and Technology, 2017. (Available here)

O1. Philander, S. G. updated for 2nd edition by D. MacMynowski, "El Niño, La Niña, and the Southern Oscillation", *Encyclopedia of Climate and Weather*, *2nd ed*., Oxford University Press, 2011

T2. MacMartin, D. G., *A Stochastic Approach to Broadband Control of Parametrically Uncertain Structures*, Ph.D. thesis, Dept. of Aeronautics and Astronautics, M.I.T., Cambridge, MA, June 1992.

T1. MacMartin, D. G., *An H_∞ Power Flow Approach to Control of Uncertain Structures*, Master's thesis, Department of Aeronautics and Astronautics, M.I.T., Cambridge, MA, Feb. 1990.

Recent Invited lectures and Media interviews

Arctic Circle Assembly 2021 (Reykjavik), "What Is SAI, How Might It Work and the Potential Climate Effects", 10/15/2021

Envision 2021 (Princeton), "Should We Consider Solar Geoengineering?", 4/10/21

Permafrost Carbon Feedback Dialogue – Avoiding Permafrost Thaw: Managing Temperature; panelist (3/11/21)

Indiana University "In this climate" series; on geoengineering (2/11/21)

C2G webinar series on climate altering approaches and the Arctic (11/11/20, 12/3/20)

C2G webinar series on governance of SAI (10/28/20, 12/1/20)

C2G webinar series on introduction to governance of SRM, 9/30/20, 10/21/20, and 11/18/20. https://www.c2g2.net/c2glearn-introduction-to-srm/

Duke University Center on Risk in Science and Society, 10/4/19, "Should geoengineering be part of an overall climate strategy?" (and guest lecture in Bass Connections course, 10/3/19)

American Museum of Natural History, 5/7/19, "Science, Society, and our Environment – Geoengineering"

Chatham House, 2/21/19 (https://www.chathamhouse.org/event/rethinking-governance-solar-geoengineering) and Overseas Development Institute 2/22/19

American Geophysical Union Fall Meeting, invited presentation Dec 12, 2018

Caribbean Academy of Sciences 21st 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

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); 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)

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)

22nd 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/1_odmMH0SiQ**)

NOAA AMOC Mechanisms and Decadal Predictability webinar, 11/9/2016, *Suppression of AMOC variability at increased CO_2*

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

Papers being overhauled

- Xia, L., A. Robock, S. Tilmes, M. Mills, J. Richter, B. Kravitz, D. MacMartin, and D. Visioni, "Impacts of sulfate injection geoengineering on particulate matter with diameter less than 2.5μm"
- Kravitz, B., D. Visioni, and D.G. MacMartin, "Geoengineering and International Security: A Design Perspective"
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