

Timothy W Cronin

Curriculum Vitae

Department of Earth, Atmospheric, and Planetary Sciences
Massachusetts Institute of Technology, 54-1616
77 Massachusetts Avenue
Cambridge, MA 02139
Email: twcronin@mit.edu
Website: <http://web.mit.edu/~twcronin/www/>

Employment

2016-	Assistant Professor, MIT
2014-2016	NOAA Environment Postdoctoral Fellow, Harvard University
2014	Postdoctoral Associate, MIT
2006-2009	Research Assistant, Ecosystems Center, Marine Biological Laboratory, Woods Hole
2005	Summer Research Assistant, Swarthmore College

Education

2009-2014	Massachusetts Institute of Technology Ph.D., Climate Physics and Chemistry
2002-2006	Swarthmore College B.A. with High Honors, Physics Major, Math Minor

Publications

Lutsko, N., and **T.W. Cronin** (2020): Mean climate and circulation of mock-Walker simulations. Part I: Comparison with observations and analysis of circulation. *Journal of Advances in Modeling Earth Systems*, in revision.

Abbott, T., and **T.W. Cronin** (2020): Aerosol invigoration of atmospheric convection through increases in humidity, *Science*, in revision.

Wilka, C., S. Solomon, **T.W. Cronin**, D. Kinnison, and R. Garcia (2020): Atmospheric Chemistry Signatures of an Equatorially-Symmetric Matsuno-Gill Circulation Pattern, *Journal of the Atmospheric Sciences*, in revision.

Abbott, T., **T.W. Cronin**, and T. Beucler (2020): Precipitation extremes in channel simulations of Radiative-Convective Equilibrium. *The Journal of the Atmospheric Sciences*, doi: 10.1175/JAS-D-19-0197.1.

Beucler, T., T. Abbott, **T.W. Cronin**, and M. Pritchard (2019): Comparing Convective Self-Aggregation in Idealized Models to Observed Moist Static Energy Variability near the Equator. *Geophysical Research Letters*, doi: 10.1029/2019GL084130.

- Koll, D., and **T. W. Cronin** (2019): Hot Hydrogen Climates near the inner edge of the Habitable Zone. *The Astrophysical Journal*, doi: 10.3847/1538-4357/ab30c4.
- Lutsko, N., J. Baldwin, and **T. W. Cronin** (2019): The impact of large-scale orography on Northern Hemisphere Winter Synoptic Temperature Variability. *Journal of Climate*, doi: 10.1175/JCLI-D-19-0129.1.
- T.W. Cronin** and D. Chavas (2019): Dry and semidry tropical cyclones. *The Journal of the Atmospheric Sciences*, doi: 10.1175/JAS-D-18-0357.1.
- Beucler, T., and **T. W. Cronin** (2018): A budget for the size of convective self-aggregation. *The Quarterly Journal of the Royal Meteorological Society*, doi: 10.1002/qj.3468.
- Lutsko, N., and **T. W. Cronin** (2018): Increase in Precipitation Efficiency with Surface Warming in Radiative-Convective Equilibrium. *Journal of Advances in Modeling Earth Systems*, doi: 10.1029/2018MS001482.
- Pithan, F., G. Svensson, R. Caballero, D. Chechin, **T. W. Cronin**, A. Ekman, R. Neggers M. Shupe, A. Solomon, M. Tjernstrom, and M. Wendisch (2018): Role of air-mass transformations in exchange between the Arctic and mid-latitudes. *Nature Geoscience*, doi: 10.1038/s41561-018-0234-1.
- Hu, Z., **T.W. Cronin**, and E. Tziperman (2018): Suppression of Cold Weather Events over High Latitude Continents in Warm Climates. *Journal of Climate*, doi: 10.1175/JCLI-D-18-0129.1.
- Koll, D., and **T. W. Cronin** (2018): Earth's outgoing longwave radiation linear due to H₂O greenhouse effect. *PNAS*, doi: 10.1073/pnas.1809868115.
- Birch, L., **T.W. Cronin**, and E. Tziperman (2018): The Role of Regional Feedbacks in Glacial Inception on Baffin Island: The Interaction of Ice Flow and Meteorology. *Climate of the Past*, doi: 10.5194/cp-14-1441-2018.
- Beucler, T., **T.W. Cronin**, and K. Emanuel (2018): A Linear Response Framework for Radiative-Convective Instability. *Journal of Advances in Modeling Earth Systems*, doi: 10.1029/2018MS001280.
- Cronin, T.W.**, and A. Wing (2017): Clouds, Circulation, and Climate Sensitivity in a Radiative-Convective Equilibrium Channel Model. *Journal of Advances in Modeling Earth Systems*, doi: 10.1002/2017MS001111.
- Rose, B., **T.W. Cronin**, and C. Bitz (2017): Ice caps and ice belts: the effects of obliquity on ice-albedo feedback. *The Astrophysical Journal*, doi: 10.3847/1538-4357/aa8306.
- Cronin, T.W.**, H. Li, and E. Tziperman (2017): Suppression of Arctic air formation with climate warming: Investigation with a 2-dimensional cloud-resolving model. *Journal of the Atmospheric Sciences*, doi: 10.1175/JAS-D-16-0193.1.

Birch, L., **T.W. Cronin**, and E. Tziperman (2017): Glacial Inception on Baffin Island: The Role of Insolation, Meteorology, and Topography. *Journal of Climate*, doi: 10.1175/JCLI-D-16-0576.1.

Beucler, T., and **T.W. Cronin** (2016): Moisture-Radiative Cooling Instability. *Journal of Advances in Modeling Earth Systems*, 8, 1620-1640, doi: 10.1002/2016MS000763.

Wing, A., and **T.W. Cronin** (2016): Self-aggregation of convection in long channel geometry. *The Quarterly Journal of the Royal Meteorological Society*, 142, 1-15, doi: 10.1002/qj.2628.

Cronin, T.W., and M. Jansen (2015): Analytic radiative-advective equilibrium as a model for high-latitude climate, *Geophysical Research Letters*, 42, doi: 10.1002/2015GL067172.

Payne, A., M. Jansen, and **T.W. Cronin** (2015): Conceptual model analysis of the influence of temperature feedbacks on polar amplification, *Geophysical Research Letters*, 42, 9561–9570, doi: 10.1002/2015GL065889.

Cronin, T.W., and E. Tziperman (2015): Low clouds suppress Arctic air formation and amplify high-latitude continental winter warming. *PNAS*, 112, 11490–11495, doi: 10.1073/pnas.1510937112.

Cronin, T.W., K. Emanuel, and P. Molnar (2015): Island Precipitation Enhancement and the Diurnal Cycle in Radiative-Convective Equilibrium. *The Quarterly Journal of the Royal Meteorological Society*, 141, 1017-1034, doi: 10.1002/qj.2443.

Molnar, P., and **T.W. Cronin** (2015): Growth of the Maritime Continent and its Possible Contribution to Recurring Ice Ages. *Paleoceanography*, 30, 196-225, doi: 10.1002/2014PA002752.

Cronin, T.W. (2014): On the Choice of Average Solar Zenith Angle. *Journal of the Atmospheric Sciences*, 71, 2994-3003, doi:10.1175/JAS-D-13-0392.1.

Cronin, T.W., and K. Emanuel (2013): The climate time scale in the approach to radiative-convective equilibrium. *Journal of Advances in Modeling Earth Systems*, 5, 843-849, doi: 10.1002/jame.20049.

Cronin, T.W. (2013): A sensitivity theory for the equilibrium boundary layer over land. *Journal of Advances in Modeling Earth Systems*, 5, 764-784, doi: 10.1002/jame.20048.

Reilly, J., J. Melillo, D. Kicklighter, A. Gurgel, S. Paltsev, **T.W. Cronin**, A. Sokolov, and A. Schlosser (2012), Using land to mitigate climate change: Hitting the target, recognizing the trade-offs. *Environmental Science and Technology*, 46, 5672-5679, doi: 10.1021/es2034729.

Felzer, B., **T.W. Cronin**, J. Melillo, D. Kicklighter, C.A. Schlosser, and S.R. Dangal (2011): Nitrogen effect on carbon-water coupling in forests, grasslands, and shrublands

in the arid western U.S. *Journal of Geophysical Research - Biogeosciences*, 116, G03023, doi:10.1029/2010JG001621.

Gurgel, A., **T.W. Cronin**, J. Reilly, S. Paltsev, D. Kicklighter, and J. Melillo (2011): Food, Fuel, Forests, and the Pricing of Ecosystem Services. *American Journal of Agricultural Economics*, 93, 342-348, doi: 10.1093/ajae/aaq087.

Galford, G., J. Melillo, D. Kicklighter, J. Mustard, **T.W. Cronin**, C. E. P. Cerri, and C.C. Cerri (2011): Historical carbon emissions and uptake from the agricultural frontier of the Brazilian Amazon. *Ecological Applications*, 21, 750-763, doi: 10.1890/09-1957.1.

Galford, G., J. Melillo, D. Kicklighter, **T.W. Cronin**, C. E. P. Cerri, J. Mustard, and C.C. Cerri (2010): Greenhouse gas emissions from alternative futures of deforestation and agricultural management in the southern Amazon. *PNAS*, 107, 19649–19654, doi: 10.1073/pnas.1000780107.

Melillo, J., J. Reilly, D. Kicklighter, A. Gurgel, **T.W. Cronin**, S. Paltsev, B. Felzer, X. Wang, A. Sokolov, and C.A. Schlosser (2009): Indirect Emissions from Biofuels: How Important? *Science*, 326, 1397-1399, doi: 10.1126/science.1180251.

Felzer, B., **T.W. Cronin**, J. Melillo, D. Kicklighter, and C.A. Schlosser (2009): Importance of carbon-nitrogen interactions and ozone on ecosystem hydrology during the 21st century. *Journal of Geophysical Research - Biogeosciences*, 114, G01020, doi: 10.1029/2008JG000826.

Sokolov, A., D. Kicklighter, J. Melillo, B. Felzer, C.A. Schlosser, and **T.W. Cronin** (2008): Consequences of considering carbon-nitrogen interactions on the feedbacks between climate and the terrestrial carbon cycle. *Journal of Climate*, 21, 3776-3796, doi: 10.1175/2008JCLI2038.1.

Felzer, B.S., **T.W. Cronin**, J. Reilly, J. Melillo, and X. Wang (2007): Impact of ozone on trees and crops. *Comptes Rendus de l'Academie des Sciences - Geoscience*, 339, 784-798, doi: 10.1016/j.crte.2007.08.008.

Bug, A., **T.W. Cronin**, P. Sterne, and Z. Wolfson (2007): Simulation of Positronium: Toward more realistic models of void spaces in materials. *Radiation Physics and Chemistry*, 76, 237-242.

Doctoral Thesis

Cronin, T.W. (2014): Land-Atmosphere Interaction and Radiative-Convective Equilibrium; Massachusetts Institute of Technology.

Undergraduate Thesis

Cronin, T.W. (2006): Path Integral Monte Carlo Simulation of Positronium in Cylindrical Pore Spaces; Swarthmore College Department of Physics & Astronomy.

Postdoctoral Researchers Supervised

Daniel Koll	2017-present
Nicholas Lutsko	2017-2019; now Assistant Professor at Scripps

Ph.D. Students Supervised

Martin Velez-Pardo	2018-present
Tristan Abbott	2016-present
Tom Beucler	2016-2018 (PhD); co-advised with Kerry Emanuel
Leah Birch	2014-2017 (PhD); Harvard, co-advised with Eli Tziperman

Undergraduate Students Supervised

Ben Richards	2019-2020, UROP
Natalie Woods	2019-2020, UROP
Zeyuan Hu	2017; Peking University student working at Harvard, with Eli Tziperman
Harrison Li	2015-2016; Harvard PRISE summer fellow, with Eli Tziperman

Teaching

2016, 2018-2020	Atmospheric Radiation and Convection (MIT 12.815)
2017-2020	Introduction to Atmosphere, Ocean, and Climate Dynamics (MIT 12.003)
2018-2020	Co-instructor for first-year graduate class (MIT 12.S597, 12.900)
2013-2014	Content Production and Course Operations team, "Global Warming Science" (MITx 12.340x, 2014)
2012, 2013	Teaching Assistant, "Theoretical Environmental Analysis" (MIT 12.009)
2011	Teaching Assistant, "Atmosphere, Ocean, and Climate Dynamics" (MIT 12.003)
2011	Teaching Assistant, "Global Warming Science" (MIT 12.340)

Conference Presentations

2020	AGU Fall Meeting (virtual), Princeton AOS Summer Workshop (virtual), 'From Bomex to EUREC4A' symposium, AMS Annual Meeting
2019	AGU Fall Meeting, ICTP Summer School on Convective Organization and Climate Sensitivity, NE Tropical Workshop, AMS Conference on Atmosphere and Ocean Fluid Dynamics
2018	AGU Fall Meeting, Heldfest, AMS Conference on Hurricanes and Tropical Meteorology, Princeton Workshop on Convection in Nature, Water & Climate Change Workshop
2017	AGU Fall Meeting, Stockholm University Arctic Air Mass Transformations Workshop, AMS Conference on Atmosphere and Ocean Fluid Dynamics
2016	AGU Fall Meeting, Princeton Model Hierarchies Workshop, NOAA Summer Institute, AMS Conference on Hurricanes and Tropical Meteorology

2015	AGU Fall Meeting, AMS Conference on Atmosphere and Ocean Fluid Dynamics, NE Tropical Workshop, Caltech Workshop on Monsoons: Past, Present, and Future
2014	AGU Fall Meeting, AMS Conference on Hurricanes and Tropical Meteorology
2013	AGU Fall Meeting, Graduate Climate Conference, AMS Conference on Atmosphere and Ocean Fluid Dynamics, NE Tropical Workshop
2012	AGU Fall Meeting, Graduate Climate Conference, AMS Conference on Hurricanes and Tropical Meteorology, AMS Annual meeting
2010	AGU Fall Meeting
2008	AGU Fall Meeting
2005	Workshop on Positron and Positronium Chemistry

Invited Talks

2020	Stanford (virtual), University of Wisconsin Madison (virtual)
2019	NYU, Colorado State University, University of Connecticut, Harvard, Cornell
2018	UC Davis, WHOI
2017	SUNY Stony Brook, Florida State University, Purdue, Swarthmore, Imperial
2016	Weizmann Institute of Science, SUNY Albany, Laboratoire de Météorologie Dynamique, Max-Planck-Institut für Meteorologie, UC Berkeley, University of Washington
2015	Brown, McGill, University of Chicago, MIT, Columbia
2014	MIT, Caltech
2013	Yale

Awards

2017-2020	Kerr-McGee Career Development Assistant Professorship
2017	Ally of Nature Fund Award
2014-2016	NOAA Climate and Global Change Postdoctoral Fellowship
2014-2016	Harvard University Center for the Environment Postdoctoral Fellowship
2013	Award for Excellence in Teaching, for role as Teaching Assistant in Spring 2013 course “Theoretical Environmental Analysis”, EAPS, MIT
2011-2012	Martin Fellow, Martin Family Society of Fellows for Sustainability, MITEI
2010	Climate Co-Lab finalist and presenter to US Congress, MIT Center for Collective Intelligence
2009-2010	Presidential Fellow, MIT
2009	Jule Charney Prize (outstanding incoming graduate student), MIT Program in Atmospheres, Oceans, and Climate
2006	LeRoy Apker Award finalist (outstanding achievement in physics as an undergraduate), American Physical Society
2006	Lang Award (outstanding academic accomplishment), Swarthmore College

Grants

- 2020-2021 MIT John Jarve (1978) Seed Fund for Science Innovation: “A novel modeling approach to studying cloud feedbacks and high-latitude climate sensitivity” (PI)
- 2020-2021 MIT Research Support Committee, Charles E. Reed Faculty Initiatives Fund: “Tempests in a Tank: Laboratory and numerical Experiments on Dry Hurricanes and Linkage to Rotating Rayleigh-Benard Convection” (PI)
- 2020-2021 NASA XRP2: “A Framework for Self-Consistent Modeling of Rocky Exoplanet Atmospheres” (co-PI; PI Matej Malik, U Maryland)
- 2019-2022 NSF AGS-1906719: “Advancing the Understanding of the Impacts of Wave-Induced Temperature Fluctuations on Atmospheric Chemistry” (co-PI; PI Susan Solomon)
- 2017-2020 NSF AGS-1740533: “Collaborative Research: Convection and Rainfall Enhancement over Mountainous Tropical Islands” (PI)
- 2017-2018 MIT ESI Curriculum Grant: “Introduction to atmospheres, oceans, and climate” (PI)
- 2016-2019 NSF AGS-1623218: “Collaborative Research: Using a Hierarchy of Models to Constrain the Temperature Dependence of Climate Sensitivity” (co-PI)

Professional Memberships

American Geophysical Union
American Meteorological Society

Professional Service

Thesis committee membership: Tom Beucler (PhD 2019), Leah Birch (Harvard PhD 2017), Brian Green (PhD 2018), Mukund Gupta (PhD 2018), Catherine Wilka, Margaret Duffy, Rohini Shivamoggi, Raphael Rousseau-Rizzi, Tristan Abbott, Jonathan Lin

EAPS Taskforce 2023 Working Group I committee (2019-2020)

PAOC graduate admissions committee (2017, 2018 chair, 2019, 2020)

PAOC faculty search committee 2019-2020

PAOC colloquium committee (2016-2019)

MIT Council on the Uncertain Human Future (2020)

MIT Taskforce 2021 research subcommittee member (2020)

UCAR Member representative from MIT (2019-)

Reviewer:

Journals: *Earth System Dynamics*, *Geophysical Research Letters*, *PNAS*, *Journal of Advances in Modeling Earth Systems*, *Journal of Climate*, *Journal of Geophysical Research*, *Journal of the Atmospheric Sciences*, *Quarterly Journal of the Royal Meteorological Society*, *Current Climate Change Reports*, *Nature Geoscience*

Funding agencies: *NSF*, *NSF panelist*, *US-Israel Binational Science Foundation*, *NERC*, *ERC*

Service as Postdoc and Graduate Student

Harvard: ClimaTea Seminar co-organizer, 2015

MIT: Graduate Climate Conference organizing committee (2011, 2013 abstract chair)

MIT: MASS Seminar organizing committee (spring 2012, fall 2012, spring 2013)

MIT: WxChallenge forecasting competition, member of team (2010-2014, 2016-2019),
individual rankings: 141/1192 (2010-2011), 56/1314 (2011-2012),
35/1424 (2012-2013), 83/1289 (2013-2014), 167/1109 (2016-2017),
46/1072 (2017-2018), 40/1037 (2018-2019)

MIT: PAOC Retreat organizing committee (2010, 2011)

Outreach Activities

Content Advisor, WGBH projects “Polar Extremes” (2020) and “Bringing the Universe to America’s Classrooms” (2017, 2020)

Science Fair Judge, KIPP Academy Lynn, 2012, 2013, 2014, 2016

Science Fair Judge, Falmouth Academy, 2010, 2011, 2012, 2013, 2014, 2015, 2016, 2017

Community Garden Coordinator, Leland Street Herb Garden, Nov. 2010 – Sept. 2016

Alumni Panel on Sustainability, Falmouth Academy, 7 Jan. 2011