

Timothy W Cronin

Curriculum Vitae

Department of Earth, Atmospheric and Planetary Sciences
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Employment

2022- Associate Professor, MIT
2016-2022 Assistant Professor, MIT
2014-2016 NOAA¹ Environment Postdoctoral Fellow, Harvard University
2014 Postdoctoral Associate, MIT
2006-2009 Research Assistant, Ecosystems Center, Marine Biological Laboratory,
Woods Hole

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

Awards and Honors

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
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

¹ Acronyms used: NOAA = National Oceanic and Atmospheric Administration; UCAR = University Corporation for Atmospheric Research; PAOC = Program in Atmospheres, Oceans and Climate

Postdoctoral Researchers Supervised

Daniel Koll 2017-2021; now Assistant Professor at Peking University
Nicholas Lutsko 2017-2019; now Assistant Professor at Scripps
Tristan Abbott 2021-2022; now Postdoctoral Researcher at Princeton/GFDL

Ph.D. Students Supervised

Paul Nicknish incoming fall 2022
Martin Velez-Pardo 2018-present
Tristan Abbott 2016-2021 (PhD)
Tom Beucler 2016-2018 (PhD; co-advised with Emanuel);
 now Assistant Professor at University of Lausanne
Leah Birch 2014-2017 (PhD, Harvard, co-advised with Tziperman);
 now Atmospheric Data Scientist at MORSE Corp

Educational Commons

UROP Students Supervised

Ben Richards 2019-2020, UROP
Natalie Woods 2019-2020, UROP

Teaching

2016, 2018-2021 Atmospheric Radiation and Convection (12.315/12.815)
2017-2020 Introduction to Atmosphere, Ocean and Climate Dynamics (12.003)
2018-2020 Co-instructor for first-year graduate class (12.S597, 12.900)
2013-2014 Content Production and Course Operations team, "Global Warming
 Science" (MITx 12.340x, 2014)

Internal Service

MIT Council on the Uncertain Human Future (2020)
MIT Taskforce 2021 research subcommittee member (2020)
UCAR Member representative from MIT (2019-)
EAPS Faculty Postdoctoral Officer (2021-)
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-)
Thesis committee membership: Margaret Duffy (*PhD 2021*), Brian Green (PhD 2018),
Mukund Gupta (PhD 2020), Ziwei Li (*PhD 2021*), Jonathan Lin, Raphael Rousseau-Rizzi
(PhD 2021), Rohini Shivamoggi, Catherine Wilka (PhD 2021)

External Service and Outreach

Co-organizer, 2022 symposium honoring career of Kerry Emanuel
Organizer, 2019 Northeast Tropical Workshop, Endicott House, Dedham MA
Thesis committee membership: Osamu Miyawaki (U Chicago)

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

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

Science Fair Judge, Falmouth Academy High School, 2010, 2011, 2012, 2013, 2014, 2015, 2016, 2017, 2021

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

Publications

(× indicates supervised undergraduate student, * indicates supervised graduate student, and + indicates supervised postdoc)

In preparation

+Abbott, T., and **T.W. Cronin**: Multiple equilibria and soil moisture-precipitation feedbacks in simulations of convection over land with parameterized large-scale dynamics.

+Lutsko, N., and **T.W. Cronin**: Mean climate and circulation of mock-Walker simulations.

In revision

T.W. Cronin and *I. Dutta: How well do we understand the Planck feedback? *Quarterly Journal of the Royal Meteorological Society*, *in revision*.

Accepted/published

*Freese, E., and **T.W. Cronin** (2021): Antarctic Radiative and Temperature responses to a doubling of CO₂. *Geophysical Research Letters*, doi: 10.1029/2021GL093676.

×Richards, B., +D. Koll, and **T.W. Cronin** (2021): Seasonal Loops between Local Outgoing Longwave Radiation and Surface Temperature. *Geophysical Research Letters*, doi: 10.1029/2021GL092978.

Muller, C., D. Yang, G. Craig, **T.W. Cronin**, B. Fildier, J. Haerter, C. Hohenegger, B. Mapes, D. Randall, S. Shamekh, and S. Sherwood (2021): Spontaneous Aggregation of

Convective Storms. *Annual Reviews of Fluid Mechanics*, doi: 10.1146/annurev-fluid-022421-011319.

*Abbott, T., and **T.W. Cronin** (2021): Aerosol invigoration of atmospheric convection through increases in humidity. *Science*, doi: 10.1126/science.abc5181.

*Wilka, C., S. Solomon, **T.W. Cronin**, D. Kinnison, and R. Garcia (2021): Atmospheric Chemistry Signatures of an Equatorially-Symmetric Matsuno-Gill Circulation Pattern. *Journal of the Atmospheric Sciences*, doi: 10.1175/JAS-D-20-0025.1.

*Abbott, T., **T.W. Cronin**, and *T. Beucler (2020): Convective Dynamics and the Response of Precipitation Extremes to Warming in 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.

Cronin, T.W., 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. Dangel (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.

Invited Talks

- 2021 George Mason University Climate Seminar (virtual), SUNY Stony Brook TAOS Seminar (virtual), University of Chicago Department of Geophysical Sciences Seminar (virtual), University of Washington Atmospheric Science Colloquium (virtual)
- 2020 University of Wisconsin Madison Department of Atmospheric and Ocean Sciences Colloquium (virtual), Princeton AOS Summer Workshop instructor (virtual), Stanford CLAOD Seminar (virtual), 'From Bomex to EUREC4A' symposium
- 2019 Cornell University EAS colloquium, Harvard University Climate Seminar, ICTP Summer School on Convective Organization and Climate Sensitivity, Northeast Tropical Workshop, University of Connecticut Climate Research Symposium keynote speaker, Colorado State University Atmospheric Science colloquium, NYU Atmosphere-Ocean Science Colloquium
- 2018 WHOI Physical Oceanography Seminar, HeldFest Symposium, UC Davis Atmospheric Science Seminar, MIT Water & Climate Change Workshop, Princeton Workshop on Convection in Nature
- 2017 Stockholm University Arctic Air Mass Transformations Workshop, Imperial College Atmospheric Physics Seminar, Swarthmore College Physics Colloquium, Purdue University EAPS Colloquium, Florida State University EOAS Seminar, SUNY Stony Brook TAOS Seminar
- 2016 University of Washington Atmospheric Science Colloquium, Berkeley Atmospheric Science Seminar, NOAA Summer Institute, Max-Planck-Institut für Meteorologie Seminar, Laboratoire de Météorologie Dynamique Seminar, SUNY Albany ASRC Seminar, Weizmann Institute of Science EPS Seminar
- 2015 Columbia University SEAS Seminar in Climate Science, University of Chicago Department of Geophysical Sciences Seminar, MIT MASS Seminar, Northeast Tropical Workshop, Caltech Workshop on Monsoons: Past, Present, and Future, McGill University AOS Seminar, Brown University Climate & Environmental Science Seminar
- 2014 Caltech ESE Seminar, MIT EAPS Special Seminar
- 2013 Yale University AOCD Seminar