TIMOTHY M. MERLIS

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Research Interests

Climate dynamics of Earth and exoplanets, extreme weather and climate change, hurricanes, atmospheric hydrological cycle & surface coupling, attribution science

Awards and Fellowships

2019–2022	Natural Sciences and Engineering Research Council of Canada Discovery Grant Accelerator Award
2018–2019	Tomlinson Professorship Award, McGill University
2015–2025	Canada Research Chair (Tier II)
2014	James R. Holton Early Career Scientist Award, Atmospheric Sciences Section of the American Geophysical Union Conference

Positions

2018–	**McGill University Department of Atmospheric and Oceanic Sciences** Associate Professor & Member of McGill Space Institute Canada Research Chair (Tier II) in Atmospheric and Climate Dynamics
2013–2018	**McGill University Department of Atmospheric and Oceanic Sciences** Assistant Professor & Canada Research Chair (Tier II, 2015–)
2011–2013	**Princeton University and Geophysical Fluid Dynamics Laboratory** Princeton Center for Theoretical Science Postdoctoral Fellow, Hosted by Isaac Held
2006–2011	**Ph.D. California Institute of Technology**
2002–2006	**B.S. Columbia University**

Refereed Journal Publications (See http://www.meteo.mcgill.ca/~tmerlis/publications.html for up-to-date list.) Advisees are underlined. H-index 21, cumulative citations 1292 (Google Scholar, October 2021).

[45] Merlis, T. M., N. Feldl, and R. Caballero (2021): Changes in poleward atmospheric energy transport over a wide range of climates: Energetic and diffusive perspectives and a priori theories. *Journal of Climate*, submitted.

[44] Rousseau-Rizzi, R., T. M. Merlis, and N. Jeevanjee (2021): The connection between Carnot and CAPE formulations of TC potential intensity. *Journal of Climate*, in revision.

[43] Hill, S. A., N. J. Burls, A. V. Fedorov, and T. M. Merlis (2021): Symmetric and antisymmetric components of polar-amplified warming. *Journal of Climate*, in revision.

[42] Kim, D, S. M. Kang, T. M. Merlis, and Y. Shin (2021): Atmospheric circulation sensitivity to changes in the vertical structure of polar warming. *Geophysical Research Letters*, **48**, e2021GL094726, doi:10.1029/2021GL094726.

[41] Feldl, N. and T. M. Merlis (2021): Polar amplification in idealized climates: the role of ice, moisture, and seasons. *Geophysical Research Letters*, **48**, e2021GL094130, doi:10.1029/2021GL094130.

[40] Bembenek, E., T. M. Merlis, and D. Straub (2021): Influence of latitudinal and moisture effects on the barotropic instability of an idealized ITCZ. *Journal of the Atmospheric Sciences*, **78**, 2677-2689, doi:10.1175/JAS-D-20-0346.1.

[39] Feng, P.-N., H. Lin, J. Derome, and T. M. Merlis (2021): Forecast skill of the NAO in Subseasonal-to-Seasonal Prediction Models. *Journal of Climate*, **34**, 4757–4769, doi:10.1175/JCLI-D-20-0430.1.

[38] Rollings, M. and T. M. Merlis (2021): The observed relationship between Pacific SST variability and Hadley cell extent in reanalyses. *Journal of Climate*, **34**, 2511–2527, doi: 10.1175/JCLI-D-20-0410.1.

[37] Henry, M., T. M. Merlis, N. J. Lutsko, and B. E. J. Rose (2021): Decomposing the drivers of polar amplification with a single column model. *Journal of Climate*, **34**, 2355–2365, doi: 10.1175/JCLI-D-20-0178.1.

[36] Henry, M. and T. M. Merlis (2020): Lapse rate changes dominate residual polar warming in solar radiation management scenarios. *Geophysical Research Letters*, **47**, e2020GL087929, doi: 10.1029/2020GL087929.

[35] Labonté, M.-P. and T. M. Merlis (2020): Sensitivity of the Atmospheric Water Cycle within the Habitable Zone of a Tidally-Locked, Earth-like Exoplanet. *Astrophysical Journal*, doi:10.3847/1538-4357/ab9102.

[34] Bembenek, E., D. Straub, and T. M. Merlis (2020): Effects of Moisture in a Two-Layer Model of the Midlatitude Jet Stream. *Journal of the Atmospheric Sciences*, **77**, 131-147, doi:10.1175/JAS-D-19-0021.1.

[33] Merlis, T. M. and I. M. Held (2019): Aquaplanet simulations of tropical cyclones. *Current Climate Change Reports*, doi:10.1007/s40641-019-00133-y.

[32] Maher, P., E. P. Gerber, B. Medeiros, T. M. Merlis, S. Sherwood, A. Sheshadri, A. H. Sobel, G. K. Vallis, A. Voigt, and P. Zurita-Gotor (2019): Model hierarchies for understanding atmospheric circulation. *Reviews of Geophysics*, **57**, 250-280, doi:10.1029/2018RG000607.

[31] Menzel, M. E. and T. M. Merlis (2019): Connecting direct effects of CO_2 radiative forcing to ocean heat uptake and circulation. *Journal of Advances in Modeling Earth Systems*, **11**, 2163-2176, doi:10.1029/2018MS001544.

[30] Yang, J., J. Leconte, E. T. Wolf, T. M. Merlis, D. D. B. Koll, F. Forget, and D. S. Abbot (2019): Simulations of Water Vapor and Clouds on Rapidly Rotating and Tidally Locked Planets: A 3D Model Intercomparison *The Astrophysical Journal*, **875**, doi:10.3847/1538-4357/ab09f1.

[29] Li, Y., D. W. J. Thompson, S. Bony, and T. M. Merlis (2019): Thermodynamic control on the poleward shift of the extratropical jet in climate change simulations: The role of rising high clouds and their radiative effect. *Journal of Climate*, **32**, 917–934.

[28] Henry, M. and T. M. Merlis (2019): The role of the nonlinearity of the Stefan-Boltzmann law on the structure of radiatively forced temperature change. *Journal of Climate*, **32**, 335–348.

[27] Merlis, T. M. and M. Henry (2018): Simple estimates of polar amplification in moist diffusive energy balance models. *Journal of Climate*, **31**, 5811–5824.

[26] Jansen, M., L.-P. Nadeau, and T. M. Merlis (2018): Transient vs Equilibrium Response of the Ocean's Overturning Circulation to Warming. *Journal of Climate*, **31**, 5147–5163.

[25] Kirshbaum, D. J., T. M. Merlis, J. R. Gyakum, R. McTaggart-Cowan (2018): Sensitivity of idealized moist baroclinic waves to environmental temperature. *Journal of the Atmospheric Sciences*, **75**, 337–360.

[24] O'Gorman, P. A., T. M. Merlis, and M. S. Singh (2018): Increase in the skewness of extratropical vertical velocities with climate warming: fully nonlinear simulations versus moist baroclinic instability. *Quarterly Journal of the Royal Meteorological Society*, **144**, 208–217.

[23] Defforge, C. L. and T. M. Merlis (2017): Evaluating the evidence of a global sea surface temperature threshold for tropical cyclone genesis, *Journal of Climate*, **30**, 9133–9145.

[22] Viale, F. and T. M. Merlis (2017): Variations in tropical cyclone frequency response to solar and CO_2 forcing in aquaplanet simulations. *Journal of Advances in Modeling Earth Systems*, **9**, 4–18, doi:10.1002/2016MS000785.

[21] Defforge, C. L. and T. M. Merlis (2017): Observed warming trend in sea surface temperature at tropical cyclone genesis. *Geophysical Research Letters*, **44**, 1034–1040, doi:10.1002/2016GL071045.

[20] Seo, J., S. Kang, and T. M. Merlis (2017): A model intercomparison of the tropical precipitation response to a CO_2 doubling in aquaplanet simulations. *Geophysical Research Letters*, **44**, 993–1000, doi:10.1002/2016GL072347.

[19] Feldl, N., S. Bordoni, and T. M. Merlis (2017): Coupled high-latitude climate feedbacks and their impact on atmospheric heat transport. *Journal of Climate*, **30**, 189–201.

[18] Galbraith, E. D., T. M. Merlis, and J. B. Palter (2016): Destabilization of glacial climate by the radiative impact of Atlantic Meridional Overturning Circulation disruptions. *Geophysical Research Letters*, **43**, 8214–8221, doi:10.1002/2016GL069846.

[17] Yang, J., J. Leconte, E. T. Wolf, C. Goldblatt, N. Feldl, T. M. Merlis, Y. Wang, D. D. B. Koll, F. Ding, F. Forget, and D. S. Abbot (2016): Differences in water vapor radiative transfer among 1D models can significantly affect the inner edge of the habitable zone. *The Astrophysical Journal*, **826**, doi:10.3847/0004-637X/826/2/222.

[16] Trossman, D., J. Palter, T. M. Merlis, Y. Huang, and Y. Xia (2016): Large-scale ocean circulation-cloud interactions reduce the pace of transient climate change. *Geophysical Research Letters*, **43**, 3935–3943.

[15] Merlis, T. M. W. Zhou, I. M. Held, and M. Zhao (2016): Surface temperature dependence of tropical cyclone-permitting simulations in a spherical model with uniform thermal forcing. *Geophysical Research Letters*, **43**, 2859–2865.

[14] Merlis, T. M. (2016): Does humidity's seasonal cycle affect the annual-mean tropical precipitation response to extratropical forcing? *Journal of Climate*, **29**, 1451–1460.

[13] Merlis, T. M. (2015): Direct weakening of tropical circulations from masked CO_2 radiative forcing. *Proceedings of the National Academy of Science*, **112**, 13167– 13171.

[12] Ballinger, A. P., T. M. Merlis, I. M. Held, and M. Zhao (2015): The sensitivity of tropical cyclone activity to off-equatorial thermal forcing. *Journal of the Atmospheric Sciences*, **72**, 2286–2302.

[11] Merlis, T. M. (2014): Interacting components of the top-of-atmosphere energy balance affect changes in regional surface temperature. *Geophysical Research Letters*, **41**, 7291-7297, doi:10.1002/2014GL061700.

[10] Merlis, T. M., I. M. Held, G. L. Stenchikov, F. Zeng, and L. Horowitz (2014): Constraining transient climate sensitivity using coupled climate model simulations of volcanic eruptions. *Journal of Climate*, **27**, 7781–7795.

[9] Merlis, T. M., M. Zhao, and I. M. Held (2013): The sensitivity of hurricane frequency to ITCZ changes and radiatively forced warming in aquaplanet simulations. *Geophysical Research Letters*, **40**, 4109-4114, doi:10.1002/grl.50680.

[8] Merlis, T. M., T. Schneider, S. Bordoni, and I. Eisenman (2013): The tropical precipitation response to orbital precession. *Journal of Climate*, **26**, 2010–2021.

[7] Merlis, T. M., T. Schneider, S. Bordoni, and I. Eisenman (2013): Hadley circulation response to orbital precession. Part II: Subtropical continent. *Journal of Climate*, **26**, 754–771.

[6] Merlis, T. M., T. Schneider, S. Bordoni, and I. Eisenman (2013): Hadley circulation response to orbital precession. Part I: Aquaplanets. *Journal of Climate*, **26**, 740–753.

[5] Merlis, T. M. and T. Schneider (2011): Changes in zonal surface temperature gradients and Walker circulations in a wide range of climates. *Journal of Climate*, **24**, 4757–4768.

[4] Merlis, T. M. and T. Schneider (2010): Atmospheric dynamics of Earth-like tidally locked aquaplanets. *Journal of Advances in Modeling Earth Systems*, **2**, Art. #13, doi:10.3894/JAMES.2010.2.13

[3] Merlis, T. M. and T. Schneider (2009): Scales of linear baroclinic instability and macroturbulence in dry atmospheres. *Journal of the Atmospheric Sciences*, **66**, 1821–1833.

[2] Merlis, T. M. and S. Khatiwala (2008): Fast dynamical spin-up of ocean general circulation models using Newton-Krylov methods. *Ocean Modelling*, **21**, 97–105.

Book Chapters

[1] Showman, A. P., R. D. Wordsworth, T. M. Merlis, and Y. Kaspi (2013): Atmospheric Circulation of Terrestrial Exoplanets. *Comparative Climatology of the Terrestrial Planets*, S. J. Mackwell, A. A. Simon-Miller, J. W. Harder, and M. A. Bullock, Eds., University of Arizona Press, pp. 277–326.

Teaching

2020	Instructor of McGill's ESYS 301: Earth System Modelling, Winter 2020
2019	Instructor of McGill's ATOC 531: Dynamics of Current Climates, Fall 2019
2018	Instructor of McGill's ATOC/PHYS 404: Climate Physics, Fall 2018
2018	Instructor of McGill's ATOC 531: Dynamics of Current Climates, Fall 2018
2018	Instructor of McGill's ATOC 215: Oceans, Weather and Climate, Winter 2018
2018	Instructor of McGill's ATOC 215: Oceans, Weather and Climate, Winter 2018
2017	Instructor of McGill's ATOC 531: Dynamics of Current Climates, Fall 2017
2017	Instructor of McGill's ATOC 215: Oceans, Weather and Climate, Winter 2017

2016 Instructor of McGill's ATOC 531: Dynamics of Current Climates, Fall 2016

2016 Instructor of McGill's ATOC 513: Waves and Stability, Winter 2016

2016 Instructor of McGill's ATOC 531: Dynamics of Current Climates, Winter 2016

2015 Instructor of McGill's ATOC 513: Waves and Stability, Winter 2015

2015 Instructor of McGill's ATOC 183: Climate and Climate Change, Winter 2015

2014 Organizer of McGill's ATOC 550: Special Topics in Meteorology and Oceanography, Fall 2014

2014 Instructor of McGill's ATOC 513: Waves and Stability, Winter 2014

Outreach

2019 Lecturer at McGill University undergraduate outreach event *Soup & Science*

2016 Lecturer at McGill University high school outreach event *Snappy Science*

2016 McGill University Atmospheric and Oceanic Science department high school outreach *Canada Wide Science Fair*

2016 Lecturer at McGill University undergraduate outreach event *Soup & Science*

2014 Lecture on physical climate science for McGill University *Under the Weather: Climate Change Research and Justice* series

2014 Lecture on climate change for Science Undergraduate Society of McGill University

2013 Interviews with *Le Devoir* newspaper and radio station CJAD 800 about Typhoon Haiyan and climate change

2013 Lecturer at McGill University undergraduate outreach event *Soup & Science*

2013 Panelist at AGU Chapman Conference "Crossing the Boundaries in Planetary Atmospheres: From Earth to Exoplanets"

2012 Panelist for "Five Controversies in Climate Science Symposium" in honor of George Philander

Advising

Post-doc Advisees, current (1): Thomas Navarro (2019–present, co-advisor with Prof. Natalya Gomez & Nicholas Cowan)

Post-doc Advisees, past (1): Eric Bembenek (2021–present, co-advisor with Prof. David Straub)

Ph.D. Advisees, current (3): Yan-Ting Chen (2019–present, co-advisor with Prof. Yi Huang), Marie-Pier Labonté (2018–present), Meera Mohan (2020–present, co-advisor with Prof. Daniel Kirshbaum),

Ph.D. Advisees, completed (4): Matthew Henry (2016–2019), Eric Bembenek (2014–2020, co-advisor with Prof. David Straub), Pei-Ning Feng (2014–2020, co-advisor with Dr. Hai Lin, ECCC), Nicholas Soulard (2015–2020, co-advisor with Dr. Hai Lin, ECCC)

M.Sc. Advisees, completed (6): Flora Viale (2014–2016), Cécile Defforge (2015–2016), Molly Syme (2015–2017), Marie-Pier Labonté (2016–2017, fast tracked to Ph.D.), Zhong Yi Chia (2016–2018, co-advisor with Prof. Daniel Kirshbaum), Michael Rollings (2017–2019), Anne-Sophie Fortin (2018–2021, co-advisor with Prof. Carolina Dufour)

Undergraduate Research Assistants (8): Bryn Ronalds (2013–2014), Valérie Losier (2013–2014, co-advisor with Prof. Daniel Kirshbaum), Luke Davis (2014–2016), Kaiti Jiang (2015), Michael Rollings (2017), Anne-Sophie Fortin (2018), Jessica Di Bartolomeo (2019), Han Szeptycki (2020–2021)

Advisee Awards and Fellowships

2021	Yan-Ting Chen, Mysak Fellowship (McGill AOS Department Award)
2019	Thomas Navarro, McGill Space Insitute Post-doc Fellowship
2019	Matthew Henry, Eben Hopson Fellowship, McGill University
2018	Michael Rollings, NSERC M.Sc. Fellowship (CGS-M)
2018	Anne-Sophie Fortin, Hydro-Quebec Fellowship, McGill Faculty of Science
2016	Cécile Defforge, Best Student Poster Award AMS Hurricanes and Tropical Meteorology Meeting
2016	Marie-Pier Labonté, McGill Space Insitute M.Sc. Fellowship
2015	Arkadiusz Bembenek, NSERC Ph.D. Fellowship
2015	Cécile Defforge, Mysak Fellowship (McGill AOS Department Award)

Professional Activities and Memberships

Vice-chair of AMS Atmospheric and Oceanic Fluid Dynamics Committee, 2021–

Associate Editor *Journal of Climate*, 2021–

Co-chair of Canadian Meteorological and Oceanographic Society Scientific Committee, 2017–2020

Member of AMS Atmospheric and Oceanic Fluid Dynamics Committee, 2017–2022

Member of US CLIVAR Working Group: Changing Width of the Tropical Belt, 2016–2018

Co-organizer of California Institute of Technology workshop "Monsoons: Past, Present and Future" in May, 2015.

Member of AMS Atmospheric and Oceanic Fluid Dynamics Committee, 2011–2013

Co-convener of session "Atmospheric Circulations and Climate Change" at AGU Fall Meeting, 2010

Reviewer for funding agencies: *NSERC, NASA, NSF, ISF*

Reviewer for journals: *Journal of the Atmospheric Sciences, Journal of Climate, Geophysical Research Letters, Nature, Nature Geoscience, npj Climate and Atmospheric Science, Bulletin of the American Meteorological Society, Proceedings of the National Academy of Science, Nature Climate Change, Journal of Marine Research, Quarterly Journal of the Royal Meteorological Society, Journal of Geophysical Research, Environmental Research Letters, Biogeosciences, Geoscientific Model Development*, and *Climate Dynamics*

Member of American Meteorological Society, American Geophysical Union, and Canadian Meteorological and Oceanographic Society

Department Seminars

2021	University of Michigan, Yale University

2020	Columbia University (rescheduled due to COVID-19), Yale University (rescheduled due to COVID-19)
2019	University of Waterloo, University of Chicago
2018	Stony Brook University
2017	Scripps Institution of Oceanography, UCSD (Climate, Atmospheric Sciences, and Physical Oceanography Department), Seoul National University
2016	McGill University (Department of Physics), Columbia University, Lamont Doherty Earth Observatory
2015	University of Michigan
2014	MIT, Weizmann Institute of Science, Tel Aviv University
2013	University at Albany, University of Oxford, Caltech, Geophysical Fluid Dynamics Laboratory, McGill University, Harvard University, Stanford University, University of Toronto
2012	Cornell University, Yale University, Columbia University, Institute for Advanced Study, Harvard University
2011	MIT, Brown University, Caltech (thesis defense), University of New South Wales
2010	Geophysical Fluid Dynamics Laboratory
2009	MIT

Conference Presentations

2021	AGU Fall Meeting (forthcoming)
2020	AMS Annual Meeting, AGU Fall Meeting
2019	AMS Conference on Atmospheric and Oceanic Fluid Dynamics, IUGG/CMOS Congress, Northeast Tropical Workshop
2018	CMOS Congress (invited plenary), MIT Lorenz Center Water and Climate Change (invited), Heldfest (invited)
2017	CMOS Congress, AMS Conference on Atmospheric and Oceanic Fluid Dynamics, Northeast Tropical Workshop, AGU Fall Meeting (invited)
2016	AMS Conference on Hurricanes and Tropical Meteorology, CMOS Congress, AGU Fall Meeting (invited), WCRP Model Hierarchies Workshop, CLIVAR Width of the Tropical Belt Workshop

2015	Caltech Monsoon Workshop, Northeast Tropical Workshop, AMS Conference on Atmospheric and Oceanic Fluid Dynamics
2014	AMS Conference on Hurricanes and Tropical Meteorology, Latsis Symposium, World Weather Open Science Conference, AGU Fall Meeting (two invited presentations)
2013	AGU Fall Meeting (invited), Northeast Tropical Workshop, CLIVAR Hurricane Working Group Workshop, AMS Conference on Atmospheric and Oceanic Fluid Dynamics
2012	AGU Fall Meeting, Atmosphere-Ocean Science Days, AMS Conference on Hurricanes and Tropical Meteorology
2011	AGU Fall Meeting, AMS Conference on Atmospheric and Oceanic Fluid Dynamics
2010	AGU Fall Meeting, AMS Conference on Hurricanes and Tropical Meteorology
2009	AMS Conference on Atmospheric and Oceanic Fluid Dynamics*, Caltech Ocean-Atmosphere Energy Transport Conference
2008	AGU Fall Meeting, Kavli Institute Frontier of Climate Conference
2007	AGU Fall Meeting, AMS Conference on Atmospheric and Oceanic Fluid Dynamics, Southern California Symposium on Flow Physics
2006	SIAM Annual Meeting, AGU Joint Assembly†

*Best Student Poster Award
†Outstanding Student Paper